Such changes address the desires of employers, increase the numbers of baccalaureate degrees earned by members of currently underrepresented groups, and promote curriculum improvement. Foundation Coalition improvements are presently available to all freshmen and sophomores except those in Chemical, Biological, and Materials Engineering, and to juniors and seniors in Electrical Engineering and Industrial and Management Systems Engineering.

Foundation Coalition programs offer students a more hands-on, team-based, computer-intensive approach to the curriculum. The freshman programs provide an important opportunity for new students to get to know a small group of students making a large university seem less overwhelming. The programs also involve more interactions with faculty and access to special tutors. All students will get a team-based, computer-intensive education in ECE 101, Introduction to Engineering Design, but the Foundation Coalition program extends this experience to many more subjects and courses.

Freshmen Foundation Coalition programs offer both an integrated set of courses which include engineering, calculus, physics, and English in both the first and second semesters, and smaller integration packages that include engineering and English. In these packages, the same set of students take all of the courses in the package in high tech, team promoting classrooms while the faculty work together to deliver a unified set of courses. Sophomore programs presently involve courses in mathematics, mechanics, and electrical circuits.

Students interested in these programs should see their department advisor or inquire in the office of the Center for Innovation in Engineering Education in room ECG 205 or call 480 965 5350, or access the Web site at www.eas.asu.edu/asufc.

Minority Engineering Program. The staff of the Minority Engineering Program (MEP) is available to assist the academic and professional development of prospective, newly admitted, and continuing students through a variety of support services. In addition, advice on financial aid, scholarships, and employment is provided. Visit the MEP office located in room ECG 345 or call 480 965 8275, or access the Web site at www.eas.asu.edu/~cmep.

Women in Applied Sciences and Engineering Program. The Women in Applied Sciences and Engineering (WISE) Program hosts seminars and workshops, and provides outreach programs to high school and community college students. WISE offers a professional development course, STE 194 Engineering for Undecided, to acquaint students with a variety of technical careers. The WISE Center, located in room ECG 214, is open for study groups, tutoring, and informal discussions. The phone number is 480 965 6882. The Web address is www.eas.asu.edu/~wise.

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:

Alpha Pi Mu — Industrial Engineering Honor Society
Chi Epsilon — Civil Engineering Honor Society
Eta Kappa Nu — Electrical Engineering Honor Society
Pi Tau Sigma — Mechanical Engineering Honor Society
Sigma Gamma Tau — Aerospace Engineering Honor Society
Sigma Lambda Chi — Construction Honor Society
Tau Beta Pi — National Engineering Honor Society
Upsilon Pi Epsilon — National Computer Science Honor Society

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

University Honors College. The College of Engineering and Applied Sciences participates in the programs of the University Honors College, which provides enhanced educational experiences to academically superior undergraduate students. 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 in the "University Honors College" section, page 316.

Scholarships. Information and applications for academic scholarships for continuing students may be obtained by contacting the college's Student Academic Services 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, Construction, or Physics or from Southwestern University (Georgetown, Texas) in Physical Science and a baccalaureate degree in one of the engineering majors or the Construction major from ASU can take advantage of a 3+2 program approved by these institutions. 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.

A similar 3+2 program is available to qualified students from Long Island University/C.W. Post Campus, College of Arts and Sciences, who wish to earn both a B.S. degree from C.W. Post in Mathematics or Physics and a Bachelor of Science in Engineering degree from ASU in Civil, Chemical, Electrical, Industrial, or Mechanical Engineering.

More information can be obtained by writing to one of the following offices:

OFF CE OF THE ADM NISTRAT VE VICE PRESIDENT
GRAND CANYON UNIVERS TY
3300 W CAMELBACK RD
PHOENIX AZ 85017 1097

PROVOST AND DEAN OF THE BROWN COLLEGE
OF ARTS AND SC ENCES
SOUTHWESTERN UNIVERS TY
GEORGETOWN TX 78626

DEAN COLLEGE OF ARTS AND SCIENCES
C W POST CAMPUS
LONG SLAND UN VERSITY
BROOKVILLE NY 11548

OFFICE OF THE DEAN
COLLEGE OF ENG NEERING AND
APPL ED SC ENCES
AR ZONA STATE UNIVERS TY
PO BOX 875506
TEMPE AZ 85287 5506

ROTC Students. Students pursuing a commission through either the Air Force or Army ROTC programs are required to take from 2 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) or military science (MIS courses are not acceptable for degree credit in engineering as social and behavioral science or humanities and fine arts under General Studies ROTC students must also meet all other degree requirements of this college.

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

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

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

Del E. Webb School of Construction

William W. Badger
Director
(SCOB 268) 480/965-3615
www.eas.asu.edu/~dewsc

PROFESSORS
BADGER, MULLIGAN

ASSOCIATE PROFESSORS
BASHFORD ERNZEN KASHIWAGI, WEBER

ASSISTANT PROFESSORS
CHASEY WALSH WIEZEL

VISITING EMINENT SCHOLAR
SCHEXNAYDER

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

Bachelor of Science (B.S.) Degree. The faculty in the Del E Webb School of Construction offer the B.S. degree in Construction. Four options are available: general building, heavy construction, residential 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.

Master of Science (M.S.) Degree. The faculty in the Del E. Webb School of Construction also offer the M.S degree in Construction. Additional details for this degree are found in the *Graduate Catalog*

Professional Accreditation and Affiliations. The Del E Webb School 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).

SPECIAL PROGRAMS

The Del E. Webb School of Construction maintains a cooperative agreement with community colleges within Arizona and also with selected out of state colleges and universities to structure courses that are directly transferable into the construction program at ASU.

ASU 3+2 Program. The Del E. Webb School of Construction also participates in the ASU 3+2 program with Grand Canyon University and Southwestern University. See "ASU 3+2 Programs," page 201, for details.

Student Organizations. The school has a chapter of Sigma Lambda Chi (SLC), a national honor society that recognizes high academic achievement in accepted construction programs. The school is also host to the Associated General Contractors of America (AGC) student chapter, the National Association of Home Builders (NAHB) student chapter, the National Association of Women in Construction (NAWIC) student chapter, and the Construction Women's Alliance (CWA).

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. The scholarships are awarded on the basis of academic achievement and participation in activities of the construction program.

ADMISSION

For information regarding requirements for admission, transfer, retention, qualification, and reinstatement, see "Undergraduate Admission," page 60, "Admission," page 196, and "College Degree Requirements," page 199. A preprofessional category is available for applicants deficient in regular admission requirements. Vocational and craft oriented courses taught at the community colleges are not accepted for credit toward a bachelor's degree in Construction.

BASIC REQUIREMENTS

Students complete the following basic requirements before registering for advanced courses: 1 all first semester, first year courses and the university First Year Composition requirement (see "University Graduation Requirements," page 81) 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.

DEGREE REQUIREMENTS

A minimum of 128 semester hours with at least 50 hours at the upper division level is required for graduation in the general building construction, heavy construction, residential construction, and specialty construction options. Students in all options are required to complete a construction core of science based engineering, construction, and management courses.

GRADUATION REQUIREMENTS

A student must earn a grade of "C" or higher in the mathematics and physics courses listed in the program of study.

In addition to fulfilling school and major requirements, majors must satisfy the General Studies requirements as noted in the "General Studies" section, page 85 and all university graduation requirements noted in the "University Graduations Requirements" section, page 81. Note that all three General Studies awareness areas are required. Consult your advisor for an approved list of courses.

SCHOOL COURSE REQUIREMENTS

The school requires that the General Studies requirement be satisfied in the following manner:

Humanities and Fine Arts (S) and Behavioral Sciences	
CON 101 Construction and Culture: A Built Environment *HU, G, H*	3
ECN 111 Microeconomic Principles *SB*	3
ECN 112 Microeconomic Principles *SB*	3
HU, SB, and awareness area courses as needed	6
Total	15
Literacy and Critical Inquiry	
COM 225 Public Speaking *L1*	3
CON 496 Construction Contract Administration *L2*	3
Total	6
Natural Sciences	
PHY 111 General Physics (S) *S2*	3
PHY 112 General Physics *S1 S2*[2]	3
PHY 113 General Physics Laboratory *S1 S2*[2]	1
PHY 114 General Physics Laboratory *S1 S2*[2]	
Total	8
Numeracy	
MAT 270 Calculus with Analytic Geometry I *N*	4
STP 226 Elements of Statistics *N2*	3
Total	7
General Studies school requirements total	36

[1] Both PHY 111 and 113 must be taken to secure S1 or S2 credit.

Both PHY 112 and 114 must be taken to secure S1 or S2 credit.

[3] Because of the school's requirement for MA 270, the total semester hours exceed the General Studies requirement of 35.

NOTE: For the General Studies requirement courses and codes such as L1, N3, C, and H, see General Studies, page 85. For graduation requirements see "University Graduation Requirements," page 81. For an explanation of additional nonbusiness courses offered but not listed in this catalog see "Classification of Courses," page 58.

Construction Major Requirements
Common to *All* Options
(Except as Noted

ACC 394 S Financial Analysis and Control for Small Businesses . . 3
or ACC 23 Uses of Accounting Information I 3
CEE 31 Testing of Materials for Construction . 3
CEE 34 Hydraulics and Hydrology . . 3
CEE 45 Soil Mechanics Construction . . 3
CON Applied Engineering Mechanics Statics 3
CON 243 Heavy Construction Equipment Methods, and Materials 3
CON 25 Microcomputer Application Construction 3
CON 25 Building Construction Methods Materials, and Equipment . . . 3
CON 273 Electrical Construction Fundamentals 3
CON 323 Strength of Material . .
CON 34 Surveying . . . .
CON 345 Mechanical Systems 3
CON 37 Construction Management and Safety 3
CON 383 Construction Estimating 3
CON 389 Construction Cost Accounting and Control Systems 3
CON 424 Structural Design 3
CON 453 Construction Labor Management 3
CON 456 Construction Project Management . . 3
CON 463 Foundations . . .
CON 495 Construction Planning and Scheduling Systems
ECE 1 Introduction to Engineering Design 4
LES 3 Legal, Ethical, and Regulatory Issues in Business . 3
or LES 36 Business Law 3
Science elective with lab . 4

Total common to all options . . . . .

Advisor approved alternates that satisfy credits for these courses may vary from the total required semester hours indicated Such variances do not reduce the minimum of 128 semester hours required for the degree

The course work for the first two years is the same for the general building, heavy, residential, and specialty construction options

First Semester
CON 1 Construction and Culture A Built Environment *HU G H* . . 3
ECN Macroeconomic Principles *SB* . . . 3
ENG 1 First Year Composition . . . 3
MAT 27 Calculus with Analytic Geometry IV . . 4
PHY 1 General Physics *S S2* . . . 3
PHY 11 General Physics Laboratory *SI S*

Total 7

Second Semester
ECE 1 Introduction to Engineering Design *M* 4
ECN 112 Microeconomic Principles *SB* . . . 3
ENG First Year Composition 3
PHY 2 General Physics *SI S2* 3
PHY 4 General Physics Laboratory *SI S2* 1
HU elective . 3

Total . . .

Third Semester
ACC 394 ST Financial Analysis and Control for Small Business or ACC 3 Uses in Accounting Information
CON 243 Heavy Construction Equipment Methods and Materials 3
CON 251 Microcomputer Applications in Construction . 3
CON 273 Electrical Construction Fundamentals . . . 3
STP 22 Elements of Statistics 3

Total 15

Fourth Semester
COM 2 Public Speaking *I* 3
CON 221 Applied Engineering Mechanics Statics 3
CON 25 Building Construction Methods, Materials and Equipment 3
CON 341 Surveying 3
Basic science elective with lab 4

Total 16

Both PHY 11 and 2 must be taken to secure S1 or S2 credit
2 Both PHY 12 and 14 must be taken to secure S1 or S2 credit

Option in General Building Construction

The general building construction 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
CON 472 Development Feasibility Reports *L2* . 3
CON 483 Advanced Building Estimating 3
PUP 43 Planning and Development Control Law or PUP 433 Zoning Ordinances, Subdivision Regulations and Building Codes 3
REA 304 ST Real Estate Fundamentals . . . 3
Upper division technical elective . . . 3

Total 15

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

Requirements
CON 344 Route Surveying 3
CON 456 Heavy Construction Estimating . . . 3
Upper division technical elective 9

Total 15

Option in Residential Construction

The residential construction option prepares students for careers in the residential sector of the industry This option covers the specific methods and processes during the planning, production, marketing and business related activities common to residential construction

Requirements
CON 377 Residential Construction Production Procedures 3
CON 477 Residential Construction Business Practices . . . 3

MKT 3	Princ p s of Marketin	3
PUP 43?	Plan in and Development C nt l Law	3
	or PUP 433 Z n ng O l a ces Subdivisi n Regulations and B ldi g Codes 3	
Internship		3
Total		15

Option in Specialty Construction

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

Requirements

CON 468	Mechanical and El tr al Estimating	3
CON 494	ST Cle in co C nstru tion	3
CON 494	ST Electr ca a d M c l an ca Pr ect Mana en nt	3
Upper division tech i ca e ect es		6
Total		5

CONSTRUCTION (CON)

CON 101 Construction and Cu ture: A Bui t Environment. 3 F S
An ana ys s of the cu t ra c ntext of nstruct n, emp as z ng ts centra ty n the evo ut on a d expans on of bu t e v r nments a express ns of eth ca a d h st r ca va ue syste s Lect re speakers, f e d tr ps *Genera Stud es H G H*

CON 221 Appl ed Eng neering Mechanics Stat cs. 3 F S
Vectors f rces and moments fo ce sy tems equ br um ana ys s of bas c structures and stru tu a c mpone ts fr ct on, cent o ds and moments of ne t a Prerequ tes MAT 2⁻0 PHY 111 113.

CON 243 Heavy Construct on Equipment, Methods and Materials. 3 F S
Emphas s o 'Ho z nta construct on F eet operat s ma ntena ce programs method and procedu e to construct tunne s ads dams and the excavat o f b d gs b f e d tr ps

CON 251 Microcomputer App icat ons for Construction. 3 F S
App cat ons of the m croc mp te as a pr b e sov g t o f r the constructor. Use of preadsheet for at on a agement, and mu t med a software Prereq s te ECE 1 0

CON 252 Building Construction Methods, Materials, and Equ pment. 3 F S
Emphas s on Ve t ca co t uct on Met ds mater a s code and equ pment u ed n bu d ng con tru t on orrespond g to the 16 d v s on Master F rmat ' Lecture ab

CON 273 Electrical Construction Fundamentals. 3 F S
C rcu ts and mach nery Powe t a sm s n nd d st but n w th emphas s on secondary d st b t n sy tems Measurements and instrumentat n Lecture f e tr p Prereq s tes P Y 112, 114

CON 323 Strength of Materials. 3 F S
Ana ys s of stre gt a d g d ty of st uctura members res st ng app ed forces Stress tra n shear m ment def ect ns comb ned stresses con ect ns, and moment d str but n Both US a d S un ts of measurement Prerequ te ON 221

CON 341 Surveying. 3 F S
Theory and f e d w rk n c n truct on a d and urvey Lecture ab Prerequ s te MAT 17

CON 344 Route Survey ng. 3 S
Simp e compo d and t ans t n u ve nc ud ng rec nna ssance pre m nary and o at on surveys Ca u at n f earthwork D mens ona c ntro f r construct pro ects Lect re ab Prereq s tes CON 243 341

CON 345 Mechanica Systems 3 F S
Des gn parameters and equ pment re ate to heat ng and coo ng sys tems for mechan ca c r truct on C mputer a ded ca c at ons ec ture f e d tr ps Prerequ tes CON 252 PHY 111 113

CON 371 Construct'on Management and Safety. 3) F S
O gan zat a d a agement the ry app ed to the construction pro cess Leadersh p f nct ons Safety procedures and equ pment OSHA requ rement f r c nstruct n Prerequ s te jun or stand ng

CON 377 Residential Construct on Production Procedures. (3) F
The process used n res dent a construct on How a house s bu t des gn perm t edu ng c de contract ng s te management mechan ca e ectr ca Prerequ s te CON 252

CON 383 Construction Estimating. 3 F S
Draw ng a d spec f cat ons Methods and techn ques used 'n con struct n est mat ng pro edu es ntroduct n to computer software used n ndustry Lecture project workshops Prerequ s tes CON 243 and 251 and 252 *or* nstructor approva

CON 389 Construction Cost Accounting and Control. (3) F S
Nature of construct on co t Deprec at on and tax theory and variab e equ pment c sts Cash f ow theory nvestment mode s, prof tabi ty a d ana ys s Computer app cat ons Fund ng sources and arrange ments B de 's ns rance P ereq s tes: ACC 230 or 394 ST: Finan c a Ana y and Account ng for Sma Bus ness CON 251 *General Stud es N3*

CON 424 Structural Design 3 F S
Econom c use of co crete stee and wo d n bu d ng and eng neered structures Des gn of beam co umns conc ete formwork and con nect ons Lecture f e d tr ps Prerequ s te CEE 310

CON 453 Construction Labor Management. 3) F, S
Labor and management h story un on, and open shop organ zat on of bu d ng and c nstruct on workers app cab e aws and government regu at on g a s econom c power ur sd ct ona d sputes and gr evance procedures ecture ab Prerequ s tes CON 371 ECN 112

CON 455 Construction Project Management. 3) F, S
Study of meth ds o rd at ng peop e, equ pment mater a s, money and schedu e to comp ete a proje t on t me and w th n approved cost Lecture c a s projects Pre or corequ te CON 495

CON 463 Foundations. 3 F S
Subsurface constr ct n theory and pract ce for descr pt on, excava t ns exp rat on f undat ons pavements and s opes Eva uation of spe f cat ns and p ans of work Lecture recitation f e d tr ps Prereq u s tes CEE 450 CON 424

CON 468 Mechanical and Electrical Estimating. 3 F
Ana ys s and rgan zat f perform g a cost est mate for both mechan ca and e ectr ca c nstruct n pr jects Computer usage Prerequ s tes CON 273 and 345 and 383 *or* nstructor approval

CON 472 Development Feasibility Reports. 3 F S
ntegrat on f econ m cat n theory deve opment cost data, mar ket research data and f nanc a ana ys s nto a feas b ty report Com puter r entat o P erequ s te REA 394 ST Rea Estate Fundamenta s *General Stud es L2*

CON 477 Residentia Construction Business Practices. (3) S
Top cs addressed w nc de deve opment market ng f nanc ng, ega ssue and sa es Prerequ s te CON 377 or nstructor approval.

CON 483 Advanced Bu lding Estimating. 3 F S
C ncepts of pr g and markup, deve opment of h stor c costs, fe cyc e c st ng change order a d conceptua est mat ng and empha s z g m roc mputer eth ds Prerequ s te CON 383

CON 486 Heavy Construction Estimating. 3 F
Methods ana y s and cost est mat on for construct on of highways br dges tunne s dam and ther eng'neer ng works Lecture f e d tr ps Pre equ s tes CON 344 383

CON 494 ST: Spec al Topics. 3 F S
a C eanroom Construct on
b E ectr ca a d Me han ca Project Management

CON 495 Construction P ann ng and Scheduling. 3) F S
Var ous network methods of project schedu ng, such as AOA AON Pert bar hart ng ne of ba ance and VPM techn ques M crocom puters sed f r schedu ng resource a cat on and t me cost ana ys s Lecture ab Prerequ s tes CON 383 STP 226 Pre or c requ s te CON 389 *Genera Stud es N3*

NOTE: Fo the Gene a Stud es equ rement courses and codes s ch as L1 N3 C and H see Genera tud es" page 85 For graduat on requ rements see n ver ty Graduat n Requ rements page 81 For an exp a at of add t ona omn bus courses offered but not 'sted n th s cata og ee C as f at n of C ur es page 58

CON 496 Construction Contract Administration. (3) F S
Survey adm n strat ve procedures of genera and subcontractors Study documentat on c a ms, arb trat on t gat on bond ng, 'nsurance, and indemn f cat on D scuss eth cal pract ces Lecture, f eld tr ps. Prerequ s tes COM 225 sen or stand ng *Genera Stud es' L2*

CON 533 Strategies of Estimating and Bidding. (3) F
Course w exp ore advanced concepts of the est mat ng process, such as mode ng and stat st ca ana ys s to mprove bid accurac es Prerequis te. CON 483 or 486 or nstructor approva

CON 540 Construction Productivity. 3 F
Product v ty concepts Data co ect on Ana ys s of product v ty data and factors affect ng product v ty. Means for improv ng product on and study of product v ty 'mprovement programs. Pre or corequ s te CON 495.

CON 543 Construction Equipment Engineering. 3) S
Analys s of heavy construct on equ pme t product v ty us ng case *stud es Appl es eng neer ng fundamentals to the p anning* se ect n, and ut zat on of equ pment Lecture case stud es.

CON 545 Construction Project Management. (3 S
Theory and pract ce of construct on project management Ro es of des gner, owner genera contractor, and construct on manager. Lec ture, f e d tr ps. Pre or corequ s te CON 495

CON 547 Strategic Planning. 3) F
The business p ann ng process of the construct on enterpr se D fferences between pub icly he d and close y he d bus nesses and the r exposure

CON 561 International Construction. 3 S
An nvest gat on of the cu tura s c a econom c po t ca and management ssues re ated to construct on n fore gn countr es and remote reg ons

CON 577 Construction Systems Eng neering. 3) S
Mode s of construction operat ons, a ternat ves for structur ng nforma t on flows and the control of projects app cat ons of nformat'on tech no ogy in construct on Prerequ s'te· nstructor approva

CON 589 Construction Company Financial Control. (3 F
Finan a accounting and cost control at the company evel n con struct on companies Account ng systems. Construct on pro ect prof t ca cu at ons. F nanc a ana ys s Lecture case stud es

School of Engineering

Daniel F. Jankowski
Director
(ECG 104) 480/965-1726

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 technical educations, it also provides an opportunity for the development of many additional attributes, including ethical and professional characteristics 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 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 solution of problems in 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 pursue a career in engineering;
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 some other 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 "Undergraduate Admission," page 60; "Admission," page 196; and "College Degree Requirements," page 199, for information regarding requirements for admission, transfer, retention, disqualification, and reinstatement.

Individuals who are beginning their initial college work in the School of Engineering should have completed certain secondary school units in addition to the minimum university requirements. Four units are required in mathematics. A course with trigonometry should be included. The laboratory sciences chosen must include at least one unit in physics and one unit in chemistry. Calculus, biology, and computer programming are recommended. Students who do not meet the college's subject matter requirements may be required to complete additional university course work that may not apply toward an engineering degree. One or more of the courses—CHM 113 General Chemistry, CSE 181 Applied Problem Solving with BASIC, MAT 170 Precalculus, and PHY 105 Basic Physics may be required to satisfy omissions or deficiencies.

DEGREES

The Bachelor of Science in Engineering (B.S.E) degree consists of three parts:

1. university requirements (e g , General Studies, First Year Composition ;
2. an engineering core, and
3. a major.

The courses identified for each of these parts are intended to meet requirements imposed by the university and by the professional accrediting agency, Accreditation Board for Engineering and Technology, Inc (ABET), for programs in engineering.

The B.S degree in Computer Science consists of two parts

1. university requirements (e.g., General Studies, First Year C mposition); and
2. a major.

The courses identified for each of these parts are intended to meet requirements imposed by the university and by the professional accrediting agency, the Computer Science Accreditation Board (CSAB), for programs in computing science.

In addition to First Year Composition, the university requires, under the heading of General Studies, courses in literacy and critical inquiry, humanities and fine arts, social and behavioral sciences, numeracy, and natural sciences (see "General Studies," page 85). There are also requirements in historical awareness, global awareness, and cultural diversity in the United States. ABET and CSAB impose additional requirements, particularly in mathematics and the basic sciences and in the courses for the major.

The engineering core is an organized body of knowledge that serves as a foundation to engineering and for further specialized studies in a particular engineering major.

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 options in Engineering Special Studies (for example, premedical engineering). With the exception of the Computer Science major, all curricula are extensions beyond the engineering core and cover a wide variety of subject areas within each field. Some of the credits in the major 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 departments: Chemical, Bio, and Materials Engineering; Civil and Environmental Engineering; Computer Science and Engineering; Electrical Engineering; Industrial and Management Systems Engineering; and Mechanical and Aerospace Engineering. The major in Engineering Special Studies is administered by the Office of the Dean. Engineering Special Studies makes use of the general structure of the engineering curricula noted above and provides students with an opportunity for study in engineering options not available in the traditional engineering curricula at ASU.

The first two years of study are concerned primarily with general education requirements, English proficiency, and the engineering core. 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.

The semester by semester selection of courses may vary from one field to another, particularly at the upper division level, and is determined by the student in consultation with a faculty advisor. An example of a typical full time freshman schedule is shown below; depending on a particular student's circumstances, many other examples are possible.

Typical Freshman Year

CHM	114 General Chemistry for Engineers *S1 S2*	4
ECE	100 Introduction to Engineering Design *N3*	4
ECN	111 Macroeconomic Principles *SB*	3
	or ECN 112 Microeconomic Principle *SB*	3
ENG	101 *First Year Composition*	3
ENG	102 First Year Composition	3
MAT	270 Calculus with Analytic Geometry I *M*	4
MAT	271 Calculus with Analytic Geometry II *M*	4
PHY	121 University Physics I: Mechanics *S1 S2*	3
PHY	122 University Physics Laboratory I *S1 S2**	1
HU, SB, and awareness area course		3
Total		32

* Both PHY 121 and 122 must be taken to secure S1 or S2 credit.

Well prepared students who have no outside commitments can usually complete the program of study leading to an undergraduate degree in engineering in four years: eight semesters at 16 semester hours per semester. Many students, however, 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, computer programming, English, mathematics, and physics), the student must complete more than the minimum of 128 semester hours. Therefore, in cases of inadequate secondary preparation, poor health, or financial necessity requiring considerable time for outside work, the undergraduate program is extended beyond four 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. In response to the opportunities provided by changing technology, educational research, and industrial input, possible improvements of various aspects of these programs are routinely considered. It is the intent of the faculty that all students be appropriately prepared in the four areas described below.

1. *Oral and written English.* Communication skills are an essential component of an engineering education. All engineering students must complete the university First Year Composition requirement (see "University Graduation Requirements," page 81), and the literacy and critical inquiry component under "Core Areas," page 86, of the General Studies requirement, which involves two courses beyond First Year Composition.
2. *Selected nonengineering topics.* This area ensures that the engineering student acquires a satisfactory level of basic knowledge in the humanities and fine arts, social and behavioral sciences, numeracy, and the natural sciences. Courses in these subjects give engineers an increased awareness of their social responsibilities, provide an understanding of related factors in the decision making process, and also provide a foundation for the study of engineering. Required courses go toward fulfilling the General Studies requirement. Additional courses in mathematics and the basic sciences are selected to meet ABET requirements.

NOTE: For the General Studies requirement, courses and codes such as L1, N3, C, and H), see General Studies, page 85. For graduation requirements, see University Graduation Requirements, page 81. For an explanation of additional nonbusiness courses offered but not listed in this catalog, see "Classification of Courses," page 58.

Because of accreditation requirements, aerospace studies (AES) and military science (MIS) courses are not acceptable for engineering degree credit in fulfilling the humanities and fine arts and social and behavioral science portions of the General Studies requirement.

3. *Selected engineering topics.* This area involves courses in engineering science and engineering design. The courses further develop the foundation for the study of engineering and provide the base for specialized studies in a particular engineering discipline. The specific courses are included in the engineering core and in the major. While some departmental choices are allowed, all students are required to take ECE 100 Introduction to Engineering Design and ECE 300 Intermediate Engineering Design as part of the engineering core. These courses, together with other experiences in the engineering core and in the major, serve to integrate the study of design, the "process of devising a system, component, or process to meet desired needs" (ABET), throughout the engineering curricula
4. *Specific engineering discipline.* This area provides a depth of understanding of a more definitive body of knowledge that is appropriate for a specific engineering discipline. Courses build upon the background provided by the earlier completed portions of the curriculum and include a major design experience as well as technical electives that may be selected by the student with the assistance of an advisor. The catalog material for the individual engineering majors describes specific departmental requirements.

COURSE REQUIREMENTS

A summary of the degree requirements is as follows:

First Year Composition	6 or 3
General Studies/school requirements	58
Engineering core	15–19
Major including area of emphasis)*	45–49
Total	128

* The requirements for each of the majors offered are described on the following pages.

The specific course requirements for the B.S. and B.S.E degrees follow.

First-Year Composition

Choose among the course combinations below 6
- ENG 101 First Year Composition (3
- ENG 102 First Year Composition (3)

—or

- ENG 105 Advanced First-Year Composition (3)
- Elective chosen with an advisor (3)

—or

- ENG 107 English for Foreign Students (3
- ENG 108 English for Foreign Students (3)

Total 6

General Studies/School Requirements

Humanities and Fine Arts/Social and Behavioral Sciences

ECN 111 Macroeconomic Principles *SB*. 3
or ECN 112 Microeconomic Principles *SB* (3
HU course(s) . . . . . 6 or 10
SB course(s). . . . . 3 or 7

Total 12–20

Literacy and Critical Inquiry

ECE 300 Intermediate Engineering Design *L1* 3
ECE 400 Engineering Communications *L2* 3
or approved department L2 course 3)

Total 6

Natural Sciences/Basic Sciences

CHM 114 General Chemistry for Engineers *S1/S2* 4
or CHM 116 General Chemistry *S1/S2* 4)
PHY 121 University Physics I Mechanics *S1/S2*[2] 3
PHY 122 University Physics Laboratory I *S1 S2*[2]. 1
PHY 131 University Physics II: Electricity and Magnetism *S1/S2*[3]. 3
PHY 132 University Physics Laboratory II *S1/S2* 1
Department basic science elective 3

Total 15

Numeracy/Mathematics

ECE 100 Introduction to Engineering Design *N3* 4
MAT 270 Calculus with Analytic Geometry I *N1* 4
MAT 271 Calculus with Analytic Geometry II *N1* 4
MAT 272 Calculus with Analytic Geometry III *N1*. 4
MAT 274 Elementary Differential Equations *N1* 3
Department mathematics elective 2

Total 21
General Studies school requirements total 58

[1] Engineering students may not use aerospace studies (AES or military science (MIS courses to fulfill HU or SB requirements

[2] Both PHY 121 and 122 must be taken to secure S1 or S2 credit

[3] Both PHY 131 and 132 must be taken to secure S1 or S2 credit.

Engineering Core

A minimum of five of the following eight courses are required, totaling 15 to 19 semester hours Courses selected are subject to departmental approval. See department requirements.

ECE 210 Engineering Mechanics I: Statics 3
ECE 301 Electrical Networks I 4
ECE 312 Engineering Mechanics II Dynamics 3
ECE 313 Introduction to Deformable Solids 3
ECE 334 Electronic Devices and Instrumentation 4
ECE 340 Thermodynamics 3
or CHM 441 General Physical Chemistry (3)
or MSE 430 Thermodynamics of Materials (3
ECE 350 Structure and Properties of Materials 3
or CHM 442 General Physical Chemistry 3)
or ECE 351 Civil Engineering Materials (3)
or ECE 352 Properties of Electronic Materials 4

Choose one microcomputer microprocessor course below . . . . . 3 or 4
- BME 470 Microcomputer Applications in Bioengineering 4)
- CHE 461 Process Control *N3* (4
- CSE 225 Assembly Language Programming and Microprocessors Motorola 4) or EEE 225 Assembly Language Programming and Microprocessors (Motorola) 4

CSE 26 As n bly Lan uag Pr ra m ng at I Microprocessors Intel 4
i EEE 226 Ass mbly Language Pr ra 1 min nd Microprocessors Intel 4
IEE 463 C puter Aid d Manufactur n and Co trol V3 3

Er g neerir c c minimum t ta 15

GRADUATION REQUIREMENTS

To qual ty f r graduation from the School of Engineer ing, a student must have a minimum cumulative GPA of 2 0 in addition to having a GPA of at east 2 ( ) for the courses in the n aj r Feld

PROFESSIONAL ACCREDITATION

The undergraduate programs in Aerospace Engineering, Bioengineering, Chemical Engineering, Civil Engineering, Computer Systems Engineering, Electrical Engineering, Industrial Engineering Materials Science and Engineering and Mechanical Engineering are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc (ABET , 111 Market Place, Suite 1050, Baltimore, MD 21202 4012, 410 347 7700. The Bachelor of Science program in Computer Science is accredited by the Computer Science Accreditation Commission CSAC of the Computing Sciences Accreditation Board CSAB .

ANALYSIS AND SYSTEMS (ASE)

ASE 100 College Adjustment and Surv val. 2 F S
Exp orat on of careers g a s a d majors Emphas s on organ zat on and deve opment f study k s nc ud ng t me management stress man agement and use of the brary

ASE 194 ST: Specia Topics 2 F
a MEP A adem c Success

ASE 399 Cooperative Work Exper'ence F S, SS
Usua y nv ve tw s x n onth work per ods w th ndustr a f rms or government agenc es a ternated w th fu t me semester and summer sess ns stud e N t pen t students fr m other c leges on cam pus May be repeated for cred t Prerequ s tes at east 45 hours com p eted m o area w th m n mum 2 50 GPA nstructo approva

ASE 485 Engineer ng Statist'cs. 3 F S SS
Des gn ng stat st ca tud es f r so ut ons t e g neer ng prob ems Metho s de regress on des gn and ana ys s of exper ments and other stat st ca t p cs P ereq s te ECE 380. *Genera Stud es N2*

ASE 490 Project in Des gn and Development. 2 3 F S SS
nd v dua pro ect n creat ve des gn and synthe s Course may be repeated P erequ te en o stand ng

ASE 496 Professional Seminar 0 F S
T p cs f nterest to tudents n t e eng neer g spec a and nterd sc p nary stud e

ASE 500 Research Methods: Engineer ng Statist'cs. 3 F S SS
Des gn ng stat st a t e for so ut ons to eng neer ng prob em Methods nc ude regre s on de gn and ana ys s f exper ments and ther stat t ca t p c Prerequ s te ECE 380

ASE 582 L near A gebra n Engineer ng. 3 F
Deve opment and o ut n f systems of near a gebra c equat ons App cat o s fr m mechan c st uctura a d e ectr ca f e ds of eng neer ng Prerequ te MAT 242 or equ va ent

ASE 586 Partial Differential Equations n Engineer ng. 3 S
Deve opment and so t on f part a d ffe ent a equat ons n eng nee ng App cat n n so d mecha v brat ons and heat tra sfer Pre req s te ECE 386 MAT 242 2 4

ENGINEERING CORE (ECE)

ECE 100 Introduction to Eng neering Design. 4 F S
ntr duct n to eng neer ng des g p osophy and meth do ogy com p ter m de ng of systems proce e and components es gn f r custo er sat sfact on pr f tab ty qua ty and manufact r g eco nom c ana y s f ow chart g ket h g CAD a d team ng A term d gn pr je t s nc uded Prer qu s te h gh schoo comput ng and phy c and a gebra c urses eq va e ts *Ge era St d es N3*

ECE 194 ST: Spec'al Top cs 2 F S
a ntr du t t Eng neer ng Des gn 2 F
b ntr duct on to Eng neer ng Des gn 2 S

ECE 210 Engineering Mechanics I Statics. 3 F, S SS
F rce systems res tants equ br um d tr buted forces area moments f u d stat cs, nterna st e ses f t on energy cr ter on f r equ br um and stab ty Lect re ec tat Prerequ s tes ECE 100 MAT 271 or 291 PHY 121, 122

ECE 300 Intermediate Eng neering Design. 3 F S SS
Eng neer ng des gn process c ncentrat ng ncreas ng the student's ab ty t prepare we wr tten techn ca comm n cat on and to def e prob em and generate and eva uate dea Team ng sk s enhanced P e equ s tes ECE 1 ENG 1 2 r 05 or 108 at east two other eng nee g core c ur es *Genera Stud es L1*

ECE 301 E ectr ca Networks I 4 F S SS
tr ct on t e ectr ca etwo s mp nent n ode s t ans ent and steady state ana y Le tu e ab P equ te ECE 1 0 P e or corequ te MAT 274 PHY 131 132

ECE 312 Engineer ng Mechanics I: Dynamics. 3 F S SS
K emat cs and k net s f part c es t ans at g a d r tat ng coord nate systems, r g d body k nemat c y am cs f systems of part c es and r g d bod es and e ergy a d e t m pr nc p es ecture rec tat on Pre equ s tes E E 210 MAT 74

ECE 313 Introduction to Deformable Solids 3 F S SS
Equ br um stra n d sp acement re t ns a d stre s stra n tempera ture re at ons App cat n to for e tran s o a d deformat ns n ax a tors ona and bend ng of bars C m ed oad ngs Lecture rec tat on P erequ s tes ECE 210 MAT 274

ECE 314 Eng neering Mechanics. 4 F S, SS
Force systems resu t nts, m me ts a d qu br m K nemat cs and k net cs of pa t es systems of part es a d r g d bod es Energy and m mentum pr nc p e Le ture rec tat on Prerequ s tes ECE 100, MAT 274 PHY 121 122

ECE 334 E ectronic Devices and Instrumentation. 4 F S SS
App cat o f e ect c etw rk the ry t em conductor c rcu ts D des trans t rs amp f ers opan p d g ta og c gates a d e ec tron c struments Lect re ab Pre equ s te ECE 3 1

ECE 340 Thermodynamics. 3 F SS
W rk heat a d energy t a sformat ns and re at onsh ps betwee pr pert es aws c cepts and de f ana y s common to a app cat ns f therm dy an c e g neer ng Le ture rec tat n Prerequ s te C M 114 116 ECE 210 PHY 131 Pre or corequ s te MA 274

ECE 350 Structure and Properties of Materia s. 3 F S SS
Bas c concepts f mater a tru tu e a d t re at n to p opert es App cat n to eng neer n p b ems Prerequ s tes CHM 114 r 116 PHY 121

ECE 351 Civ l Engineering Materia s. 3 F S
St uct re and behav or f c v eng neer ng mater a s aboratory nve t gat ons and test cr ter a Lect re ab Prerequ s te ECE 313

ECE 352 Properties of E ectronic Materia s. 4 F S SS
c r d nge s wave eq at on potent a barr er pr b em bonds f crysta s t e band theory of s ds em ductor superconductor d e ectr c and magnet c propert e P erequ te CHM 114 r 116 , MAT 274 PHY 241

ECE 380 Probab l ty and Statistics for Engineer ng Problem Solv- ng. 3 F S
App cat on or e ted u se v th mp ter ba ed ex er ence us ng tat t software f f rmu at n v ng eng nee g pr b ems 2 hours ect re 2 h u s ab Pre eq s t MAT 271 *Genera Stud es N2*

NOTE: For t e Genera Stud es requ rement, courses and codes such as 1 N3, C and H see Ge era Stud es page 85 For graduat on requ reme ts see Un vers ty Graduat on Requ rements " page 81 Fo an exp anat on f add t ona omn bus courses offered but not sted n th s cata g see C ass f cat on of Co rses page 58.

ECE 384 Numerical Analysis for Engineers I. 2 F S
N e ca ut on f a gebra c and transcendenta equat ons and systems of near equat s Numer ca ntegrat Curve f tt ng Error bo ds and error propagat on Emphas s on use f d g ta computer Prerequ s te MAT 272 or 291

ECE 385 Numerical Analysis for Engineers II. 2 S
C t n at on of ECE 384 Numer ca so ut o of part a different a equat ons and m xed equat on systems. ntroduct on to exper menta des gn and opt m zat on techn ques Prerequ s te ECE 384

ECE 386 Partia D fferential Equations for Engineers. 2 F S
B dary va ue prob ems *separat on of var ab es and Four er ser es* as app ed to n t a -b u dary va ue prob ems Prerequ s te MAT 274

ECE 394 ST: Spec'a Topics. 3–4 F S
a Conservat o Pr c p es 4 F S
b Eng eer ng Sy tems 4 F S
c ntr duct to Manufactur ng Eng neer ng (3 F S
d Propert es that Matter 4) F S

ECE 400 Engineering Communicat ons. 3 F S SS
P an g and prepar ng eng neer ng pub cat ons a d ora presenta- t ons based o d rected brary research re ated to current eng neer ng top cs Prerequ s tes ENG 102 or 105 or 108 complet on of Genera Stud es L1 requ rement or ECE 300 · sen or stand ng n an eng neer ng major *Genera Stud es L2*

SOCIETY, VALUES, AND TECHNOLOGY (STE)

STE 194 ST: Special Topics. 2 F
a Eng neer ng for Undec ded

STE 201 Introduct on to Bioeng neering. 3) F
mpact f b oeng neer ng on s c ety Deve op ng an awareness of the contr but of b oeng neer ng to so ve med ca and b og cal prob ems Cross sted as BME 201 Cred t s a owed on y for BME 201 or STE 201 Prereq s te· ENG 102 or 105 or 108 *Genera Stud es L1.*

STE 208 Patterns in Nature. 4 F S
Pro ect o ented sc ence course w th computer tra n ng to deve op cr t ca th nk g, and techn ca sk s f r student or ented sc ence ess ns K 12 Lect re ab Cross sted as PHS 208 Cred t s al owed on y for PHS 208 or STE 208 Prerequ s te I ege eve sc ence course or structor approva *Genera Stud es S1 S2*

Department of Chemical, Bio, and Materials Engineering

Eric J. Guilbeau
Chair
(FCG 202) 480/965-3313
www.eas.asu.edu/~cbme

The faculty in the Department of Chemical, Bio, and Materials Engineering offer the B.S. degree in three exciting disciplines: chemical engineering, bioengineering, and materials science and engineering. Each of these majors builds on a broad base of knowledge within the basic and mathematical sciences and the engineering core. Each offers excellent career opportunities.

Chemical engineers design and operate processes that may include chemical change. They combine the science of chemistry with the discipline of engineering in order to solve complex problems in a wide variety of industries. Challenging job opportunities exist not only in the chemical and petroleum industries, but also in the plastics, electronics, computer, metals, space, food, drug, and health care industries. In these industries, chemical engineers practice in a wide variety of occupations including environmental control, surface treatments, energy and materials transformation, biomedical applications, fermentation, protein recovery, extractive metallurgy, and separations. In the environmental area, chemical engineers develop methods to reduce the pollution created in manufacturing processes, devise techniques to recover usable materials from wastes, design waste storage and treatment facilities, and design pollution control strategies.

Bioengineering (synonyms: biomedical engineering or medical engineering) is the discipline of engineering that applies principles and methods from engineering, the life sciences, and the medical sciences to understand, define, and solve problems in medicine, physiology, and biology. Bioengineering students typically pursue either a career in the medical-device/biotechnology industry or a career in bioengineering, medical or biotechnology research or enter a postgraduate program in clinical or veterinary medicine or dentistry. The practicing bioengineer uses engineering principles and technology to develop instrumentation, biomaterials, diagnostic and therapeutic devices, artificial organs, and other equipment needed in medicine and biology. They also discover new fundamental principles regarding the functioning and structure of living systems.

Materials science and engineering uses fundamental knowledge in chemistry and physics to correlate relationships between the structure and processing of materials and their properties. Students educated in this discipline decide how to optimize existing materials or how to develop new *advanced materials and processing techniques*. Students who major in materials science and engineering will find employment opportunities in a variety of industries and research facilities which include aerospace, electronics, energy conversion, manufacturing, medical devices, semiconductors, and transportation.

The following sections describe the curriculum requirements for the Bachelor of Science in Engineering degree in each of these disciplines. Faculty within the department also *participate in the Engineering Special Studies program* in premedical engineering which is described separately in the "Programs in Engineering Special Studies" section, page 252.

CHEMICAL ENGINEERING B.S.E.

PROFESSORS
BERMAN, GUILBEAU, RAUPP, SATER

ASSOCIATE PROFESSORS
BECKMAN, BELLAMY BURROWS, GARCIA
RIVERA TORREST

ASSISTANT PROFESSOR
S BEAUDOIN

LECTURER
D BEAUDO N

Chemical engineers are generally concerned with transfer within and between liquid, gas, and solid phases and the chemical changes that may also occur. They design and operate processes that accommodate such changes, including the chemical activation of materials. Typically this involves complex multicomponent systems wherein the interactions between species have to be considered and analyzed. The new challenge in chemical engineering is to

apply the principles of fluid dynamics, mass transfer, solution thermodynamics, reaction kinetics, and separation techniques to technological endeavors such as pollution control within manufacturing and the environment, 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

A minimum of 128 semester hours is necessary for the B.S.E. degree in Chemical Engineering A minimum of 50 upper-division semester hours is required.

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

First-Year Composition

Choose among the course combinations below ..... 6 or 3

ENG 101 First Year Composition 3
ENG 102 First Year Composition 3
or
ENG 105 Advanced First Year Composition 3
Elective chosen with an advisor 3
or
ENG 107 English for Foreign Students 3
ENG 108 English for Foreign Students 3

Total ..... 6 or 3

General Studies/School Requirements

Humanities and Fine Arts Social and Behavioral Sciences

ECN 111 Macroeconomic Principles *SB* 3
or ECN 112 Microeconomic Principles *SB* 3
HU, SB, and awareness area courses 13

Total 16

Literacy and Critical Inquiry

CHE 352 Transport Laboratories *L2* .. 3
ECE 300 Intermediate Engineering Design *L1* 3

Total 6

Natural Sciences/Basic Sciences

CHM 113 General Chemistry *S1 S2* 4
CHM 116 General Chemistry *S1 S2* 4
CHM 331 General Organic Chemistry 3
CHM 335 General Organic Chemistry Laboratory 1
PHY 121 University Physics I Mechanics *S1 S2* 3
PHY 122 University Physics Laboratory I *S1 S2* 1

Total 16

Numeracy Mathematics

ECE 100 Introduction to Engineering Design *N3*. . .4
ECE 384 Numerical Analysis for Engineers I 2
MAT 270 Calculus with Analytic Geometry I *N1* 4
MAT 271 Calculus with Analytic Geometry II *N1* 4
MAT 272 Calculus with Analytic Geometry III *N1* 4
MAT 274 Elementary Differential Equations *N1*..... 3

Total 21
General Studies school requirements total 59

Engineering Core

CHE 342 Applied Chemical Thermodynamics 4
CHE 461 Process Control *N3*. 4
ECE 394 ST: Conservation Principles 4
ECE 394 ST Engineering Systems 4
ECE 394 ST Properties that Matter 4

Total 20

Major

CHE 311 Introduction to Chemical Processing. 3
CHE 331 Transport Phenomena I: Fluids. 3
CHE 332 Transport Phenomena II: Energy Transfer 3
CHE 333 Transport Phenomena III Mass Transfer . 3
CHE 432 Principles of Chemical Engineering Design 3
CHE 442 Chemical Reactor Design 3
CHE 451 Chemical Engineering Laboratory . . 2
CHE 462 Process Design 3
CHM 332 General Organic Chemistry 3
ECE 380 Probability and Statistics for Engineering Problem Solving *N2*..... 3
ECE 385 Numerical Analysis for Engineers II. 2
Technical electives..... 12

Total 43

Engineering students may not use aerospace studies AES or military science MIS courses to fulfill HU or SB requirements. See "Degree Requirements," page 199

[2] Both PHY 121 and 122 must be taken to secure S1 or S2 credit

Consult with your department academic advisor to ensure that all requirements are met.

The technical elective courses must be selected from upper division courses with an advisor's approval and must include two three semester hour chemistry courses; a three semester hour natural science or materials course; and a three semester hour chemical engineering 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.

The faculty in the Department of Chemical, Bio, and Materials Engineering also offer 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

NOTE: For the General Studies requirement courses, and codes such as L1 N3 C, and H , see 'General Studies page 85 For graduation requirements see University Graduation Requirements " page 81 For an explanation of additional omnibus courses offered but not listed in this catalog see "Classification of Courses " page 58

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, fermentation, food processing, pharmaceuticals, and other areas within biochemical engineering should select from the following.

Chemistry Electives

CHM 361	Principles of Biochemistry	3
CHM 461	General Biochemistry	3
CHM 462	General Biochemistry	3

Technical Electives

AGB 440	Food Safety	3
AGB 441	Food Chemistry	4
AGB 442	Food and Industrial Microbiology	3
AGB 443	Food and Industrial Fermentations	4
CHE 475	Biochemical Engineering	3
CHE 476	Bioreaction Engineering	3
CHE 477	Bioseparation Processes	3

Biomedical. Students who are interested in biomedical engineering but wish to maintain a strong, broad chemical engineering base should select from the following:

Chemistry Electives

CHM 361	Principles of Biochemistry	3
CHM 461	General Biochemistry	3
CHM 462	General Biochemistry	3

Technical Electives

BME 318	Biomaterials	3
BME 411	Biomedical Engineering I	3
BME 412	Biomedical Engineering II	3
BME 413	Biomedical Instrumentation *L2*	3
BME 435	Physiology for Engineers	4

Environmental. ASU does not offer a B S E degree in Environmental Engineering, but students with this interest are encouraged to pursue a B.S.E. degree in Chemical Engineering with this area of emphasis. Students interested in the management of hazardous wastes and air and water pollution should select from the following:

Chemistry Electives

CHM 302	Environmental Chemistry	3
CHM 361	Principles of Biochemistry	3
CHM 461	General Biochemistry	3
CHM 481	Geochemistry	3

Technical Electives

CEE 361	Introduction to Environmental Engineering	4
CEE 362	Unit Operations in Environmental Engineering	3
CEE 561	Physical Chemical Treatment of Water and Waste	3
CEE 563	Environmental Chemistry Laboratory	3
CHE 474	Chemical Engineering Design for the Environment	3
CHE 478	Industrial Water Quality Engineering	3
CHE 479	Air Quality Control	3
CHE 533	Transport Processes I	3

Materials. Students interested in the development and production of new materials such as alloys, ceramics, composites polymers, semiconductors, and superconductors should select from the following:

Chemistry Electives

CHM 441	General Physical Chemistry	3
CHM 443	General Physical Chemistry	3
CHM 453	Inorganic Chemistry	3
CHM 471	Solid State Chemistry	3

Technical Electives

BME 318	Biomaterials	3
CHE 458	Semiconductor Material Processing	3
ECE 352	Properties of Electronic Materials	4
MSE 353	Introduction to Materials Processing and Synthesis	3
MSE 354	Experiments in Materials Synthesis and Processing I	2
MSE 431	Corrosion and Corrosion Control	3
MSE 453	Experiments in Materials Synthesis and Processing II	2
MSE 454	Advanced Materials Processing and Synthesis	3
MSE 470	Polymers and Composites	3

Premedical. Students planning to attend medical school should select courses from those listed under the biomedical emphasis In addition, BIO 181, 182, and CHM 336 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 of these courses are as follows:

Energy Conversion and Conservation

CHE 528	Process Optimization Techniques	3
CHE 554	New Energy Technology	3
CHE 556	Separation Processes	3
MAE 436	Combustion	3

Plant Administration and Management

CHE 479	Air Quality Control	3
CHE 528	Process Optimization Techniques	3
IEE 30	Economic Analysis for Engineers	3
IEE 43	Engineering Administration	3

Simulation, Control, and Design

CHE 494	ST. Special Topics	1–4
CHE 527	Advanced Applied Mathematical Analysis in Chemical Engineering	3
CHE 528	Process Optimization Techniques	3
CHE 556	Separation Processes	3
CHE 563	Chemical Engineering Design	3

Semiconductor Processing. Students who are interested in the development and manufacturing of semiconductor and other electronic devices should select from the following:

Chemistry Elective
CHM 44[illegible] General Physical Chemistry . . . [illegible]
CHM 442 General Physical Chemistry . . . 3
CHM 45[illegible] Inorganic Chemistry . . 3
CHM 471 Solid State Chemistry 3

Technical Electives
CHE 45[illegible] Semiconductor Material Processing . . 3
CHE 494 ST Special Topics . . 1–4
ECE 352 Properties of Electronic Materials . . 4
EEE 4[illegible] Microelectronics . . . 3
EEE 436 Fundamentals of Solid State Devices . [illegible]
EEE 4[illegible]9 Semiconductor Facilities and Cleanroom Practices . [illegible]
MSE 353 Introduction to Materials Processing and Synthesis . . 3
MSE 354 Experiments in Materials Synthesis and Processing I . 2
MSE 45[illegible] Experiments in Materials Synthesis and Processing II . 2
MSE 454 Advanced Materials Processing and Synthesis . . . 3
MSE 4[illegible] Integrated Circuit Materials Science . 3

Chemical Engineering
Program of Study
Typical Four-Year Sequence

First Year

First Semester
CHM [illegible] General Chemistry *SI S2* . . . 4
ECE [illegible] Introduction to Engineering Design *N3* . 4
ENG [illegible] First-Year Composition 3
MAT 27[illegible] Calculus with Analytic Geometry I *N1* . 4

Total [illegible]

Second Semester
CHM [illegible]16 General Chemistry *S1 S2* . 4
ENG [illegible] First-Year Composition . . . [illegible]
MAT 2[illegible] Calculus with Analytic Geometry II . 4
PHY [illegible]21 University Physics I: Mechanics *SI S2* . [illegible]
PHY [illegible] University Physics Laboratory I *SI S2* 1

Total . . . . 1[illegible]

Second Year

First Semester
CHE [illegible] Introduction to Chemical Process [illegible] . . . 3
ECE [illegible] Probability and Statistics for Engineering Problem Solving *N2* 3
ECE [illegible]4 ST Conservation Principles . . . 4
ECN [illegible] Microeconomic Principles *SB* or ECN 112 Macroeconomic Principles *SB* [illegible]
MAT [illegible]74 Elementary Differential Equations *N1* . . [illegible]

Total . . . [illegible]6

Second Semester
CHE [illegible]3 Transport Fluids 3
[illegible] Numerical Analysis for Engineers I . . .
[illegible] ST Properties that Matter . . 4
MAT [illegible] Calculus with Analytic Geometry III . . 4
HU or SB elective . 4

Total [illegible]

Third Year

First Semester
CHE [illegible] Transport Phenomena II: Heat Transfer
CHE [illegible]42 Applied Chemical Thermodynamics . . 4
CHM [illegible] General Organic Chemistry . . [illegible]
CHM [illegible] General Organic Chemistry Laboratory [illegible]
ECE 3[illegible] Intermediate Engineering Design *L* . 3
HU or SB elective . . [illegible]

Total [illegible]

Second Semester
CHE 333 Transport Phenomena III: Mass Transfer [illegible]
CHE [illegible] Transport Laboratory *L* . . .
CHE 4[illegible] Principles of Chemical Engineering Design [illegible]
CHM [illegible] General Organic Chemistry . . [illegible]
ECE [illegible] Numerical Analysis for Engineers II
ECE 3[illegible]4 ST Engineering Systems . . 4

Total . . . [illegible]

Fourth Year

First Semester
CHE 442 Chemical Reactor Design . . .
CHE 4[illegible] Chemical Engineering Laboratory . . . .
CHE 4[illegible] Process Control 4
HU, SB, and awareness area course . . .
Technical elective . . 3

Total [illegible]

Second Semester
CHE 4[illegible]2 Process Design . . [illegible]
HU, SB, and awareness area course
Technical elective . . . .

Total . . . [illegible]
Total degree requirements . . [illegible]

Both PHY [illegible] and [illegible] must be taken to secure SI/S2 credit.

BIOENGINEERING—B.S.E.

PROFESSORS
GUILBEAU, TOWE

ASSOCIATE PROFESSORS
GARCIA, HE, KIPKE, MASSIA, PIZZICONI, SWEENEY, YAMAGUCHI

ASSISTANT PROFESSOR
PANITCH

LECTURER
D. BEAUDOIN

Bioengineering (synonymous with biomedical engineering) is the medical engineering field that applies principles and methods from engineering and 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 students to use engineering principles and to [illegible]

NOTE: For the General Studies requirement courses and codes (such as L1, N3, C, and H), see General Studies, page 85. For graduation requirements, see University Graduation Requirements, page 81. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 58.

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 graduate study in bioengineering, a career in the medical device biotechnology 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*.

DEGREE REQUIREMENTS

A minimum of 128 semester hours is necessary for the B.S.E. in Bioengineering degree. A minimum of 50 upper division semester hours is required.

GRADUATION REQUIREMENTS

In addition to fulfilling school and major requirements, majors must satisfy all university graduation requirements. See "University Graduation Requirements," page 81.

COURSE REQUIREMENTS

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

First-Year Composition

Choose among the course combinations below	6 or 7
ENG 101 First Year Composition 3	
ENG 102 First Year Composition 3	
or	
ENG 105 Advanced First Year Composition 3	
Elective chosen with an advisor (3	
or	
ENG 107 English for Foreign Students 3	
ENG 108 English for Foreign Students 3	
Total	6 or 7

General Studies/School Requirements

Humanities and Fine Arts/Social and Behavioral Sciences

ECN 111 Macroeconomic Principles *SB*	3
or ECN 112 Microeconomic Principles *SB*	3
HU, SB, and awareness area courses	13
Total	16

Literacy and Critical Inquiry

BME 413 Biomedical Instrumentation *L2*	3
BME 423 Biomedical Instrumentation Laboratory *L2*	
ECE 301 Intermediate Engineering Design *L1*	3
Total	7

Natural Sciences/Basic Sciences

CHM 113 General Chemistry *S1/S2*	4
CHM 116 General Chemistry *S1 S2*	4
PHY 121 University Physics I: Mechanics *S1/S2*	3
PHY 122 University Physics Laboratory I *S1 S2*	1
PHY 131 University Physics II: Electricity and Magnetism *S1 S2*[1]	3
PHY 132 University Physics Laboratory II *S1 S2*	1
Total	16

Numeracy/Mathematics

ECE 100 Introduction to Engineering Design *N3*	4
MAT 242 Elementary Linear Algebra	2
or ECE 384 Numerical Analysis for Engineers I 2	
or ECE 386 Partial Differential Equations for Engineers I 2	
MAT 270 Calculus with Analytic Geometry I *N1*	4
MAT 271 Calculus with Analytic Geometry II *N*	4
MAT 272 Calculus with Analytic Geometry III *N1*	4
MAT 274 Elementary Differential Equations *N1*	3
Total	21
General Studies school requirements total	60

Engineering Core

ECE 210 Engineering Mechanics I: Statics	3
ECE 311 Electrical Networks I	4
ECE 334 Electronic Devices and Instrumentation	4
ECE 340 Thermodynamics	3
ECE 350 Structure and Properties of Materials	3
Total	17

Major

BIO 181 General Biology *S1 S2*	4
BME 201 Introduction to Bioengineering *L1*	3
BME 318 Biomaterials	3
BME 331 Biomedical Engineering Transport I: Fluids	3
BME 334 Bioengineering Heat and Mass Transfer	3
BME 416 Biomechanics	3
BME 417 Biomedical Engineering Capstone Design I	3
BME 435 Physiology for Engineers	4
BME 473 Microcomputer Applications in Bioengineering	4
BME 490 Biomedical Engineering Capstone Design II	1.5
ECE 380 Probability and Statistics for Engineering Problem Solving *N2*	3
Technical electives	9
Minimum total	45

[1] Both PHY 121 and 122 must be taken to secure S1 or S2 credit.

Both PHY 131 and 132 must be taken to secure S1 or S2 credit.

The major BME courses require a grade of "C" or higher to advance in the program and to receive a baccalaureate degree.

Bioengineering Areas of Emphasis

Students interested in a career in bioengineering may elect to emphasize either biochemical, bioelectrical, biomaterials engineering, biomechanical, bionuclear, biosystems, molecular and cellular bioengineering, or premedical engineering.

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.

Bioelectrical Engineering. This emphasis is designed to strengthen the student's knowledge of electrical systems, electronics, and signal processing. Students considering a career in bioelectrical phenomena, biocontrol systems, medical instrumentation, noninvasive imaging, neural engineering, and electrophysiology should consider this area of emphasis. Technical electives must include the following

BME 350	Signals and Systems for Bioengineers or EEE 333 Signals and Systems	3 3)
BME 419	Biocontrol Systems	3
EEE 302	Electrical Networks II	3
Total		9

Biomaterials Engineering. This area of emphasis integrates the student's knowledge of materials science and engineering with biomaterials science and engineering concepts for the design of materials intended to be used for the development of medical and diagnostic devices. It emphasizes structure property relationships of engineering materials: metals, polymers, ceramics, and composites and biological materials, biomaterial host response phenomena, technical and regulatory aspects of biomaterials testing and evaluation. Students interested in careers in the biomaterials, medical device, or biotechnology industries should consider this area of emphasis. Technical electives must include the following:

MSE 353	Introduction to Materials Processing and Synthesis	3
MSE 355	Introduction to Materials Science and Engineering	3
MSE 470	Polymers and Composites or MSE 471 Introduction to Ceramics	3 3
Total		9

Biomechanical Engineering. This emphasis is designed to strengthen the student's knowledge of mechanics and control theory. Students interested in careers related to biomechanical design, orthotic prosthetic devices, rehabilitation engineering, and orthopedic implants should consider this area of emphasis. It also provides the fundamentals for the study of neuromuscular control and the study of human motion. The following course is a required selection in the engineering school requirements (page 199):

ECE 354	Numerical Analysis for Engineers I or MAT 242 Elementary Linear Algebra	2 2

Technical electives must include the following.

BME 350	Signals and Systems for Bioengineers or BME 419 Biocontrol Systems or EEE 333 Signals and Systems	3 3 3
ECE 312	Engineering Mechanics II Dynamics	3
ECE 313	Introduction to Deformable Solids	3
Total		9

Biomedical Imaging Engineering. This emphasis is designed to strengthen the student's knowledge of radiation interactions, health physics, medical diagnostic imaging (MRI, PET, X ray, CT), radiation protection and nuclear instrumentation. Students considering careers in medical engineering or health physics should consider this area of emphasis. Technical electives include the following

PHY 361	Introductory Modern Physics	3
Department approved electives		6
Total		9

Biosystems Engineering. This emphasis is designed to strengthen the background of students interested in physiological systems modeling and analysis and design and evaluation of artificial organs and medical devices. Analyzing physiological systems and designing artificial organs requires knowledge in integrating electrical, mechanical, transport, and thermofluid systems. Students considering careers in medical device industries, clinical engineering, or artificial organs should consider this area of emphasis. Technical electives must include the following:

BME 350	Signals and Systems for Bioengineers or BME 419 Biocontrol Systems	3 3
BME 411	Biomedical Engineering I or BME 412 Biomedical Engineering II	3 3
BME 415	Biomedical Transport Processes	3
Total		9

Molecular and Cellular Bioengineering. This emphasis is designed to strengthen and integrate the student's knowledge of molecular and cellular biology, biochemistry, and biomaterials science and engineering for the design of biomolecular and cellular based hybrid medical and diagnostic devices. It is particularly suited for students interested in pursuing graduate studies in molecular and cellular bioengineering and health related biotechnology. Technical electives must include the following

BIO 353	Cell Biology	3
CHM 331	General Organic Chemistry	3
CHM 361	Principles of Biochemistry	3
Total		9

Premedical Engineering. This emphasis is designed to meet the needs of students desiring entry into a medical, dental, or veterinary 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 the following

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
Total		8

To fulfill medical school admission requirements, BIO 182 General Biology is a so required in addition to the degree requirements

Bioengineering Program of Study
Typical Four-Year Sequence

First Year

First Semester		
CHM 113	General Chemistry S S2	4
ECE 100	Introduction to Engineering Design \ ?	4

NOTE: For the General Studies requirement courses and codes such as L1 N3 C and H see "General Studies page 85 For graduation requirements, see University Graduation Requirements" page 81 For an explanation of additional omnibus courses offered but not listed in this catalog see Classification of Courses page 58

ENG 101 First Year Composition 3
MAT 270 Calculus with Analytic Geometry I *N1* 4

Total 15

Second Semester
CHM 116 General Chemistry *S1 S2* 4
ENG 102 First Year Composition 3
MAT 271 Calculus with Analytic Geometry II *N1* . . 4
PHY 121 University Physics I Mechanics *S1 S2* . . . 3
PHY 122 University Physics Laboratory I *S1 S2* . . 1

Total 15

Second Year

First Semester
BIO 181 General Biology *S1 S2* 4
BME 201 Introduction to Bioengineering *L1* . . . 3
ECE 210 Engineering Mechanics I Statics 3
MAT 272 Calculus with Analytic Geometry III *N1* 4
PHY 131 University Physics II Electricity and Magnetism *S1/S2*[2] 3
PHY 132 University Physics Laboratory II *S1/S2*[2] 1

Total 18

Second Semester
ECE 301 Electrical Networks I 4
ECE 350 Structure and Properties of Materials . . 3
MAT 274 Elementary Differential Equations *N1* 3
HU, SB, and awareness area courses 6

Total 16

Third Year

First Semester
BME 331 Biomedical Engineering Transport I Fluids. . . . 3
BME 435 Physiology for Engineers 4
ECE 300 Intermediate Engineering Design *L1* 3
ECE 340 Thermodynamics 3
ECN 111 Macroeconomic Principles *SB* 3
or ECN 112 Microeconomic Principles *SB* 3
MAT 242 Elementary Linear Algebra 2
or ECE 384 Numerical Analysis for Engineers I 2
or ECE 386 Partial Differential Equations for Engineers 2)

Total 18

Second Semester
BME 318 Biomaterials. 3
BME 334 Bioengineering Heat and Mass Transfer 3
ECE 334 Electronic Devices and Instrumentation . . . 4
ECE 380 Probability and Statistics for Engineering Problem Solving *N2*. 3
HU, SB, and awareness area courses[3]. 4

Total 17

Fourth Year

First Semester
BME 413 Biomedical Instrumentation *L2* 3
BME 416 Biomechanics 3
BME 417 Biomedical Engineering Capstone Design I. . . 3
BME 423 Biomedical Instrumentation Laboratory *L2* 1
HU, SB, and awareness area course[3] 3
Technical electives 3

Total 16

Second Semester
BME 470 Microcomputer Applications in Bioengineering. 4
BME 490 Biomedical Engineering Capstone Design II . . 3
Technical electives 6

Total 13
Total degree requirements 128

Both PHY 121 and 122 must be taken to secure S or S2 credit.

Both PHY 131 and 132 must be taken to secure S1 or S2 credit.

[3] Engineering students may not use aerospace studies (AES) or military science (MIS) courses to fulfill HU and SB requirements. See "Degree Requirements," page 199

MATERIALS SCIENCE AND ENGINEERING—B.S.E.

REGENTS' PROFESSOR
MAYER

PROFESSORS
ADAMS, DEY, KRAUSE, MAHAJAN

ASSOCIATE PROFESSOR
ALFORD

Materials science and engineering is concerned with the study of fundamental relationships between the structure and processing of materials and their properties. The program develops a knowledge of materials that allows graduates to decide how to optimize design of engineering components with existing materials or how to develop new advanced materials and processing techniques.

All major industries and many research laboratories are involved with the selection, utilization, and development of materials used for designing and producing engineering systems. Students who major in materials science and engineering will find employment opportunities in a variety of industries and research facilities which include aerospace, automotive, electronics, energy conversion, manufacturing, medical devices, and semiconductors.

The responsibilities of a materials engineer include research and development of materials to meet new demands of advancing technologies, to select the best material for a specific application, and to devise novel processing methods to improve the performance or cost of a material in an engineering component.

In essence, a materials engineer uses the fundamental principles of chemistry and physics for the benefit of mankind in areas such as communication, computation, medicine, and transportation.

DEGREE REQUIREMENTS

A minimum of 128 semester hours is necessary for the B.S.E. degree in Materials Science and Engineering. A minimum of 50 upper division semester hours is required.

Graduation Requirements. In addition to fulfilling school and major requirements, majors must satisfy all university graduation requirements. See "University Graduation Requirements," page 81

Course Requirements. The undergraduate curriculum requires that students take a series of interdisciplinary courses of fundamental importance to an understanding of all engineering materials. Following these are additional

courses that may be taken as technical electives to develop an area of emphasis. The courses for the undergraduate degree can be classified into the following categories (in semester hours).

First-Year Composition

Choose among the course combinations below ..... 6 or 3
- ENG 101 First Year Composition 3)
- ENG 102 First Year Composition (3)

or

- ENG 105 Advanced First Year Composition 3)
- Elective chosen with an advisor 3)

—or

- ENG 107 English for Foreign Students 3)
- ENG 108 English for Foreign Students 3)

Total ..... 6 or 3

General Studies/School Requirements

Humanities and Fine Arts/Social and Behavioral Sciences

ECN 111 Macroeconomic Principles *SB* 3
or ECN 112 Microeconomic Principles *SB* (3
HU, SB, and awareness area courses 13

Total 16

Literacy and Critical Inquiry

ECE 300 Intermediate Engineering Design *L1* 3
ECE 400 Engineering Communications *L2* 3

Total 6

Natural Sciences/Basic Sciences

CHM 113 General Chemistry *S1/S2* 4
CHM 116 General Chemistry *S1/S2* 4
PHY 121 University Physics I: Mechanics *S1/S2*[1] 3
PHY 122 University Physics Laboratory *S1/S2*[1] 1
PHY 131 University Physics II: Electricity and Magnetism *S1/S2*[2] 3
PHY 132 University Physics Laboratory II *S1/S2*[2] 1

Total 16

Numeracy Mathematics

ECE 100 Introduction to Engineering Design *N3* 4
MAT 242 Elementary Linear Algebra 2
or ECE 384 Numerical Analysis for Engineers I (2)
or ECE 386 Partial Differential Equations for Engineers (2
MAT 270 Calculus with Analytic Geometry I *N1* 4
MAT 271 Calculus with Analytic Geometry II *N1* 4
MAT 272 Calculus with Analytic Geometry III *N1* 4
MAT 274 Elementary Differential Equations *N1* 3

Total 21
General Studies/school requirements total 59

Engineering Core

ECE 210 Engineering Mechanics I: Statics 3
ECE 301 Electrical Networks I 4
ECE 313 Introduction to Deformable Solids 3
ECE 350 Structure and Properties of Materials 3
MSE 430 Thermodynamics of Materials 3

Total 16

Major

ECE 380 Probability and Statistics for Engineering Problem Solving *N2* 3
MSE 353 Introduction to Materials Processing and Synthesis 3
MSE 354 Experiments in Materials Synthesis and Processing I 2
MSE 355 Introduction to Materials Science and Engineering 3
MSE 420 Physical Metallurgy 3
MSE 421 Physical Metallurgy Laboratory 1
MSE 440 Mechanical Properties of Solids 3
MSE 450 X-ray and Electron Diffraction 3
MSE 470 Polymers and Composites 3
MSE 471 Introduction to Ceramics 3
MSE 482 Materials Engineering Design 3
MSE 490 Capstone Design Project 3
Select two of the following four courses[3] 6
- CHM 325 Analytical Chemistry (3)
- CHM 331 General Organic Chemistry (3
- CHM 341 Elementary Physical Chemistry 3)
- PHY 361 Introductory Modern Physics 3)

Technical electives[4] 8

Total 47

[1] Both PHY 121 and 122 must be taken to secure S1 or S2 credit.

[2] Both PHY 131 and 132 must be taken to secure S1 or S2 credit

In order to take CHM 341 Elementary Physical Chemistry, CHM 331 Organic Chemistry must be taken as the prerequisite

[4] Three of the eight hours must be a non MSE upper division engineering elective course.

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.

Biomaterials. Students interested in the materials used in the body and other living systems to improve or replace body components should choose from the following technical electives:

BME 318 Biomaterials 3
BME 411 Biomedical Engineering I 3
BME 412 Biomedical Engineering II 3
BME 413 Biomedical Instrumentation *L2* 3
BME 416 Biomechanics 3

Ceramic Materials. Students who want to develop an understanding of the chemistry and processing that control the structure and properties of ceramics and their application should select from these technical electives

CHM 331 General Organic Chemistry 3
CHM 332 General Organic Chemistry 3
CHM 471 Solid State Chemistry 3
EEE 435 Microelectronics 3
EEE 436 Fundamentals of Solid State Devices 3
EEE 439 Semiconductor Facilities and Cleanroom Practices 3
MSE 453 Experiments in Materials Synthesis and Processing II 2

NOTE: For the General Studies requirement, courses and codes (such as L1 N3, C and H see "General Studies," page 85 For graduation requirement see University Graduation Requirements," page 81 For an explanation of additional omnibus courses offered but not listed in this catalog see 'Classification of Courses," page 58

MSE 454 Advanced Materials Processing and Synthesis... 3
MSE 472 Integrated Circuit Materials Science. 3

Energy Systems. Students interested in the materials used in energy conversion systems such as solar energy or nuclear energy should choose from the following technical electives:

MAE 441 Principles of Design... 3
MAE 442 Mechanical Systems Design... 3
MSE 431 Corrosion and Corrosion Control ... 3
MSE 441 Analysis of Material Failures 3

Integrated Circuit Materials. Students interested in the materials used in the semiconductor industry and in how they are processed to achieve the desired properties should choose from the following technical electives.

CHE 458 Semiconductor Material Processing... 3
EEE 435 Microelectronics... 3
EEE 436 Fundamentals of Solid State Devices... 3
EEE 439 Semiconductor Facilities and Cleanroom Practices... 3
MSE 453 Experiments in Materials Synthesis and Processing II... 2
MSE 454 Advanced Materials Processing and Synthesis . 3
MSE 471 Introduction to Ceramics 3

Manufacturing and Materials Processing. Students interested in the manufacturing and processing of materials for a broad base of applications should choose from the following technical electives:

CHE 458 Semiconductor Material Processing... 3
MAE 422 Mechanics of Materials... 4
MAE 441 Principles of Design... 3
MAE 442 Mechanical Systems Design . 3
MSE 431 Corrosion and Corrosion Control 3
MSE 441 Analysis of Material Failures... 3
MSE 453 Experiments in Materials Synthesis and Processing II... 2
MSE 454 Advanced Materials Processing and Synthesis... 3
MSE 472 Integrated Circuit Materials Science... 3

Mechanical Metallurgy. Students interested in the materials used in the semiconductor industry and in how they are processed to achieve the desired properties should choose from the following technical electives:

MAE 415 Vibration Analysis... 4
MAE 422 Mechanics of Materials 4
MAE 441 Principles of Design 3
MAE 442 Mechanical Systems Design... 3
MSE 431 Corrosion and Corrosion Control... 3
MSE 441 Analysis of Materials Failures . 3

Metallic Materials Systems. Students interested in building an understanding of the basis for the design and processing of metals and alloys should choose from the following technical electives.

MAE 351 Manufacturing Processes... 3
MSE 431 Corrosion and Corrosion Control . 3
MSE 441 Analysis of Material Failures... 3
MSE 472 Integrated Circuit Materials Science... 3

Polymers and Composites. Students who desire to build an understanding of the chemical and processing basis for the properties of polymers and their applications, including composite systems, should select from the following technical electives:

CHM 331 General Organic Chemistry... 3
CHM 332 General Organic Chemistry... 3
CHM 471 Solid State Chemistry... 3
MSE 441 Analysis of Material Failures... 3
MSE 472 Integrated Circuit Materials Science... 3

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

First Year

First Semester
CHM 113 General Chemistry *S1/S2*... 4
ECE 100 Introduction to Engineering Design *N3*... 4
ENG 101 First Year Composition... 3
MAT 270 Calculus with Analytic Geometry I *N1*... 4

Total... 15

Second Semester
CHM 116 General Chemistry *S1/S2*... 4
ENG 102 First Year Composition... 3
MAT 271 Calculus with Analytic Geometry II *N1*... 4
PHY 121 University Physics I Mechanics *S1/S2*... 3
PHY 122 University Physics Laboratory I *S1/S2*[1]... 1

Total... 15

Second Year

First Semester
ECE 210 Engineering Mechanics I: Statics... 3
ECN 111 Macroeconomic Principles *SB*... 3
MAT 242 Elementary Linear Algebra... 2
or ECE 384 Numerical Analysis for Engineers I (2)
or ECE 386 Partial Differential Equations for Engineers (2)
MAT 272 Calculus with Analytic Geometry III *N1*... 4
PHY 131 University Physics II: Electricity and Magnetism *S1/S2*[2]... 3
PHY 132 University Physics Laboratory II *S1/S2*[2]... 1

Total... 16

Second Semester
ECE 301 Electrical Networks I... 4
ECE 313 Introduction to Deformable Solids... 3
ECE 350 Structure and Properties of Materials... 3
ECE 380 Probability and Statistics for Engineering Problem Solving *N2*... 3
MAT 274 Elementary Differential Equations *N1*... 3

Total... 16

Third Year

First Semester
ECE 300 Intermediate Engineering Design *L1*... 3
MSE 353 Introduction to Materials Processing and Synthesis... 3
MSE 355 Introduction to Materials Science and Engineering... 3
Advanced science course[4]... 3
HU, SB, and awareness area courses[3]... 4

Total... 16

Second Semester
MSE 354 Experiments in Materials Synthesis and Processing I... 2
MSE 420 Physical Metallurgy... 3
MSE 421 Physical Metallurgy Laboratory... 1
MSE 430 Thermodynamics of Materials... 3

MSE 450 X ray and Electron D ff act on	3
HU, SB and awareness area c urses[3]	6
Total	18

Fourth Year

First Semester

MSE 440 Mechanical Properties of Solids	3
MSE 470 Polymers and Compos tes	3
MSE 471 Introduction to Cera mics	3
MSE 482 Materials Eng neering Desig	3
Technical elective	4
Total	16

Second Semester

ECE 400 Engineering Comn unications *L2*	3
MSE 490 Capstone Design Project	3
Advanced science course[4]	3
HU, SB, and awareness area c ourse[3]	3
Technical elect ves	4
Total	16
Degree requirements total	128

Both PHY 121 and 122 must be t ken to se ure S1 or S2 credit

[2] Both PHY 131 and 32 must be tak n tc secure S1 or S2 credit.

[3] Engineer ng students may not use ace cspa e studies AES or n ilitary scienc MIS courses t fu fill HU and SB requiren ents See "Degree Requirements," page 199

[4] In order to take CHM 341 E en entary Pl ysical Chem ist y, CHM 33 Organic Che strv m st be taken as the prereq uisite

BIOENGINEERING (BME)

BME 201 Introduction to Bioengineering. 3 F
mpact of b eng neer ng on soc ety Deve op ng an awareness of the contr but ons of b oeng neer g to so ve med ca and b o og ca prob lems Cross sted as STE 201 Cred t s a wed on y for BME 201 or STE 201 Prerequ's te ENG 102 or 105 or 108 *Genera Stud es L1*

BME 202 G obal Awareness W thin Biomed cal Engineering Design. (3 N
ntroduct n to eth ca ega soc a e nom c and techn ca ss es ar s ng from the des gn and mp ementat on f b oeng neer ng techno ogy Lecture crit ca d scourse Prerequ s tes ECE 100 ECN 111 or 112 ENG 102 *General Stud es L1 HU*

BME 318 Biomaterials. (3 S
Mater a properties of atura and art f c al b omater a s T ssue and b ood b ocompat b ty Uses of mater a s to rep ace body parts Pre requ s te ECE 350

BME 331 Biomedical Engineering Transport I: F uids. 3 F, S
Transport phenomena w th empha on b omed ca eng neer ng f u d systems Prerequ s tes MAT 274· PHY 131

BME 334 Bioengineering Heat and Mass Transfer. 3 S
Appl cat on of the pr n p e of heat and mass transfer phenomena to solut on of prob ems n med c ne and med ca dev ce des gn Prerequ s te ECE 340. Prerequ s te w th a grade of C or h gher. BME 331

BME 350 Signals and Systems for Bioengineers. (3) S
App cat on of pr nc p es of ca cu us and ord nary d ffere t a equat ons to mode ng and ana ys s of responses s gna s and s g a transfers n b osystems Prerequ s tes ECE 301 MAT 272 274

BME 411 Biomedical Engineer'ng I. 3 A
Rev ew of d agnost c and prosthet c methods us ng eng neer ng meth odo ogy ntroduct on to transpo t metabo c and autoregu atory pr cesses in the human body Prerequ s te w th a grade of 'C or h gher BME 334

BME 412 B omedical Engineering II 3 A
Rev ew f e ectrophys o ogy and nerve pac ng app cat ons tr duc t n to b omechan c and o nt/ mb rep acement te h o ogy card vascu ar and pu m nary f u d mechan cs and the app cat o f mathemat a mode g Prerequ s te nstruct r approva

BME 413 Biomedical Instrumentat'on. 3 F
Pr nc p es of med ca nstrumentat on Stud es of med cal d agnost c nstruments and techn ques for the measurement of phys o og c var ab es n v ng systems Prerequ s tes ECE 300, 334. Prerequ s te w th a g ade f C r h gher BME 435 Coreq s te BME 423. *Genera Stud es L2*

BME 415 Biomedical Transport Processes. 3 A
P nc p es f momentum heat and mass tra sport w th app cat o s t ed ca and b g ca sy tems and med ca dev ce des g Prereq u s tes MAT 274 PHY 131

BME 416 Biomechan cs. 3 F
Mechan ca propert e of b ne musc e and soft t ssue Stat c a d dynam ana ys s of human movement tasks such as ocomot on Pre- requ s te w th a grade of C or h gher BME 318

BME 417 Biomedical Engineering Capstone Des gn I. 3 F
Tech ca reg atory econ m c, ega , s c a and eth ca aspects of med ca dev ce systems eng neer ng des gn Lecture f e d tr ps Pre- requ s tes w th a grade of C or h gher BME 318 334

BME 419 Biocontrol Systems 3 F
App cat on of ear a d on near contro systems techn ques toward ana ys s f neuromuscu oske eta ard ovascu a , the ma and mass tra sfer systems of the body Prerequ s tes ECE 301; MAT 274

BME 423 Biomedica Instrumentation Laboratory. 1 F
Laboratory expe ence w th pr b ems co cepts and techn ques of b omed ca nstrumentat n stat c and dy am c env ronments ab Prerequ s tes ECE 300 334 Prerequ s te w th a grade f C" or h gher BME 435 C requ s te BME 413 *Genera Stud es L2*

BME 435 Physiology for Eng neers. 4 F
Phys o gy of the nervous muscu ar ard vas u ar endocr ne, e a and resp ratory systems Emphas zes use of quant tat ve methods n understand ng phys o og ca systems Lecture ab Prerequ s tes B O 181 and CHM 116 and PHY 131 *or* structor approva

BME 470 Microcomputer Applications in Bioeng neering. 4 S
Use of m c ocomputers for rea t me data co ect on ana ys s, and contro of exper me ts nv v ng a tua and s mu ated phys o og cal systems Lecture ab Prerequ s tes. ECE 100 334 Prerequ s te w th a grade f C or h gher BME 435

BME 490 Biomedical Engineering Capstone Design II. 1 5 F S
nd v dua pro ects n med ca systems or med ca dev ce des gn and deve opme t Lecture ab Prerequ s te w th a grade of C" or h gher BME 417

BME 496 Professional Seminar. 1 3 F S
Pr fess ona and eth ca aspects w th a d scuss on of respons b ties Lecture f e d tr ps Prerequ s te nstr ctor approva

BME 511 Biomed'ca Engineer'ng. 3 A
D agnost c and prosthet c meth ds us ng eng nee ng methodo gy T ansport metabo c and autoregu at ry processes n the body

BME 512 Biomedical Engineer ng II. (3 A
E ectrophys gy and nerve pac ng app cat ons ntroduct on to b o mechan cs and jo nt/ mb rep acement, techno ogy card ovascu ar and pu monary f u d mechan cs and mathemat ca model ng

BME 513 Biomedical Instrumentation I. 3 F
Pr nc p es of med ca nst umentat on Stud es of med cal d agnost c nstruments and tech ques for the measurement of phys o og c var ab es n v ng systems

BME 514 Advanced B omedical Instrumentation. 3 N
Pr nc p es f app ed b ophys ca measurements u ng b oe ectr c a d rad o og ca approach Prerequ s tes ECE 334, MAT 274 or equ va- e t

BME 515 Biomedical Transport Processes. 3 N
Pr nc p es of momentum heat, and ma s transpo t w th app cat ons *to med ca and b o og ca systems and med ca dev ce des gn Prereq* u s te nstructor appr va

NOTE: For the Genera Stud es req ement, courses and codes (such as L1 N3 C and H see Genera Stud es " page 85 For graduat n requ rements see 'Un vers ty Graduat on Requ rements " page 81 For an exp anat on of add t a omn bus ses offered but not sted n th s cata og see C ass f at on of Courses " page 58

BME 516 Topics n Biomechanics. 3 F
Mechan ca pr pert es of b ne m sc e a d soft t ssue Stat c and dynam c ana ys s of human m vement tasks c ud ng n depth pro ect Prerequ s te st uct r approva

BME 518 Introduction to B omater'a s. 3 S
Top'cs nclude structure property re at sh ps for synthet c and natu ra b omater a b ocompat b ty a d u es of mater a s to rep ace body parts P erequ te ECE 350 equ va ent or str ct r approva

BME 519 Topics in Biocontrol Systems. 3 F
L near and non near contro sy te s ana ys s of neuromusc oske e ta card ovasc ar therma and ma s transfer systems of the body, nc ud ng n depth pro ect P erequ tes ECE 301 and MAT 274 *or* nstr ct appr va

BME 520 Bioelectric Phenomena. 3 N
Study f the r g n pr pagat on and nteract ons of e ect c ty n v ng th ngs v ume ndu to pr b e mathemat ca ana ys s of b o e ectr c nteract on a d ses n med a d agn st cs

BME 521 Neuromuscu ar Control Systems. 3 S
Overv ew of sensor motor bra n t u tures App cat on f non near adapt ve opt ma and superv s ry ontro theory to eye head hand co rd nat o a d c m t on

BME 522 Biosensor Design and Appl cation. 3 A
Theory and pr nc p es f b sensor des g and app cat on n med c ne and b o gy Pr p e f mea urements w th b osensors Prerequ s te nstructor approva

BME 523 Phys ological Instrumentation Lab. 1 F
Laboratory expe ence w th pr b ems concepts and techn ques of b omed ca n trumentat n stat c and dynam c env ronments ab Pre or corequ s tes AGB BME 435 BME 413 ECE 334

BME 524 Fundamentals of Applied Neural Control. 3 A
Fundamenta concept f e ectr ca st mu at on and record ng n the nervous system w th t e goa of funct ona c ntr resto at on Pre or corequ s te. BME 435 or nstructor app ova

BME 525 Surgical Techniques. 2 S
Pr nc p es of surg ca tech ques standard operat ve pr cedures fed era regu at ns gu de nes and state f the art methods Lecture ab

BME 532 Prosthetic and Rehabilitation Engineer'ng. 3 A
Ana ys s and cr t ca a e sment f des gn and contro trateg es f r state of the art med ca dev es sed n rehab tat n eng neer g Pre r orequ s te BME 416 or 5 6 o EPE 610

BME 533 Transport Processes I. 3 F
Un f ed t eatment of m me t heat and mass t ansfer fr m mo ec u ar theory and co t nuum po ts f v ew C nt nuum eq at ons of m croscop c and macro c p c systems and mu t component and mu - t phase systems Cross sted as CHE 533 Cred t s a wed on y f r BME 533 or CHE 533.

BME 534 Transport Processes II. 3 S
Cont nuat on of BME CHE 533 emphas z ng ass transfer Cross sted as CHE 534 Cred t s a owed on y for BME 534 r CHE 534 Prerequ s te BME CHE 533

BME 543 Thermodynam cs of Chem ca Systems. 3 F
C ass ca a d tat t ca thermody am cs f non dea phys c chem ca systems and processe pred ct on of pt m m operat ng cond t ons Cross sted as CHE 543 Cred t a wed on y for BME 543 or CHE 543

BME 544 Chem ca Reactor Eng neering. 3 S
React on rates thermodynam cs and t anspo t p nc p e app ed to the des gn and pe at on f chem ca react rs Cr ss sted as CHE 544 Cred t s a wed on y for BME 544 or CHE 544 Prerequ s te BME/CHE 543

BME 551 Movement Biomechanics. 3 S
Mechan cs app ed t the a a ys s and mode ng f phys o og ca movements Computat a mode ng of musc es tend s, j nts and the ske eta system w th app at o t sports and rehab tat on Pre requ s te BME 416 or 5 6 o st u t r appr va

BME 566 Medical Imaging nstrumentation. 3 N
Des g and ana ys of mag ng systems and n c ear dev es for med ca d agnos s therapy and research Labo ato y exper ments us ng d agnost c rad ogy f uoros opy u trasou d and CAT scann ng Lec ture, ab Prerequ s te nstr ctor approva

BME 568 Med ca Imag ng. 3 N
CT SPECT, PET and MR 3 d me o a *n v vo* mea rements. nstrument des g phys og a m de ng c n ca prot co s reco struct n a g r thms and quant tat ssues P erequ s te nstru t r approva

CHEMICAL ENGINEERING (CHE)

CHE 311 Introduction to Chemical Processing. 3 F S
App cat n of chem ca eng neer ng ana y s and pr b em so v ng to chem ca processes mater a and energy ba ance methods and sk s. Prerequ s tes CHM 116 MAT 271

CHE 331 Transport Phenomena I: Flu'ds. 3 F S
Transport phen mena w th emphas s on f u d systems Prerequ s tes CHE 311 ECE 394 ST C nservat on Pr c p es MAT 274

CHE 332 Transport Phenomena II: Energy Transfer 3 F S
C nt nuat n of transpo t pr nc p es w th e phas s o energy trans port n stat ary and f u d ystems Pre equ s te CHE 331

CHE 333 Transport Phenomena II : Mass Transfer. 3 F S
The app at on of t ansp t phen me a t mass tra sfer The des gn f mass transfe equ pment nc ud g staged pr cesses Prerequ s te CHE 332

CHE 342 App ied Chemical Thermodynam cs. 4 F S
App cat on of c n ervat on and a unt ng pr nc p es w th non dea property est mat on techn ques to m de pha e and chem ca equ b r um processes Lecture rec tat n Prerequ tes CHE 311 ECE 394 ST Conse vat n Pr nc p es ECE 394 ST Propert es that Matter. Pre or corequ s te MAT 272

CHE 352 Transport Laboratories. 3 S
The demo strat on of transport phenome a p nc p es w th exper ments n f u d f ow heat and mass tra fer Prerequ s tes CHE 332 ECE 300 Pre or corequ s te CHE 333 *Genera Stud es L2*

CHE 432 Principles of Chem cal Engineering Design. 3 F
Mu t c mponent d st at on eng neer ng econom cs equ pment s z ng and costs p ant operat on econom cs and s mu at on and opt m zat on techn ques Prerequ s tes CHE 332 342

CHE 442 Chemical Reactor Design 3 F S
App cat on of k net cs to em ca react r des gn Prereq s te CHE 342 Pre- or c requ s te CHE 333

CHE 451 Chemical Engineering Laboratory. 2 F
Operat on contro and des g of exper menta and ndustr a process equ pment dependent resear h proje ts 6 h urs ab Prerequ s tes CHE 333 352 ECE 384

CHE 458 Semiconductor Mater al Process ng 3 N
ntroduct on to the process ng and character zat n f e ectron c mate r a s for sem c nductor app cat ns Prerequ tes CHE 333 342

CHE 461 Process Control 4 F
Pr cess dynam cs nstrumentat on and feedback app ed to auto mat c process contro Lecture, ab Prerequ s te ECE 394 ST Eng neer ng Systems *Genera Stud es N3*

CHE 462 Process Design 3 S
App cat on of econom c pr nc p es to opt m ze equ pment se ect on and des gn deve opment and des gn f pr cess systems Prerequ - s tes CHE 432 442

CHE 474 Chemical Eng neering Design for the Environment. 3 F
Conf ct of process g mater a s and preserv g the atura resources Students w understand va ue the env ronme t and attempt to contro our mpact Prerequ s tes CHE 333 342

CHE 475 B ochemical Engineering. 3 N
App cat on of chem ca eng neer ng methods mass transfer thermo- dynam cs and transport phenomena to ndu tr a b otechno ogy Pre requ s te nstruct approva .

CHE 476 Bioreaction Engineering. 3 N
Pr nc p es of ana ys s and des gn f reactors f r pr ce s ng w th ce s a d other b o og ca y act ve mater a app cat ons f react on eng neer ng n b otechno ogy Pre equ s te nstru t r appr va

CHE 477 Bioseparation Processes. 3 N
Pr nc p es of separat on of b og ca y a t ve hem ca s, the app ca t on sca eup, and des gn of separat on processes n b otechno ogy Prerequ s te· nstructor appr va

CHE 478 Industrial Water Quality Eng neering. 3 F
Chem ca treatment process ng qua ty cr te a and contro system des gn and water po utants Prerequ s tes CHE 331 sen or stand ng

CHE 479 Air Quality Control. 3 F
A r poi utant tro effect and or g ns Chem ca and phys ca pro cesses nc ud ng combust n cont o eq pment des gn d spers on and sampl ng Prerequ s te CHE 331 se r stand ng

CHE 490 Chem cal Engineering Projects. 1 5 F S SS
nd v dua projects n chem ca eng nee g perat ons and des gn Prerequ s te nstructor approva

CHE 494 ST: Specia Top cs. 1 4 F S

CHE 496 Professional Sem nar. 1 3 F S
Profess na and eth a aspects w th a d cuss on of respons b t es Lecture f e d tr ps P ereq s te nstruct r app ova

CHE 501 Introduction to Transport Phenomena. 3 F S
Transport phe ome a w th emphas s on f u d systems Prerequ s te trans t on student w th nst ct r app ov

CHE 502 Introduction to Energy Transport. 3 F S
C nt nuat on of transp t pr n p es w th emphas s n energy trans port n stat nary and f u d systems Prerequ s te t ans t n st dent w th nstruct r approva

CHE 503 Introduction to Mass Transport. 3 F S
The app cat on of transport phen m a t mass transfer The des gn of mass transfer equ pme t c ud g staged processes Pre equ s te trans't on st dent w th nstructor approva

CHE 504 Introduction to Chemica Thermodynamics. (3 F, S
Energy re at ons and equ br um convers ons based on chem ca potent a s and phase equ br a Prereq s te trans t on student w th nstructor appr va

CHE 505 Introduction to Chem ca Reactor Design. 3 F, S
App cat on of k net cs to chem ca ea to de g Prerequis te. trans t on student w th nstructor appr va

CHE 527 Advanced App ied Mathemat ca Analysis n Chemical Engineering. 3 F
Formulat on and so ut on of c mp ex mathemat ca re at onsh ps resu t ng from the desc pt on of phys ca pr b ems n mass energy and momentum transfer and chem ca k net cs

CHE 528 Process Opt'mizat'on Techniques. 3 S
Method for pt m z ng e g neer ng pro e ses Exper menta des gn and ana ys s, near and n n nea regress on methods c ass ca search and dynam programm ng a g r thms

CHE 533 Transport Processes I. 3 F
Un f ed treatment f m mentum eat and mass transfer from mo ec u ar theory and c t n u po nt f v ew C nt nuum equat ons of m croscop c and macr scop c systems and mu t component and mu t phase systems Cr s sted as BME 533 Cred t s a wed on y for BME 533 or CHE 533

CHE 534 Transport Processes II 3 S
Cont nuat on of CHE/BME 533 emphas z ng ma s transfer Cross sted as BME 534 Cred t s a wed on y f r BME 534 or CHE 534 Prerequ s te BME/CHE 533.

CHE 536 Convect ve Mass Transfer. 3 N
Turbu ent f ow for m t c mp ent systems nclud ng chem ca reac t ons w th app cat n sepa at ns and a r po ut on Prerequ s te CHE 533 or MAE 571

CHE 543 Thermodynamics of Chem ca Systems. 3 F
C ass'ca and stat st ca therm dynam cs of n n dea phys cochem ca systems a d processes pred ct on of pt mum perat ng cond t ons Cr ss 'sted as BME 543 Cred t s a owed on y for BME 543 or CHE 543

CHE 544 Chemical Reactor Engineer'ng. 3
React on rates thermodynam cs a d transport pr nc p es app ed t the des gn and operat n f chem ca reactors Cross- sted as BME 544 Cred t s a wed on y for BME 544 r CHE 544 Prerequ s te BME/CHE 543

CHE 548 Topics in Catalys s. 3 N
Eng eer ng ata ys s emphas z ng ad o pt on, k'net cs character za t on d ffus na co s de at ns and reactor d s g Other top cs nc ude mechan sms urface ana yses and e ectron c stru ture

CHE 552 Industria Water Qual ty Engineering. 3 N
Water po uta ts q a ty cr'ter a and cont o chem ca t eatment p o cess ng, a d system des g Case stud es Pre equ s te CHE 331 or equ va ent

CHE 553 A r Quality Contro . 3 N
A r po utant or g ns effects a d c ntr Phys ca and chem ca pro cesses nc ud ng d spers n mbust n amp g cont o equ p ment des gn a d spec a to s Prere s te CHE 331 or equ va ent.

CHE 554 New Energy Technology. 3 N
Gas f cat on q efact on pyro ys s and c mb st on processes f r coa wastes and t er raw ater a s s tu pr cesses for c a o sha e a d geotherma ene gy E v r nmenta qua ty ssue .

CHE 556 Separat on Processes. 3 N
T p cs n b nary mu t mp r ent separat on ate go erned and equ brat on pr cesses ass transfe r ter a e ergy requ rements sepa rat ng agents and dev ces and stag d perat s

CHE 558 Electronic Materials 3 N
Process g and haracter zat f e e tr n mater a s for sem c ductor type uses Thermodynam and transport phenomena, phase equ br a and st ucture mass t a sfer and d ffus on and therma pr p ert es

CHE 561 Advanced Process Control. 3 S
Dynam c pr ce s representat on near pt ma contro pt ma state reconstruct on and paramete and state est mat on techn ques for cont nuous and d s ete t me systems

CHE 563 Chemical Engineering Design. 3 N
Computat ona meth ds the des gn f chem ca p ant and p ocesses

MATERIALS SCIENCE AND ENGINEERING (MSE)

MSE 353 Introduction to Mater'a s Processing and Synthesis. (3 F
Pr nc p es of mater a s structure and pr pert e w th emphas s on app cat ns n bu k and th n f m mater a s pr cess ng and synthes s Prerequ s tes CHM 116 and PHY 131 r equ va ents

MSE 354 Experiments n Materials Synthes s and Processing . 2 S
Sma l gro ps of st de ts comp ete t ree exper e ts se ected from a t Each s superv sed by a se e ted facu ty membe Lab. Prerequ s te MSE 353 or equ va ent

MSE 355 Introduction to Mater a s Science and Engineering. 3 F
E ements of the stru ture of meta s and a ys meas rement of mechan ca p ope t e and pt ca meta ography Lecture ab f e d tr ps. Prereq s te CHM 114 o 116

MSE 420 Phys ca Metallurgy. 3 F
Crysta structu e and defe ts Phase d agrams meta ography, s d f at on and cast ng, def r at o and a ea g Prerequ s te ECE 35

MSE 421 Phys ca Metallurgy Laboratory 1 S
Focuses o a a ys s of cr st u t re f meta a d a oys and c udes c rre at on w th mecha c prope t es to some extent Lab Pre or req s te MSE 42

MSE 430 Thermodynamics of Mater a s. 3 S
Pr n p es of stat t a mecha c stat st ca ther ody am cs of s n g e crysta s so ut ons, phase equ br um f ee energy f react ons free e ect o theo y and thern odynam c f defects Prerequ te ECE 350.

MSE 431 Corrosion and Corrosion Contro . 3 S
ntroduct on to co ros n mechan m and methods f prevent ng cor- ros on T p cs nc ude the fo ow ng e ectrochem stry po a zat on, cor- ros on rates x dat on coat gs and cathod c prote t on Prereq s te ECE 3 0

MSE 440 Mechanical Properties of Solids 3 S
Effects of env r nmenta and m cr structura var ab es f mechan ca propert es nc ud ng p ast c def rmat o fat gue reep br tt e frac ture, and nterna fr ct on Prerequ te ECE 350

MSE 441 Analys s of Mater al Failures. 3 S
de t ficat n of type of fa ures Ana yt ca techn ques Fractography SEM nondestruct ve spect o and meta og aphy Mechan ca and e ectron c compo ents Prereq s te ECE 35

MSE 450 X-ray and E ectron Diffract'on F
Fundamenta s of X ray d ffract n tra m ss o e ectron m croscopy and scann ng e ectr n m c s opy Tech q e for study ng surfaces nter a m crostructu es and f uorescen e ect re demonstrat ons Prerequ s te ECE 35

NOTE: For the Genera St d es equ ement c u ses a d codes such as L1 N3 C and H see Ge e a tud es page 85 For graduat on requ reme ts see Un ve s ty Grad at on Requ rements " page 81 For an exp a at n of add t a omn bus ou es offered but n t sted n th s cata og see 'C ass f at o f Courses page 58

MSE 453 Experiments n Materials Synthesis and Processing II. 2 F
A cont nuat on of MSE 354 w th emphas s on character zat on Sma groups comp ete th ee exper ments superv sed by se ected facu ty membe s Lab P erequ s tes MSE 353 and 354 r equ va ents

MSE 454 Advanced Materials Processing and Synthesis. 3 S
Case stud es from pub hed te ature f current techn ques n materi als process ng and synthes s Student part c pat on n c a sroom pre sentat ons Lecture, rec tat on Prerequ s tes MSE 353 a d 354 *or* equ va ents

MSE 470 Polymers and Composites. 3 F
Re at o sh p between hem stry structure and propert es of eng nee ng po yme s Des gn, pr pert es and behav or of f ber compos te systems Cross sted as MAE 455 Cred t s a owed on y for MAE 455 or MSE 470 Prerequ s te ECE 350

MSE 471 Introduction to Ceramics. 3 F
Pr nc p es f str ture and property re at ons n ceram c mater a s Process ng techn ques App cat ns n mechan ca e ectr n c and superconduct ng system Prerequ s te ECE 350

MSE 472 Integrated Circuit Materials Science. 3 N
Pr nc p es of mater a c ence app e t sem c ndu ctor process ng and fab cat on n meta s eram cs po ymers and em conduct rs Prerequ s te ECE 350

MSE 482 Materials Engineering Design. 3 F S
Pr nc p es of the des gn proces Fea b ty and opt m zat n Manu fact r ng p ocesses mater a s se ect n fa ure ana ys s and econom cs Prerequ s tes ECE 313 350

MSE 490 Capstone Design Project. 1 3 F S
For sma gr ups n fundamental or app ed aspects f eng neer ng mater a s emphas s on exper menta prob ems and des gn Prerequ s tes MSE 430 440 450

MSE 496 Professional Seminar. 1 3 F S
Profes ona and eth ca aspects w th a d scuss n f espons b t es Lectures f e d tr ps Prerequ s te nstr ctor approva

MSE 510 X-ray and Electron Diffraction. 3 F
Fundamenta s of X ray d ffract on transm ss on e ectron m croscopy a d sca n ng e ectron m cr scopy Techn ques for study ng surfaces nterna m crostru tures and f orescence ectu e demonst at ns Prerequ s te trans t st de t w th nstruct approva

MSE 511 Corrosion and Corrosion Contro . 3 S
nt oduct on t corros on mechan sms and meth ds of prevent ng cor ro on Top cs nc ude t e f ow ng e ectrochem stry po ar zat n cor ro on rates ox dat on coat ngs and athod c p tect n Prerequ s te trans t on st de t w th nstruct r approva

MSE 512 Analysis of Materia Fa lures. 3 S
dent f cat on of types of fa ures Ana yt ca techn ques F actography SEM nondestruct ve nspect o and meta ography Mechan ca and e ectron c components Prerequ s te trans t o st dent w th nstr ctor approva

MSE 513 Polymers and Composites 3} F
Re at onsh p between chem stry str ct re and propert e of eng neer ng po ymers Des gn propert es, and behav o of f ber comp s te systems

MSE 514 Physical Metal urgy. 3 S
Crysta t u ture and defects Phase d agrams meta ography, so d f cat on and ast ng and deformat on and annea ng P erequ s te· tran s t st dent w th nstructo app va

MSE 515 Thermodynamics of Materia s. 3 N
Pr nc p es of stat st ca mechan cs stat st ca thermodynam cs of s n g e crysta s so ut ons phase equ br um free energy of react ons free e ectr n the ry, and thermodynam cs of defects Prerequ s te trans t on student w th nst uctor approva

MSE 516 Mechan ca Properties of Solids. 3 S
Effects of env r nmenta and *m* crostruct ona var ab es of mechan ca propert es nc ud g p ast c deformat on fat gue creep br tt e frac ture and nterna fr ct on Prereq s te. trans t on t dent w th nstruc tor approva

MSE 517 Introduction to Ceramics. 3 F
Pr nc p es of structure property e at ons ceram c ater a s P o cess ng techn ques App cat ons n mechan ca e ectron c and super c nduct ng systems P e equ s te trans t on tudent w th n tructor approva

MSE 518 Integrated Circuits Materials Science. (3 N
Pr nc p es of mater a s sc en e app ed t sem conduct r pr cess ng and fabr cat n meta s ceram cs po ymers and sem conductors P e eq s te. trans t st de t w th nstructor approva

MSE 520 Theory of Crysta line Solids. 3 F
An sotrop c pr pert es f crysta s tensor treatment of e ast c mag net c e ectr c and therma prope t s a d crysta ography of Martens t c transformat ons

MSE 521 Defects in Crysta line Solids. 3 S
ntroduct on to the geometry nte a t on and equ br um between d s oc t ns and po nt defects Re at ons between defects and pr pert es w be d scussed Prerequ s te ECE 350 or nstructor approva

MSE 530 Materials Thermodynamics and Kinetics. 3 S
Thermodynam cs of a oy systems d ffus n n so ds k net cs of pre- c p tat on and phase t ansf rmat ons n so ds Prerequ s tes ECE 340 350

MSE 540 Fracture, Fat gue, and Creep 3} F
Re at onsh p betwee m rostr ct re and fracture; fat gue and creep propert es of mater a s Env ronmenta effects and recent deve op ments Cur e t theo es and exper menta resu ts Prerequ s te MSE 440 or equ va ent

MSE 550 Advanced Mater als Characterizat on. 3 N
Ana yt a strumentat f r character zat on of mater a s SEM SIMS A ger a a yt cal TEM and other advanced research tech n ques

MSE 556 Electron Microscopy Laboratory. 3 F
Lab supp rt for MSE 558 Cr ss sted as SEM 556 Cred t s a owed on y for MSE 556 or SEM 556 Pre or corequ s te. MSE/SEM 558

MSE 557 Electron Microscopy Laboratory. 3 S
Lab support for MSE 559 Cr ss sted as SEM 557 Cred t s a wed only for MSE 557 or SEM 557 Pre or corequ s te MSE/SEM 559

MSE 558 Electron Microscopy I. 3 F
M croana ys s of the structure and c mpos t on of mater a s us ng mages d ffract on and X ray a d energy oss spectroscopy Knowl edge f e ementary crysta graphy rec proca att ce stereograph c project ons and comp ex var ab es s equ red Cross sted as SEM 558 Cred t s a wed on y for MSE 558 o SEM 558 Prerequ s te· nstructor approva

MSE 559 Electron Microscopy II. 3 S
M croana ys s f the st ucture and comp s t on of mater a s us ng mages d ffract n and X ray and energy oss spectroscopy Know edge of e ementary crysta ography rec proca att ce ste eograph c project ns and comp ex var ab es s requ red Cross sted as SEM 559 Cred t s a owed on y for MSE 559 or SEM 559. Prerequ s te nstructor approva

MSE 560 Strengthening Mechanisms. 3 S
Deformat on of crysta ne mater a s Propert es of d s ocat ons Theo- r es of stra n harden ng so d so ut on prec p tat on and transforma- t on strengthen ng Prerequ s te ECE 350 or equ va e t

MSE 561 Phase Transformation in Solids. 3 N
Hete ogeneous and homogeneou prec p tat on react ons shear d s p ac ve react ons and order d sorder transformat on

MSE 562 Ion Implantat on. 3 S
nc udes defect product and an ea ng Genera zed treatment nc ud g n mp antat ne tr rrad at on damage, and the nter act o of other n dent beams Prerequ s te MSE 450

MSE 570 Polymer Structure and Propert'es. 3 F
Re at onsh ps betwee structure and propert es of synthet c po ymers nc ud ng g ass tran t , mo ecu ar re axat ons, crysta ne state v s c e ast c ty morpho og ca chara te zat on and pro ess ng

MSE 571 Ceramics. 3 A
nc udes ceram c pr cess ng cast ng mo d ng f r g s nter ng crysta defects and mecha ca e ect c, a d phys ca propert es Prereq u s tes MSE 521 561

MSE 573 Magnetic Materia s. 3 A
Emphas s on ferromagnet c and ferr magnet c phenome a Doma ns magnet an sotrophy and ag etastr ct on Study of commerc a magnet c mater als Prerequ s te MSE 520 or equ va ent

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ASSISTANT PROFESSORS
BAKER, MUCC NO, OWUSU-ANTW ,
WESTERHOFF ZHU

CIVIL ENGINEERING

The civil engineering profession includes analysis, planning, design, construction, and maintenance of many types of facilities for government, commerce, industry, and the public domain. These facilities include 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 they attempt to coordinate the needs of society with technical and economic feasibility.

Career Opportunities in the Field. University graduates with the B.S.E. degree in Civil Engineering readily find employment. Civil engineers work in many different types of companies, from large corporations to small, private consulting firms, or in governmental agencies. A civil engineering background is an excellent foundation for jobs in management and public service. Civil engineering is one of the best engineering professions from the viewpoint of international travel opportunities or for eventually establishing one's own consulting business.

Uniqueness of the Program at ASU. The faculty in the Department of Civil and Environmental Engineering at ASU offer a challenging program of study designed to provide the student with the resources and background to pursue a career in a wide range of specialty areas. Some of these areas are structural, geotechnical, environmental and water resources, transportation and materials engineering. The Civil Engineering program is fully accredited by ABET. With the program, students will be prepared for the Fundamentals of Engineering (FE) examination and professional registration

The Department of Civil and Environmental Engineering offers challenging programs of study designed to provide students with the scientific and technical resources to pursue a broad and multifaceted range of careers.

Civil Engineering Areas of Study

Areas of study in the civil engineering curriculum are described below.

Environmental Engineering. This area of study includes the quality of air, water, and land resources; transport, use, and disposal of hazardous wastes; water and wastewater treatment; and water reuse.

Geotechnical Engineering. This area of study includes the analysis and design of foundation systems, seepage control, earthdams and water resource structures, earthwork operations, fluid flow-through porous media, and response of foundations and embankments to earthquakes.

Structural Engineering. This area of study considers the planning, analysis and design of steel and concrete bridges, buildings, dams; special offshore and space structures; composite materials.

Transportation and Materials Engineering. This area of study is pursued in two major areas and several interrelated areas: (1) transportation planning, design, and operation, and (2) pavements and materials. Transportation planning, design, and operation emphasizes the highway mode but also encompasses public transit and airport planning and design. Urban transport planning, geometric design of facilities, traffic operations, and evaluation of highway capacity and safety are also a part of transportation planning. The application of advanced technology to the vehicle and the roadway is included in the study of intelligent vehicle/highway systems. Pavements and materials focus on pavement analysis and design; pavement maintenance and rehabilitation; pavement evaluation and management, and characterization of highway materials such as asphalt, concrete, portland cement, and portland cement concrete; durability of highway structures; and structural retrofit of existing bridges

Water Resources Engineering. This area of study is concerned with surface and groundwater flow, planning and management of water supply, and water distribution system modeling.

The undergraduate program provides an excellent background for entry to graduate study in engineering.

Environmental Engineering Option

The environmental engineering option has been developed and implemented at ASU to augment the environmental area of study in the traditional civil engineering curriculum. Environmental engineering is a multidisciplinary field based on the traditional engineering principles, and chemistry, biology, and geology. Environmental engineers are involved with the design and operation of water and wastewater treatment systems, remediation of contaminated soils and waters, construction of hazardous waste containment systems, analysis of the fate and transport of pollutants in natural environments, water

NOTE: For the General Studies requirement courses, and codes such as L1 N3 C, and H), see "General Studies" page 85. For graduation requirements see "University Graduation Requirements" page 81 For an explanation of additional omnibus courses offered but not listed in this catalog see "Classification of Courses" page 58.

conservation and reuse, and surface water quality management.

Career Opportunities in the Field. University graduates with the B S E. in Civil Engineering (environmental engi neering option) find employment in consulting firms, municipalities, regulatory agencies, and industry. The growth of environmental engineering positions has been balanced by the growing number of students entering the field, resulting in a stable job market. International opportu nities are great and are likely to expand. After earning the undergraduate B.S E degree in Civil Engineering (environ mental engineering option), many students continue their education by enrolling in an environmental engineering graduate degree program

Uniqueness of the Program at ASU. The environmental engineering option at ASU is presently one of a few such programs in the country. The curriculum includes a solid core of engineering fundamentals, in accordance with an ABET accredited Civil and Environmental Engineering degree program, so that students will be prepared for the Fundamentals of Engineering (FE) examination and profes sional registration. The curriculum also includes a strong emphasis on chemistry, microbiology, and water and waste water treatment processes.

ENTRANCE REQUIREMENTS

See "Admission," page 196 and "Degrees," page 198, for information regarding entrance requirements.

DEGREE REQUIREMENTS

The B.S E. degree in Civil Engineering and the B.S.E. degree in Civil Engineering with an option in environmental engineering require a minimum of 128 semester hours of course work. A minimum of 50 upper division semester hours is required The minimum requirements are for a stu dent 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 the following categories:

Civil Engineering	
First-Year Composition	6
General Studies School Requirements	54
Eng neering Core	19 20
Major	48–49
Total	128
Environmental Engineering Option	
First Year Composition	6
General Studies/School Requirements	54
Engineering Core	19
Major	49
Total	128

Graduation Requirements

In addition to fulfilling school and major requirements, majors must satisfy all university graduation requirements. See "University Graduation Requirements," page 81.

Course Requirements. See "Degree Requirements," page 199 and "Course Requirements," page 208, for General Studies, school, and engineering core requirements

DEGREE REQUIREMENTS FOR MAJOR IN CIVIL ENGINEERING

Civil Engineering Core

Twenty seven hours are required Each sequence of the MAT courses and the ECE courses (excluding ECE 300, 351, and 380) must be completed with an average grade of "C" or higher before any 400 level CEE courses are taken. Also, each sequence of the CEE courses, and the senior design and technical elective courses must be completed with an average grade of "C" or higher All are part of the CEE graduation requirement

CEE	296	Civil Engineering Systems	3
CEE	315	Computer Methods for Civi Engineers	1
CEE	321	Structural Analysis and Design	4
CEE	341	Fluid Mechanics for Civil Engineers	4
CEE	351	Geotechnical Engineering	4
CEE	361	Introduction to Environmenta Engineering	4
CEE	372	Transportation Engineering	4
ECE	380	Probability and Statistics for Eng neering Problen Solving *N2*	3
Total			27

Civil Engineering Design Electives

Six semester hours from the following list are required

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

Fifteen to 16 semester hours are required. The design elective courses that have not been selected to satisfy the design electives requirement (see above) may be used as technical electives.

A maximum of seven hours may be selected from outside of civil engineering with advisor's approval Students must select technical electives from at least three different CEE areas of study

Construction. A maximum of three hours may be selected from any of the following Construction (CON) courses.

CON	341	Surveying	3
CON	383	Construction Estimating	3
CON	495	Construction Plann ng and Scheduling *N3*	3
CON	496	Construction Contract Admin stration *L2*	3

Environmental Engineering. This area includes water treatment, industrial and domestic waste treatment and dis posal, public health engineering, and industrial hygiene.

CEE	362	Unit Operations n Environmental Engineering	3
CEE	466	Sanitary Systems Design	3
CHM	231	Elementary Organic Chemistry	3
MIC	220	Bio ogy of Microorganisms	3
		or MIC 205 Microbio ogy *S2* 3 and MIC 206 Microb ology Laboratory *S2* (1	

Geotechnical Engineering. This area includes assessment of engineering properties and design utilizing soils and rocks as engineering materials.

CEE	452	Foundations	3

Structural Engineering. This area includes analysis and design of structures for buildings, bridges, space frames, structural mechanics.

CEE 322 Steel Structures 3
CEE 323 Concrete Structures 3
CEE 423 Structural Design 3
CEE 432 Matrix and Computer Applications in Structural Engineering 3

Transportation/Materials Engineering. This area includes analysis and design of transportation facilities, transportation planning and economics, and transportation in the urban environment

CEE 412 Pavement Analysis and Design 3
CEE 471 Intelligent Transportation Systems 3
CEE 475 Highway Geometric Design 3

Water Resources Engineering. This area includes planning and design of facilities for collection, storage and distribution of water, water systems management, and estimating availability of water resources.

CEE 440 Engineering Hydrology 3
CEE 441 Water Resources Engineering . . . 3

Civil Engineering Program of Study
A Four-Year Sequence

First Year

First Semester

CHM 114 General Chemistry for Engineers *S1/S2* . 4
ECE 100 Introduction to Engineering Design *N3* . . . 4
ENG 101 First Year Composition 3
MAT 270 Calculus with Analytic Geometry I *N1* 4

Total 5

Second Semester

CEE 296 Civil Engineering Systems 3
ENG 102 First Year Composition 3
MAT 271 Calculus with Analytic Geometry II *N1* 4
PHY 121 University Physics I: Mechanics *S1 S2* 3
PHY 122 University Physics Laboratory I *S1 S2* . . . 1

Total 14

Second Year

First Semester

ECE 210 Engineering Mechanics I: Statics . 3
MAT 272 Calculus with Analytic Geometry III *N1* 4
MAT 274 Elementary Differential Equations *N1* 3
PHY 131 University Physics II: Electricity and Magnetism *S1 S2*[2] . . . 3
PHY 132 University Physics Laboratory II *S1 S2* . . . 1
HU, SB, and awareness area course[3] 3

Total 17

Second Semester

CEE 315 Computer Methods for Civil Engineers . . . .
ECE 312 Engineering Mechanics II: Dynamics . . . 3
ECE 313 Introduction to Deformable Solids 3
ECE 340 Thermodynamics 3
or ECE 301 Electrical Networks I 4
ECE 384 Numerical Analysis for Engineers I . 2
ECN 111 Macroeconomic Principles *SB* 3
or ECN 112 Microeconomic Principles *SB* 3
Basic science elective 3

Total 18

Third Year

First Semester

CEE 321 Structural Analysis and Design 4
CEE 341 Fluid Mechanics for Civil Engineers . . 4
ECE 300 Intermediate Engineering Design *L1* 3
ECE 351 Civil Engineering Materials 3
ECE 380 Probability and Statistics for Engineering Problem Solving *N2* 3

Total 17

Second Semester

CEE 351 Geotechnical Engineering 4
CEE 361 Introduction to Environmental Engineering 4
CEE 372 Transportation Engineering . . . 4
HU, SB, and awareness area course[3] 3

Total 15

Fourth Year

First Semester

Design elective 3
HU, SB, and awareness area courses 4
Technical electives 9

Total 16

Second Semester

CEE 486 Integrated Civil Engineering Design *L2* 3
Design elective 3
HU, SB, and awareness area course[3] 3
Technical electives 6–7

Total 15 16
Graduation requirement total 128

Both PHY 121 and 122 must be taken to secure S1 or S2 credit

Both PHY 131 and 132 must be taken to secure S1 or S2 credit

Engineering students may not use aerospace studies (AES) or military science (MIS) courses to fulfill HU or SB requirements. See "Degree Requirements," page 214

A maximum of two graduate courses may be taken for undergraduate credit by students whose cumulative GPA is 3.00 or higher and with the approval of the instructor, advisor, department chair, and the dean of the college.

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.

DEGREE REQUIREMENTS FOR ENVIRONMENTAL ENGINEERING OPTION

Environmental Engineering Core

See "Course Requirements," page 214, for General Studies, school, and engineering core requirements.

NOTE: For the General Studies requirement courses and codes such as L1, N3, C and H) see "General Studies" page 85. For graduation requirements, see University Graduation Requirements, page 81. For an explanation of additional omnibus courses offered but not listed in this catalog see "Classification of Courses" page 58

Thirty semester hours are required. Each sequence of the MAT courses and the ECE courses (excluding ECE 300, 351, and 380) must be completed with an average grade of "C" or higher before any CEE 400 level courses are taken. Also, each sequence of the environmental engineering core courses, and the senior design and technical courses must be completed with an average grade of "C" or higher. This is a CEE graduation requirement.

CEE	296	Civil Engineering Systems 3
CEE	315	Computer Methods for Civil Engineers 1
CEE	321	Structural Analysis and Design 4
CEE	341	Fluid Mechanics for Civil Engineers . . 4
CEE	351	Geotechnical Engineering 4
CEE	361	Introduction to Environmental Engineering 4
CEE	372	Transportation Engineering 4
CHM	341	Elementary Physical Chemistry 3
ECE	380	Probability and Statistics for Engineering Problem Solving *N2* 3
Total		 30

Environmental Design Courses

CEE	441	Water Resources Engineering . . . 3
CEE	466	Sanitary Systems Design 3
Total		 6

Environmental Technical Courses

BIO	320	Fundamentals of Ecology . . . . . 3 or PUP 442 Environmental Planning 3 or PUP 475 Environmental Impact Assessment 3 or CHM 302 Environmental Chemistry 3 or CHM 361 Principles of Biochemistry 3)
CEE	362	Unit Operations in Environmental Engineering 3
CEE	440	Engineering Hydrology 3
MIC	205	Microbiology *S2* 3
MIC	206	Microbiology Laboratory *S2* 1
Total		 13

Environmental Engineering
Program of Study
A Four-Year Sequence

First Year

First Semester

CHM	114	General Chemistry for Engineers *S1/S2* . . . 4
ECE	100	Introduction to Engineering Design *N3* 4
ENG	131	First Year Composition 3
MAT	270	Calculus with Analytic Geometry I *N1* . . . 4
Total		 15

Second Semester

CEE	296	Civil Engineering Systems . 3
ENG	102	First Year Composition . . 3
MAT	271	Calculus with Analytic Geometry II *N1* 4
PHY	121	University Physics I Mechanics *S1 S2* . . . 3
PHY	122	University Physics Laboratory I *S1 S2* 1
Total		 14

Second Year

First Semester

ECE	210	Engineering Mechanics I Statics . . 3
MAT	272	Calculus with Analytic Geometry III *N1* . . 4
MAT	274	Elementary Differential Equations *N1* 3
PHY	131	University Physics II Electricity and Magnetism *S1 S2*[2] 3
PHY	132	University Physics Laboratory I *S1/S2* . . 1
HU, SB, and awareness area courses[3] 3		
Total		. . 17

Second Semester

CEE	315	Computer Methods for Civil Engineers . .
CHM	231	Elementary Organic Chemistry *S1 S2* 3
ECE	312	Engineering Mechanics II Dynamics 3
ECE	313	Introduction to Deformable Solids 3
ECE	340	Thermodynamics 3 or ECE 301 Electrical Networks I 4
ECE	384	Numerical Analysis for Engineers I 3
ECN	111	Macroeconomic Principles *SB* 3 or ECN 112 Microeconomic Principles *SB* 3
Total		 18

Third Year

First Semester

CEE	321	Structural Analysis and Design 4
CEE	341	Fluid Mechanics for Civil Engineers 4
ECE	300	Intermediate Engineering Design *L1* 3
ECE	351	Civil Engineering Materials 3
ECE	380	Probability and Statistics for Engineering Problem Solving *N2* 3
Total		 7

Second Semester

CEE	351	Geotechnical Engineering . . 4
CEE	361	Introduction to Environmental Engineering 4
CEE	372	Transportation Engineering 4
CHM	341	Elementary Physical Chemistry 3
HU, SB, and awareness area courses[3]		3
Total		 18

Fourth Year

First Semester

CEE	362	Unit Operations in Environmental Engineering 3
CEE	440	Engineering Hydrology 3
CEE	466	Sanitary Systems Design 3
MIC	205	Microbiology *S2* 3
MIC	206	Microbiology Laboratory *S2* 1
HU, SB, and awareness area courses		4
Total		 7

Second Semester

BIO	320	Fundamentals of Ecology . . 3 or CHM 302 Environmental Chemistry 3 or CHM 361 Principles of Biochemistry 3 or PUP 442 Environmental Planning 3 or PUP 475 Environmental Impact Assessment 3
CEE	441	Water Resources Engineering . 3
CEE	486	Integrated Civil Engineering Design *L2* 3
HU, SB, and awareness area course		3
Total		 12
Graduation requirement total		128

[1] Both PHY 121 and 122 must be taken to secure S1 or S2 credit.

[2] Both PHY 131 and 132 must be taken to secure S1 or S2 credit.

[3] Engineering students may not use aerospace studies, AES or military science, MIS courses to fulfill HU or SB requirements. See "Degree Requirements," page 214.

A maximum of two graduate courses may be taken for undergraduate credit by students whose cumulative GPA is

3.00 or higher and with the approval of the instructor, advisor, department chair, and the dean f the college

CIVIL AND ENVIRONMENTAL ENGINEERING (CEE)

CEE 296 Civil Eng neering Systems. 3 F S
ntroduct n to c v eng neer ng Prob em s v ng econ m cs descr p-tion of c v eng neer g systems des gn co cepts, eth cs and profes s onal respons b t es Lecture, f e d tr ps Pre or coreq s te ECE 100

CEE 310 Testing of Mater als for Construction. 3 F S
Structura and behav ora character st cs eng nee ng propert es measurements and app cat on of constru t on mater a s. Lecture ab Not open to eng nee ng students Prerequ s te CON 323

CEE 315 Computer Methods for Civı Engıneers (1 F S
Deve opment of c mputer programs n a h gh eve anguage to so ve c v eng neer ng prob ems ecture ab Pre or c requ s te ECE 384

CEE 321 Structural Analysıs and Desıgn. 4 F S
Stat ca y determ nate and ndeterm nate structures trusses beams and frames by c ass ca and matr x meth d ntroduct on to structural des gn Lecture rec tat on Prerequ tes ECE 312 313 Pre or corequ s tes ECE 380 384

CEE 322 Steel Structures. 3 F
Behav or of structura components and sy tems Des gn of stee mem bers and connect ons Load and res stance fact r des gn methods Lecture, rec'tat on Prerequ te CEE 321

CEE 323 Concrete Structures. 3 S
Behav or of concrete structures and the des gn of re nforced and pre stressed concrete members nc ud g foot ngs Part a des gn of con crete bu d ng system Lecture rec tat on Prerequ s te CEE 321

CEE 340 Hydraulics and Hydrology. 3 F S
App cat on of hydrau c eng neer ng pr nc p e to f ow of qu ds n p pe systems and open channe s; hydrostat cs, character st cs of pumps and turb nes ntrodu t on to hydro ogy Not open to eng neer ng students Lecture ab Prerequ s te CON 221

CEE 341 Fluıd Mechanics for Civil Engineers. 4 F S
Fundamenta pr nc p es and meth ds of f d mechan cs form ng the ana yt ca bas s for water resources eng neer g Condu t and open channe f ow 3 hours ecture, 1 hour ab Prerequ s tes ECE 312 313 Pre- or corequ s tes ECE 380 384

CEE 351 Geotechnical Engıneering. 4 F S
ndex propert es and eng neer ng character st cs of so s Compact on, permeab l ty a d seepage, compress b ty and sett ement and shear strength Lecture lab P erequ s tes ECE 312 313 Pre or corequ - s tes ECE 380 384

CEE 361 Introduction to Envıronmental Eng neering. 4 F S
Concepts of a r and water po ut on env ronmenta regu at on r sk assessment chem stry, water qua ty mode ng water and wastewater treatment systems des gns. Lect re ab Prerequ s tes ECE 312, 313 Pre or corequ s tes ECE 380, 384

CEE 362 Unit Operations ın Environmental Eng neering. 3 S
Des gn and operat n of u t proces es f r water and wastewater treatment Prerequ s te CEE 361

CEE 372 Transportation Engineering. 4 F S
H ghway ra water, and a r tran portat n Operat na character st cs and traff c contro dev ces of each transp rt m de mpact on urban form Prerequ s tes ECE 312, 313 Pre or c requ s tes ECE 380 384

CEE 412 Pavement Analysis and Des gn. 3 F
De gn of f ex b e and r g d pavements for h ghways and a rports Sur face, base and subgrade c urses Cost ana ys s and pavement se ec t on Prerequ s tes CEE 351 ECE 351

CEE 423 Structural Desıgn. 3 F
Analys s and des gn of re nforced concrete stee mas ry and tımber structures. Lecture ab P e equ s te CEE 323

CEE 432 Matrix and Computer Applications in Structural Engineerıng. 3 S
Matr x and computer app cat ns t structura eng neer ng and struc tura mechan cs St ff ess and f ex b ty methods f n te e ements and d fferences Prerequ s te CEE 321

CEE 440 Engineerlng Hydrology. 3 F
Descr pt ve hydro ogy hydro og c cyc e mode s and systems Ra n runoff mode s Hydro og c des gn Concepts propert es and bas c equat ons of groundwater f ow Prerequ s te CEE 341

CEE 441 Water Resources Engineering. 3) S
App cat on of the pr nc p es of hydrau cs and hydro ogy t the eng neer ng of water res urces pro ects des gn and operat on of water resources systems water qua ty Prerequ s te CEE 341

CEE 450 Soil Mechanics in Construction. 3 F, S
So mechan cs as app ed to the c nstruct on f e d ncludıng founda t ons h ghways retaın ng wa s and s ope stab ty Re at nsh p between so character st cs and geo og c format ons Not open t eng neer ng students Lecture ab Prerequ s te CON 323

CEE 452 Foundations. 3 F
App ıcat ons of so mechan cs to foundat on systems bear ng capac-ty atera earth pressure and slope stab ty Prerequ s te CEE 351

CEE 466 Sanıtary Systems Desıgn. 3 F
Capac ty p ann ng and des gn of water supp y domest c and storm dra nage and so d waste systems. Prerequ s te CEE 361

CEE 471 Intelligent Transportation Systems. 3 N
App cat on of advanced technology to the veh c e and the roadway to so ve traff c congestıon safety, and a r qua ty prob ems Prerequ s te CEE 372 or nstructor approva .

CEE 475 Hıghway Geometric Design. (3 S
Des gn of the v s b e e ements of the roadway Fundamenta des gn controls w th app cat on to rura roads at grade ntersect ons free ways and nterchanges Lect re rec tat on Prerequ s te CEE 372

CEE 486 Integrated Civil Engineering Design. 3) F S
Students are requ red to comp ete a c v eng nee ng des gn a s m u ated practıc ng eng neer ng envıronment Lecture, team earn ng L m ted to undergraduates n the r f na semester Prerequ s tes CEE 321 341 351 361 372 *Genera Stud es L2*

CEE 512 Pavement Performance and Management. 3 S
Pavement management systems nc ud ng data co ect on eva uat on opt m zat on, econom c ana ys s and computer app cat ons for gh way and a port des'gn Prerequ sıte. nst uctor appr va

CEE 514 Bituminous Materials and Mixture. 3 F
Types of b tum nous mater als used n pavement m xtures Chem ca composıt on, phys ca propert es, des rab e aggregate chara ter s t cs opt mum aspha t contents superpave aspha t bınder m xture des gn Lecture, ab Prerequ s te ECE 351

CEE 515 Properties of Concrete. 3) S
Mater a s sc ence of concrete. Cement chem stry mechan sms of hydrat on nterre at onsh ps among m cro and macro propert es of cement based mater a s. Mechan ca propert es, fa ure theor es frac ture mechan cs of concrete mater als Cement based compos te mater a s and the durab ty aspects Lecture ab Prerequ s te ECE 350 or 351.

CEE 521 Stress Analysis. 3) F
Advanced topıcs n the analyt ca determ nat on of stress and stra n Prerequ s te CEE 321

CEE 524 Advanced Steel Structures. 3 F
Strength propert es of stee and the r effe ts on structura behav or E ast c des gn of stee structures P ast c ana ys s and des gn of beam frames and bents P ast c def ect ons P ast c des gn requ re ments Mu t story bu d ngs Prerequ s te CEE 322

CEE 526 Fınite Element Methods In Civıl Engineering. 3 F
F nıte e ement formulat on for so ut ons of structura geotec n ca , and hydrau c prob ems Prerequ s te CEE 432

CEE 527 Advanced Concrete Structures. 3 S
U t mate strength des gn Comb ned shear and tors on Serv ceab ty P ast c analys s Spec a systems Prerequ's te CEE 323

CEE 530 Prestressed Concrete. (3) N
Mater a s and methods of prestress ng Ana ys s and des gn for f ex ure shear and tors on Prestress osses due to fr ct on creep, shr nk age and anch rage set Stat cal y ndeterm nate structures. Des gn of f at s abs, br dges and compos te beams Prerequ s te CEE 323

NOTE: F r the Genera St d es req reme t ourses and codes such as L1 N3 C and H see 'Genera Stud es " page 85 For graduat on requ rements see ver ty Graduat on Requ rements," page 81 For an exp anat on of addıt ona omn bus courses offered but not sted th s cata og see C ass f cat on of C urses page 58

CEE 533 Structural Optimizat'on. (3 N
L near and non near programm ng. Prob em formulat on Constra ned and unconstra ned optim zat on Sensit v ty analysis Approx mate techn ques FEM based opt ma des gn of mechan cal and aerospace structures Cross sted as MAE 521 Cred t is a owed on y for CEE 533 or MAE 521 Prerequ s te instruct r approva

CEE 536 Structural Dynamics. 3) S
Structures and structural members subjected to dynam c oad ngs response spectra theory app cat ons to br dges and power p ants nvest gat ons of the responses of mult degree of freedom structures and matr x and numer ca methods of ana ysis Lecture rec tat on Prerequ s tes· CEE 321 instructor approva

CEE 537 Topics in Structural Engineering. (1 3) F S
Advanced top cs nclud ng non near structura analysis exper mental stress ana ys s, advanced fin te e ements p ast c ty and v scoe est city compos tes and damage mechan cs Prerequ s te nstruct r approva

CEE 540 Groundwater Hydrology. (3) F
Phys ca propert es of aquifers we pump ng subsurface f w mode ng unsaturated f ow numer'cal meth ds and subs dence and groundwater po lut on. Prerequ s te CEE 440 or instructor approva

CEE 541 Surface Water Hydrology. (3) S
Hydr og c cyc e and mechan sms nc ud ng prec pitation, evapora t on and transpirat on hydrograph ana ys s flood rout ng; stat st cal methods n hydr l gy and hydro ogic des gn Prerequ s te CEE 440 or nstructor approva

CEE 542 Water Resources Systems Planning. (3 S
Ph os phy of water resources p ann ng· econom c, soc a and eng neer ng nteract on ntroduct on to the theory and app cat on of quan t tat ve p ann ng methodo og es n water resources p ann ng Guest ect rers case tud es Prerequ s te nstructor approva

CEE 543 Water Resources Systems. 3) F
Theory and app cat on of quant tat ve p ann ng method og es for the des gn and ope at'on of water resources systems c ass pro ects using a computer case stud es

CEE 545 Foundations of Hydraulic Engineering 3) F
Rev ew f ncompress b e f u d dynam cs. F ow n p pes and channe s unsteady and va ed flows; wave mot on Prerequ s te CEE 341

CEE 546 Free Surface Hydraulics. 3) S
Der vat on of 1 d mensiona equat ons used in open channe flow ana ys s computat ons for un form and nonuniform flows unsteady flow and f ood rout ng Mathemat ca and phys ca mode s Prerequ s te CEE 341

CEE 547 Principles of River Engineering. (3) N
Uses of r vers, study of watershed and channe processes Sed ment sources y e d and contro hydro og c ana ys s Case stud es Prereq u s te CEE 341 or n tructor approva

CEE 548 Sed mentation Engineering. 3 N
ntroduct on to the transportat on of granu ar sed mentary mater a s by mov ng f u ds Degradat on aggregat on and oca scour n a uv a channe s Mathemat ca and phys ca mode s Prerequis te CEE 547 or nstructor appr va

CEE 550 Soil Behavior. 3) S
Phys cochem ca aspects of so behavior stab lzat on of s s and eng neer ng propert es of so s Prerequ s te CEE 351

CEE 551 Advanced Geotechnical Testing. (3 S
Odometer tr ax a stat c and cyc c) back pressure saturated a d unsaturated samp es pore pressure measurements. c sed oop computer contr led test ng n s tu test ng. and samp ing Lecture, ab Prerequ s te CEE 351

CEE 552 Geo ogical Engineering. (3 F
Geo og ca nvest gat ons f r eng neer ng purposes case h stor es ge og c st cture weather ng remote sens ng, geophys cs, and air photo nterpretat on for eng neer ng s te ocat ons. Lecture fie d tr ps Prerequ s te CEE 351

CEE 553 Advanced Soi Mechanics. 3) N
App cat on of theor es of e ast c ty and plast ty to so s theor es of c so dation fa lure theor es and response to stat c and dynamic oad ng Prerequ s te CEE 351

CEE 554 Shear Strength and Slope Stability. 3 F
Shear strength of saturated and unsaturated so s strength deforma t on re ationsh ps t me dependent strength parameters. ffects of sampl ng and advanced s ope stab ty Prerequ s te CEE 351

CEE 555 Advanced Foundations. 3 N
Deep foundat ons, braced excavat ons anchored bu kheads re n forced earth and underp nn ng Prerequ s te CEE 351.

CEE 556 Seepage and Earth Dams. (3) N
Trans ent and steady state f u d f ow through so co f ned and uncon f ned flow pore water pressures, and app cation to earth dams Pre requ·site CEE 351

CEE 557 Hazardous Waste: Site Assessment and Mitigation Measures. (3) S
Techn ques for hazardous waste s te assessment and m t gat on. Case h stor es presented by nstructor and guest speakers Prereq · s tes graduate stand ng nstructor approva

CEE 559 Earthquake Engineering. (3) F
Character st cs of earthquake motions, se ection of des gn earth quakes s te response ana yses se sm c s ope stab l ty and quefac t on Prerequ s te CEE 351.

CEE 560 Soil and Groundwater Remediation. (3 F
Techn ques for remediat on of contam nated soi s and groundwaters are presented w th bas c eng neering pr nc p es Prerequ s te nstruc tor approva

CEE 561 Physical-Chemical Treatment of Water and Waste. 3 F
Theory and design of phys ca and chem ca processes for the treat ment of water and waste waters Prereq is'te: CEE 361

CEE 562 Environmental Biochemistry and Waste Treatment. 3 S
Theory and des'gn of b o og ca waste treatment systems Po lut on and environmenta ass m lat on of wastes Prerequ s te CEE 362

CEE 563 Environmental Chemistry Laboratory. (3) F
Ana ys s of water domest c and ndustria wastes aboratory proce dures for po ut on eva uat on and the cont o of water and waste treat ment processes Lecture, ab Prerequisite CEE 361

CEE 565 Modeling and Assessment of Aquatic Systems. 3 S
Deve opment of pred ctive mode s of water qua ty methods to assess environmenta mpacts app cat ons to water qua ty management Prerequ s te CEE 361 or nstructor approva

CEE 566 Industrial/Hazardous Waste Treatment. (3) N
Emphas s on treatment of loca ndustr a hazardous waste prob ems nclud ng so vent recovery and meta s Lecture project Prerequ s tes CEE 561 563

CEE 573 Traffic Engineering. (3 N
Driver veh c e and roadway character stics, aws and ordinances traff c contro dev ces, traff c eng neer ng stud es and Transportation System Management measures Prerequ's te: CEE 372

CEE 574 Highway Capacity. (3) N
H ghway capac ty for a funct ona c asses of highways Traffic signa ization, nc ud ng traff c stud es warrants, cyc e engh t m ng phas ing and coord nat on Prerequisite· CEE 372

CEE 575 Traffic Flow Theory and Safety Analysis. 3 N
Traff c f ow theory d str but ons queuing de ay mode s and car fo low ng H ghway safety acc dent records systems acc dent analys s identify ng problem locat'ons and accident countermeasures Prereq u s te. CEE 573 or 574

CEE 576 Airport Engineering. 3 N
Plann ng and des gn of a rport faci t es Effect of a rcraft character s t cs a r traff c contro procedures and aircraft demand for runway and passenger handl ng fac' t es on s te selection runway conf gurat on and term nal des gn Prerequ s te CEE 372.

CEE 577 Urban Transportation Planning. (3) N
App cation of and use parameters traff c generat on theory, traff c d s tribut on and ass gnment mode s trans t ana ysis and econom c fac tors to the solut on of the urban transportat on problem Prerequ s te CEE 372

Students enrol ed n CEE 580 590 592 599, 792, and 799 are required to attend graduate student sem nars at the t mes shown n the Schedule of C asses *Each semester, every graduate st dent enrol ed for more than e ght semester hours s to enro l for at east one semester hour of CEE 592 599 792, or 799*

Department of Computer Science and Engineering

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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 mach inery. Other important topics include computino techniques and appropriate languages for general information processing, for scientific computa tion, for the recognition, storage, retrieval, and processing of data of all kinds and for the automatic control and simu lation of processes

The curricula offered by the Department of Computer Science and Engineering prepare the student to be a partici pant in this rapidly changing area of techno ogy by presenting in depth treatments of the fundamentals of com puter science and computer engineering The department offers two undergraduate degrees a B S degree in Com puter Science and a B S E degree in Computer Systems Engineering.

DEGREE REQUIREMENTS

A minimum of 128 semester hours is required for the B.S. degree in Con puter Science and the B.S.E. degree in Computer Systems Engineering. A minimum of 50 upper division semester hours is required In addition to the requirement for a cumulative GPA of 2.00 or higher, all computer science and computer systems engineering stu dents must obtain a minimun grade of "C" in all CSE courses used for degree cred t.

GRADUATION REQUIREMENTS

In addition to fulfilling school and major requirements, majors must satisfy all university graduation requirements. See "Graduation Requirements," page 81.

DEGREES

Computer Science—B.S.

The faculty in the Department of Computer Science and Engineering offer a B.S degree that prepares the student for a career in computer science. A student pursuing a B.S degree must complete the First Year Composition require ment, the General Studies requirement, department degree requirements, the computer science core courses, a senior level breadth requirement in the major, technical electives, and unrestricted electives For more information, contact the department office, refer to the department Web site, or e mail questions to cse.ugrad.desk@asu.edu.

The following list specifies departmental requirements for the B.S. degree in Computer Science.

First-Year Composition

Choose among the course ombinations be ow . . . . . 6 or 3
- ENG 101 First Year Composition 3
- ENG 102 First Year Comp sition 3

or

- ENG 105 Advanced Fir t Year Composition 3
- Elective chosen with an adv isor 3

or

- ENG 107 Engl sh f r Foreign Students 3
- ENG 108 Eng ish for Foreign Students 3

Total . . . . . 6 or 3

General Studies/Department Requirements

Humanities and F ne Arts So ial and Behavior al Sc ences
HU SB electives 18

Literacy and Critical Inquiry
L1/L2 ele tives 6

Natural S ien es Basi Sc er ces
PHY 121 University Physics I Mechanics *SI S2* . . 3
PHY 122 University Phys cs Laboratory I *SI S2* 1
PHY 131 University Physics II Electricity and Magnetism *SI S2*. 3
PHY 132 Un vers ty Phys ics Laboratory II *SI S2* 1
Science e ect ve 4

Total 12

Numer y M thematics
ECE 380 Probability and Statist cs for Engineering Prob em Solv ing *M2*. 3
MAT 243 Discrete Mathematical Structures . 3
MAT 270 Calculus with Analyt c Geomet y I *MI* 4
MAT 271 Calculus with Analyt Geometry II *MI* 4
MAT 272 Calculus with Analytic Geom etry III *MI* 4
MAT 342 Linear Algebra 3

Tota 21
General Studies department requirement total . . . 57

Computer Science Core
- CSE 120 Digital Des gn Fundar entals 3
- CSE 200 Concepts of Computer Science *N3* 3
- CSE 210 Data Structures and Algorithm s I *N3* 3

NOTE: For the Genera Stud es requ rement, courses and codes such as L1 N3 C and H ee Genera St d es page 85 For graduat on requ rements see Un vers ty Graduat on Requ rements page 81 For an exp anat on of add t ona om b s c urse ffered but not sted n th s cata og see C ass f cat on f Co rses page 58

CSE 225 Assembly Language Programming and Microprocessors Motoro a) *N*[3] 4
or CSE 226 Assembly Language Program ming and Microprc cessors Intel *N3* 4
CSE 240 Introduction to Programming Languages 3
CSE 31) Data Structures and Algorithms II 3
CSE 330 Computer Organization and Arch tecture 3
CSE 340 Pr nciples of Programming Languages 3
CSE 355 Introduction to Theoretical Computer Science . . . 3
CSE 360 Introduction to Sc ftware Eng neering 3
CSE 430 Operating Systems 3

Total computer science c re 34

400 level CSE computer science breadth requ rement . . . 18
Technical e ectives[4] 6
Unrestricted e ectives 7

Total 31
Degree requirements tota 128

Both PHY 121 and 122 must be taken to secure S1 or S2 credit.

- Both PHY 131 and 132 must be taken to secure S1 or S2 cred t

This elect ve may be satisfied by any physics courses requiring PHY 131 as a prerequisite or a laboratory sci ence for sc ence or engineer ng majors satisfy ng the S1 or S2 Genera Studies requirements (except PHS 110

[4] Each student must complete six hours of courses chosen from the con puter science technica elective list and approved by the student's advisor

Computer Science Program of Study
Typical Four-Year Sequence

First Year

First Semester

CSE 200 Concepts of Computer Science *N3* 3
ENG 101 First Year Composition 3
MAT 270 Ca cu us with Analytic Geometry I *N1* 4
HU SB, awareness area ourse 3
Unrestri ted elective 3

Total 16

Second Semester

CSE 12(Digital Design Fundamentals . . 3
CSE 210 Data Structures and Algorithms I *N3* . 3
ENG 102 First Year Composit on 3
MAT 271 Calculus with Analyt c Geometry II *N1* 4
Unrestricted elective 4

Total 17

Second Year

First Semester

CSE 24 Introduction to Programming Langu ages 3
MAT 243 D screte Mathematical Structures 3
MAT 272 Calculus w th Analytic Geometry III *N1* 4
PHY 121 University Physics I Mechanics *S1 S2*[2] 3
PHY 122 Univers ty Phys cs Laboratory I *S1 S2* 1
HU SB, awareness area co urse 3

Tota 17

Second Semester

CSE 225 Assemb y Language Programming and M croprocessors Motorola 4
or CSE 226 Assembly Langua e Program ng and Microp ocessors Intel) 4
CSE 310 Data Stru tures and Algorithms II 3
PHY 131 Un versity Physics II: Electricity and Magnet sm *S1/S2*[3] 3
PHY 132 Un versity Physics Laboratory II *S1/S2*[3] 1
HU SB, awareness area course 3
L1 elect ve 3

Total 17

Third Year

First Semester

CSE 330 Computer Organization and Architecture. 3
CSE 340 Principles of Programming Languages 3
MAT 342 Linear Algebra 3
H , SB, awareness area course 3
Laboratory science for engineering ma ors *S1 S2*[4] 4

Total 16

Second Semester

CSE 355 Intre duct on to Theo et cal Con puter Science 3
CSE 360 Introduction to Software Eng neering 3
CSE 430 Operating Systems 3
ECE 380 Probability and Stat st cs for Engineering Problem Solv ng *N2*. 3
HU, SB, awareness area course 3

T tal 15

Fourth Year

First Semester

400 level CSE con puter science breadth electives 9
L2 elective 3
Technical elective 3

Total 15

Second Semester

400 level CSE omputer science breadth e ectives 9
HU, SB, awareness area course 3
Technical elective 3

Total 15

[1] Engineering students n ay n t use aerospace studies AES or military science MIS courses to fulfill HU and SB requirements See "Course Requ ren ents," page 208

Both PHY 121 and 122 n ust b taken to secure S1 or S2 credit

[2] Both PHY 131 and 132 must be taken to secure S1 or S2 credit

[3] This elect ve may be satisf ed by any phy sics courses requir ng PHY 131 as a p erequisite or any laboratory sci ence fo majors in the d scip ine and satisfying the S1 or S2 General Studies requ rements except PHS 110, PHY 101, 105, 111 or 112

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 engineer ng This degree program provides training in both engineering and computer science. The follow ng list specifies departmental requirements for the B S E degree in Computer Systems Engineering.

First-Year Composition

Choose an e ng the course co ibut ons below . . . 6 or 3
ENG 101 F rst Year C n position 3
ENG 102 F rst Year Composition 3
or
ENG 105 Advanced First Year C mposition 3
Elective chosen w th an adv sor 3
or

ENG 107 English for Foreign Students 3
ENG 108 English for Foreign Students 3

Total . . . . . 6 or 3

General Studies/Department Requirements

Humanities and Fine Arts Social and Behavioral Sciences
ECN 111 Macroeconomic Principles *SB* 3
or ECN 112 Microeconomic Principles *SB* 3
HU SB electives. 13

Total 16

Literacy and Critical Inquiry
CSE 423 Microcomputer System Hardware *L2* . 3
ECE 300 Intermediate Engineering Design *L1* . . . 3

Total 6

Natural Sciences Basic Sciences
CHM 114 General Chemistry for Engineers *S1/S2* 4
or CHM 116 General Chemistry *S1/S2* (4)
PHY 121 University Physics I: Mechanics *S1/S2*[1] 3
PHY 22 University Physics Laboratory I *S1/S2* 1
PHY 31 University Physics II: Electricity and Magnetism *S1/S2*[2] 3
PHY 132 University Physics Laboratory II *S1 S2* 1
PHY 361 Introductory Modern Physics 3

Total 15

Numeracy/Mathematics
ECE 100 Introduction to Engineering Design *N3* 4
ECE 380 Probability and Statistics for Engineering Problem Solving *N2* 3
MAT 243 Discrete Mathematical Structures 3
MAT 270 Calculus with Analytic Geometry I *N1* 4
MAT 271 Calculus with Analytic Geometry II *N1* 4
MAT 272 Calculus with Analytic Geometry III *N1* 4
MAT 274 Elementary Differential Equations *N1* 3
MAT 342 Linear Algebra 3

Total 28
General Studies department requirement total 65

Engineering Core
CSE 200 Concepts of Computer Science *N3* . . 3
CSE 225 Assembly Language Programming and Microprocessors (Motorola 4
ECE 210 Engineering Mechanics I: Statics 3
ECE 301 Electrical Networks I 4
ECE 334 Electronic Devices and Instrumentation 4

Total 18

Computer Science Core
CSE 120 Digital Design Fundamentals 3
CSE 210 Data Structures and Algorithms I *N3* 3
CSE 240 Introduction to Programming Languages . . . 3
CSE 310 Data Structures and Algorithms II . . . 3
CSE 330 Computer Organization and Architecture 3
CSE 340 Principles of Programming Languages 3
CSE 355 Introduction to Theoretical Computer Science 3
CSE 360 Introduction to Software Engineering . . . 3
CSE 421 Microprocessor System Design I 4
CSE 422 Microprocessor System Design II 4
CSE 430 Operating Systems 3
Technical electives[3] 4

Total 39

Degree requirement total 128

[1] Both PHY 21 and 22 must be taken to secure S1 or S2 credit

[2] Both PHY 131 and 132 must be taken to secure S1 or S2 credit

[3] Each student must complete four hours of courses chosen from the computer science technical elective list and approved by the student's advisor

Computer Systems Engineering
Program of Study
Typical Four Year Sequence

First Year

First Semester
CSE 200 Concepts of Computer Science *N1* . . 3
ECE 10 Introduction to Engineering Design *N2* 4
or CSE 120 Digital Design Fundamentals 3
ECN 111 Macroeconomic Principles *SB* 3
ENG 101 First Year Composition 3
MAT 270 Calculus with Analytic Geometry I *N1* . 4

Total 17

Second Semester
CHM 114 General Chemistry for Engineers *S1 S2* 4
CSE 120 Digital Design Fundamentals . 3
or ECE 100 Introduction to Engineering Design *N3* 4
CSE 210 Data Structures and Algorithms I *N3* 3
ENG 102 First Year Composition 3
MAT 271 Calculus with Analytic Geometry II *N1* 4

Total 17

Second Year

First Semester
CSE 225 Assembly Language Programming and Microprocessors Motorola . . 4
MAT 243 Discrete Mathematical Structures . . . 3
MAT 272 Calculus with Analytic Geometry III *N1* 4
PHY 121 University Physics I Mechanics *S1/S2* 3
PHY 122 University Physics Laboratory I *S1 S2* 1

Total 15

Second Semester
CSE 240 Introduction to Programming Languages 3
CSE 330 Computer Organization and Architecture . . 3
ECE 210 Engineering Mechanics I: Statics 3
MAT 274 Elementary Differential Equations *N1* 3
PHY 131 University Physics II: Electricity and Magnetism *S1 S2* . 3
PHY 132 University Physics Laboratory II *S1 S2* 1

Total 16

Third Year

First Semester
CSE 310 Data Structures and Algorithms II . . 3
ECE 300 Intermediate Engineering Design *L* 3
MAT 342 Linear Algebra 3
HU, SB, awareness area courses[3] 7

Total 16

Second Semester
CSE 340 Principles of Programming Languages 3

NOTE: For the General Studies requirement courses and codes (such as L1, N3, C, and H) see General Studies page 85. For graduation requirements see "University Graduation Requirements" page 81. For an explanation of additional nonbusiness courses offered but not listed in this catalog see "Classification of Courses" page 58.

CSE	360	Introduction to Software Engineering	3
CSE	421	Microprocessor System Design I	4
ECE	380	Probability and Statistics for Engineering Problem Solving *N2*	3
HU, SB, awareness area course[3]			3
Total			16

Fourth Year

First Semester

CSE	355	Introduction to Theoretical Computer Science	3
CSE	422	Microprocessor System Design II	4
CSE	430	Operating Systems	3
ECE	301	Electrical Networks I	4
PHY	361	Introductory Modern Physics	3
Total			17

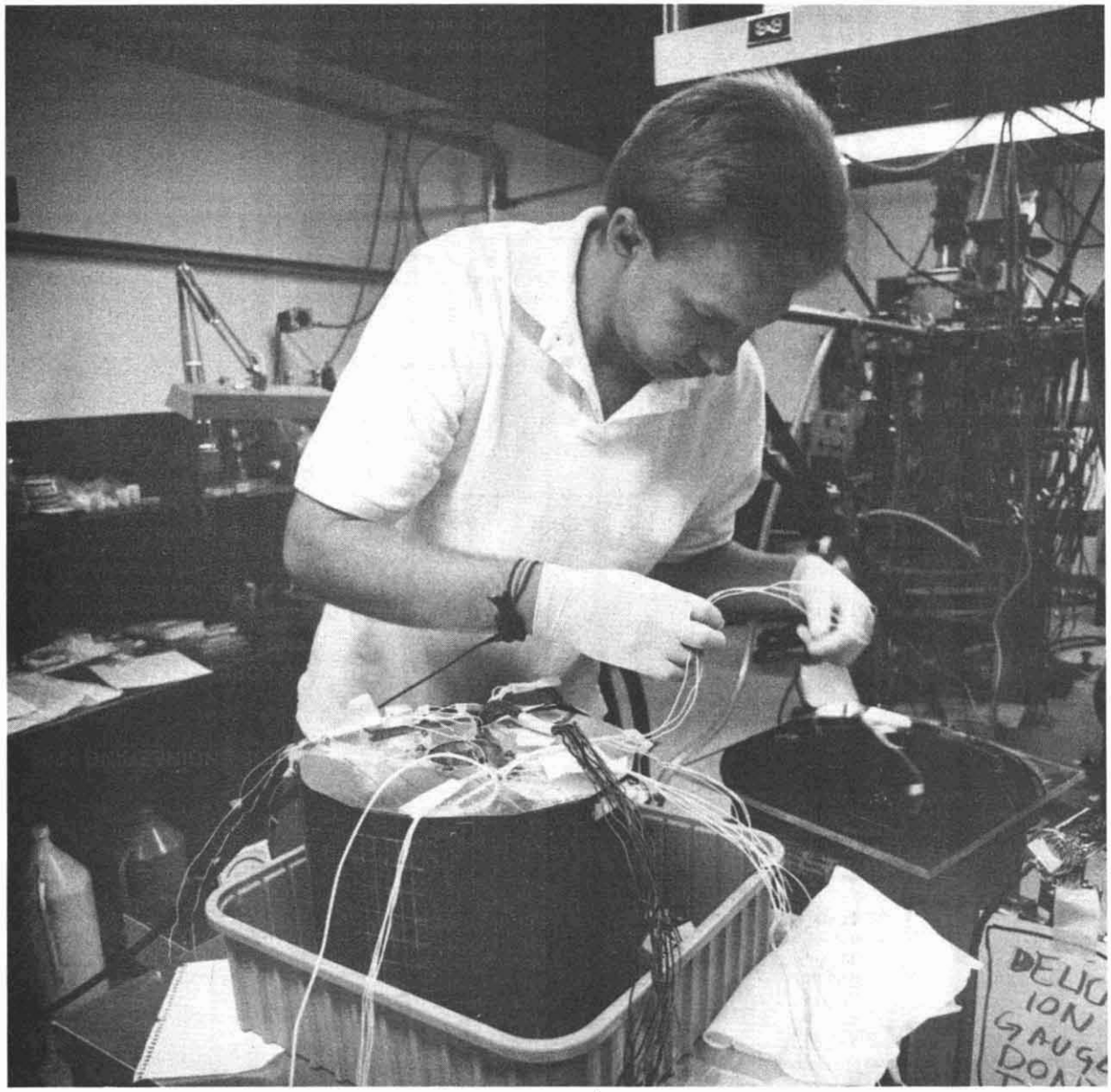
Second Semester

CSE	423	Microcomputer System Hardware *L2*	3
ECE	334	Electronic Devices and Instrumentation	4
HU, SB, awareness area course[3]			3
Technical electives			4
Total			14

[1] Both PHY 121 and 122 must be taken to secure S1 or S2 credit.

[2] Both PHY 131 and 132 must be taken to secure S1 or S2 credit.

[3] Engineering students may not use aerospace studies (AES) or military science (MIS) courses to fulfill HU and SB requirements. See "Graduation Requirements," page 209.



Graduate student Joel Rademacher prepares a student-built satellite for vacuum testing. Jeff Havir photo

COMPUTER SCIENCE AND ENGINEERING (CSE)

CSE 100 Principles of Programm ng. 3 F S SS
Concepts of prob em so v ng a gor thm des gn structured program m ng fun amenta a g r thms and techn ques and computer systems concepts Soc a a d eth ca esp ns b ty Prerequ s te MAT 170 *Genera Stud es N3*

CSE 120 Digital Design Fundamentals 3 F S SS
Number systems c nvers on meth ds b a y a d co p ement ar th met c B o ean a gebra c rcu t m n m zat on ROMs PLAs f pf ops synchronous sequent a c rcu ts Lecture ab Cross sted as EEE 12 Cred t s a owed on y for CSE 120 or EEE 120 Prerequ s te computer teracy

CSE 180 Computer Literacy. 3 F S, SS
ntr duct on to persona computer operat o s and the r p ace n soc ety Prob em so v ng approa hes us g databases spreadsheets and word proces ng May be taken for cred t on e ther W nd ws or Mac n tosh, but not both Lecture demonstrat on Prerequ s te nonmajor *Genera Stud es N3*

CSE 181 Appl ed Problem Solving with Visual BASIC. 3 F S SS
troduct on of systemat c def n t n f prob ems so ut on formu at on and method va dat on. Computer so ut on u ng V sua BAS C requ red for project Lecture ab Pre eq s tes· MAT 117 nonma or *Genera Stud es N3*

CSE 183 Applied Problem Solving with FORTRAN. 3 F
A human-or ented systems approach to prob m def n t n, formu a t on and so ut on us ng FORTRAN. C pute so ut on requ red for pro ects Prerequ s tes MAT 17 nonma or *Ge era Stud es. N3*

CSE 185 Internet and the World W de Web. 3 F S
Fundamenta Internet concepts W r d W de Web brows ng pub sh ng, search ng advanced nternet prod ct v ty too s

CSE 200 Concepts of Computer Science 3 F S SS
Overv ew of a gor thms ar h tecture anguages perat ng systems theory. P ob em s v ng w th a h gh eve anguage C++ Lecture ab. Prerequ s te one year f h gh s hoo pr gra m ng w th a structured anguage C++ preferred or CSE 100 *Gene a Stud es N3.*

CSE 210 Data Structures and Algorithms I. 3 F S SS
Object or e ted des gn stat c and dynam c data tructures str ngs stacks queues, b nary trees recurs on, and search ng and sort ng Profess ona respons b ty Prerequ te CSE 200 *Genera Stud es N3*

CSE 225 Assembly Language Programming and Microprocessors (Motorola). 4 F S SS
Assemb y anguage programm ng nc ud ng np t/output program m ng and except on/ nterrupt hand g Reg ster eve computer orga n zat on i O nterfaces assem ers and kers Motoro a based ass gnments Lecture ab Cross sted as EEE 225. Cred t s a owed on y for CSE 225 r EEE 225 Prerequ tes CSE 1 0 (or 200 CSE/ EEE 120.

CSE 226 Assembly Language Programming and Microprocessors (Intel). 4 F S
CPU Mem ry per phera dev ce nterfaces and programm ng System buses nterrupts ser a and pa a e O DMA coprocessors nte based ass gnme ts Lecture ab Cross sted as EEE 226 Cred t s a wed on y for CSE 226 r EEE 226 Pre equ s tes CSE 100 or 200 , CSE/EEE 120

CSE 240 Introduction to Programm'ng Languages. 3 F S SS
Introduct on t the procedura Ada app cat ve L SP and dec ara t ve Pro og anguages Lecture ab Prerequ s te CSE 210.

CSE 310 Data Structures and Algor'thms II. 3 F S, SS
Advanced data structu es and a gor thms n ud ng stacks queues trees B B+ AVL and graphs Search ng for graphs hash ng exter na sort ng Lecture ab Prereq s tes CSE 210, MAT 243

CSE 330 Computer Organ zation and Arch tecture. 3 F S SS
nstruct on set ar h te ture pr cessor performance and des gn data path cont hardw red m c oprogrammed p pe n ng nput/output Memory organ zat n w th cache v rtua memo y. Prerequ s te CSE EEE 225 or 226

CSE 340 Pr nc'ples of Programm'ng Languages. 3 F S, SS
introduct on to anguage des g a d mp ementation Para e mach ne depend nt and dec arat ve features type theory spec f'ca t on recogn t n trans at on run t me management Prerequ s tes CSE 240 310 CSE EEE 225 or 226

CSE 355 Introduction to Theoretical Computer Science. (3 F, S
ntroduct o t forma a guage theory and aut mata Tur ng mach nes dec dab ty undec dab ty re urs ve f ct o theory, and ntroduct on to c p ex ty theory Pre equ s te. CSE 310

CSE 360 Introduction to Software Engineering. 3 F, S, SS
Software fe cyc e m de s pro ect management team deve opment e v ronme ts and met od g es s ftware arch tectures, qua ty assurance and standards ega eth ca ssues Prerequ s'tes CSE 210, 240

CSE 408 Mult media Information Systems. 3 F
Des gn use a d app cat ons of mu t med a systems An ntroduction to acqu s t on c mpre s n storage, retr eva and presentat'on of data from d fferent med a such as mages, text vo ce, and a phanu mer c Prerequ s te CSE 310

CSE 412 Database Management. 3 F S
ntroduct on to DBMS concepts Data mode s and anguages Re a t ona database theory Database sec rity tegr ty and concurrency. Prerequ s te· CSE 310

CSE 420 Computer Arch tecture I. 3 S
Computer arch tectu e Perf rmance vers s cost trade offs nstruc t on set des gn Bas p cessor mp ementat on and p pe n ng Prerequ s te CSE 330

CSE 421 Microprocessor System Design I. 4 F, S
Assemb y ang age programm ng and og ca hardware des gn of systems s ng 8 b t op cessors a d m ro ontro ers Fundamenta concepts of d g ta system de gn Re ab ty and soc a ega mpl ca t on Lecture ab Prerequ s te CSE/EEE 225

CSE 422 Microprocessor System Design II. 4 F S
Des gn of m cr computer systems us ng c ntemporary ogic and m crocomputer system mp nents Req res assemb y anguage programm ng Prerequ s te CSE 421

CSE 423 M crocomputer System Hardware. 3) S
nf rmat on and techn ques presented n CSE 422 are used to deve op the hardware des gn of a mu t processor, mu t programming m cropro- cessor based system Prerequ s te CSE 422 *Genera Stud es L2*

CSE 428 Computer-Aided Processes. 3 A
Hardware and oftware cons derat ons for com uter zed manufactur ng systems Spec f c conce trat on automat c nspect on numeri- ca contro robot cs and ntegrated manufactur ng systems P erequ s te CSE 330

CSE 430 Operating Systems. 3 F S
Operat ng system structure and erv ces pr cessor schedul ng con current proces es synchr n zat o techn ques memory manage ment v tua mem ry, nput/ utput st r ge management and f e systems Prerequ s tes CSE 330, 340

CSE 434 Computer Networks. 3 F S
Cryptography f ndamenta s data compress on error hand ng f ow c ntro mu t hop out ng network protoco a go thms network re iabi ty, t m ng secur ty phys a ayer bas cs Prerequ s te: CSE 330

CSE 438 Systems Programm ng. 3 A
Des gn and mp ementat on f systems prog ams nc ud ng text ed - tors f e ut t es mon tors assemb er re ocat ng nk ng oaders O hand ers and schedu ers Prerequ s te CSE 421 or nstructor approva *Genera Stud es L2*

CSE 440 Comp ler Construction . 3 F
ntr duct n to programm ng anguage mp ementat on mp ementa- t on strateg es such as comp at on nterp etat on and trans at on Major c mp at phases such as ex ca ana ys s semant c ana ys's opt m zat on and code ge erat on Prerequ s tes. CSE 34 355

CSE 445 D str buted Computing with Java and CORBA. 3 F, S
Techno og es for deve op g softwa e comp nents. C ent server com put ng w th s ckets and d str buted ob ects Dynam c nterface d scov- ery and v cat on Le ture p o ects Prerequ s te. CSE 310 or nstructor approva

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NOTE: For the Genera Stud es requ re e t ourses and codes such as L1 N3 C and H see Genera St d es page 85 For graduat on requ re e ts see n vers ty Graduat on Requ rements, page 81 For an exp anat on f add t ona om bus c rses offered but not sted in th s cata g see "C ass f cat on of Courses " page 58

CSE 446 Client-Server User Interfaces. 3) S
C ent server mode and ts use in creat ng and manag ng w ndow nterfaces T o k ts and ibrar es nclud ng X11 M crosoft Foundat on Classes and Java Abstract W ndow Too k t Lecture projects Prereq uisite CSE 310 or nstructor approva

CSE 450 Design and Analysis of Algorithms. (3) F
Des gn and ana ys s of computer algor thms us ng ana yt cal and emp r ca methods comp ex ty measures, des gn methodo og es and survey of mportant a gor thms Prerequ s te: CSE 310

CSE 457 Theory of Formal Languages. (3) A
Theory of grammar methods of syntact c ana ys s and spec fica t on types of art f c a anguages re at onship between forma anguages and automata Prerequ site: CSE 355

CSE 459 Logic for Computing Scientists I. (3 F
Propos t ona og c syntax and semant cs proof theory versus mode theory soundness cons stency and comp eteness f rst order og c og ca theor es automated theorem prov ng ground reso ut on pat tern match ng un f cat on and reso ut on D jkstras og c proof ob ga t ons and program prov ng Prerequ s te CSE 355.

CSE 461 Software Engineering Project I. 3 F
F rst of two-course software des gn sequence Deve opment p anning management process mode ng ncrementa and team deve opment us ng CASE too s Lecture lab Prerequ s te CSE 360

CSE 462 Software Engineering Project II. (3) S
Second of two course software design sequence Process product assessment and mprovement, ncrementa and team deve opment us ng CASE too s Lecture, ab Prerequis te· CSE 461

CSE 470 Computer Graphics. 3) F S
D sp ay dev ces, data structures, transformat ons nteract ve graphics, 3-d mens ona graph cs, and h dden ne prob em Prerequ s'tes CSE 310 MAT 342

CSE 471 Introduction to Art ficial Intelligence. (3 F, S
State space search heur st c search games know edge representa- t on te hn ques expert systems and automated reason ng Prerequ s tes CSE 240 310

CSE 473 Nonprocedural Programming Languages. (3) S
Funct ona and g c programm ng us ng anguages ke Luc d and Pro og Typ ca app cat ons wou d be a Screen Editor and an Expert System Prerequ s te CSE 355

CSE 476 Introduction to Natural Language Processing. 3 F
Pr nc p es of computat onal ngu st cs forma syntax and semantics, as app ed to the des gn of software w th natura human anguage O Prerequ s te CSE 310 or nstructor approva .

CSE 477 Introduction to Computer-Aided Geometric Design. 3) F, S
ntroduct on to parametr c curves and surfaces Bez er and B sp ne nterpo at on and approx mat on techn q es. Prerequ s tes· CSE 210 470 MAT 342

CSE 507 Virtual Reality Systems. 3) S
Computer generated 3D env ronments s m ation of rea ity, spatia presence of v rtua ob ects techno og es of mmers on tracking sys tems Lecture, ab. Prerequ s te CSE 408 or 470 or 508 or nstructor approval

CSE 508 Digital Image Processing. 3 S
D'g ta mage fundamenta s mage tra sforms mage enhancement and restorat on techniques mage enc d ng, and segmentat on meth ods P erequ s te EEE 303 or nstructor approva

CSE 510 Advanced Database Management. 3) F, S
Advanced data mode ng deduct ve databases object-or ented data- bases, d str buted and mu t database systems emerg ng database techno og es Prerequ s te CSE 412

CSE 512 Distributed Databases. 3 A
Fragmentat on des gn Q ery opt m zat on D str buted jo ns Concur rency contro D str buted dead ock detect on Prerequ s te CSE 510.

CSE 513 Deductive Databases. 3 F
Log c as a data mode Query opt m zat on emphas z ng the top down and bottom up eva uat on of dec arat ve ru es Prerequ s te CSE 510

CSE 514 Object Oriented Database Systems. 3) A
Ob ect or ented data mode ng database and anguage ntegrat on object a gebras extens b ty transact ons object managers vers on ng/conf gurat on, act ve data nonstandard app cat ons Research sem nar Prerequ s te CSE 510.

CSE 517 Hardware Design Languages. (3) F
ntroduct on to hardware des gn anguages Mode ng concepts for spec f cat on s'mulat on and synthesis Prerequ s te CSE 423 or EEE 425 or nstructor approva .

CSE 518 Synthesis with Hardware Design Languages. (3) N
Mode ng VLS design n hardware des'gn anguages for synthes s. Transformat'on of anguage based des gns to phys ca layout App ica t on of synthes s too s Prerequ s te CSE 517

CSE 520 Computer Architecture II. (3) F
Computer arch tecture descr pt on languages, computer arithmetic, memory-h erarchy design para e vector, and mu t processors, and nput/output Prerequ s tes CSE 420 430

CSE 521 Microprocessor Applications. (4) S
M croprocessor techno ogy and ts appl cat on to the des gn of practi- cal d g ta systems. Hardware assemb y anguage programm ng and nterfac ng of m croprocessor based systems Lecture ab Prerequ s te· CSE 421

CSE 523 Microcomputer Systems Software. (3) F
Deve op ng system software for a mu t processor mu t programm ng, m croprocessor-based system us ng nformat on and techn ques pre- sented n CSE 421, 422 Prerequ s te CSE 422.

CSE 526 Parallel Processing. 3) N
Rea and apparent concurrency Hardware organ zat on of mu tipro cessors, mult ple computer systems, sc entif c attached processors and other parat e systems Prerequ site. CSE 330 or 423

CSE 530 Operating System Internals. 3 F
mp ementat on of process management and synchronization system ca l and nterrupt hand ng, memory management dev ce drivers and f e systems in UNIX Prerequ s tes. CSE 430, knowledge of C lan- guage

CSE 531 Distributed and Multiprocessor Operating Systems. (3) N
D str buted systems arch tecture remote fi e access message-based systems, object based systems, cl ent/server parad gms, d str buted a gorithms rep cat on and cons stency and mu t processor operat ng systems. Prerequ s te CSE 530 or nstructor approval.

CSE 532 Advanced Operating System Internals. (3) F
Memory, processor, process and commun cat on management, and concurrency control in the W ndows NT mu t processor and d str buted operat ng system kerne s and servers Prerequ site: CSE 530 or nstructor approva

CSE 534 Advanced Computer Networks. (3) F
Advanced network protoco s and nfrastructure, app 'cations of h gh- performance networks to d str buted systems, high performance com- puting and mu t med a doma ns spec a features of networks. Prereq- u s te CSE 434

CSE 536 Theory of Operating Systems. (3) S
Protect on. Commun cation and synchron zat on n d str buted sys- tems d str buted f e systems dead ock theory virtua memory theory, and un processor and mu t processor thread management Prerequ s te CSE 430

CSE 540 Compiler Construction II. 3 S
Forma pars ng strateg es, opt m zation techn ques code generat on, extens bi ty and transportab ty cons derat ons and recent deve op ments Prerequ s te CSE 440

CSE 545 Programming Language Design. (3 N
Language constructs extensibi ty and abstract ons, and runt me sup port Language des gn process. Prerequ s te CSE 440

CSE 550 Combinatorial Algorithms and Intractability. (3) N
Comb nator a a gor thms nondeterm n st c a gor thms c asses P and NP NP-hard and NP-comp ete prob ems and ntractab l ty Design techn ques for fast comb'nator a a gor thms Prerequ s te CSE 450

CSE 555 Automata Theory. 3) N
F n te state mach nes pushdown automata, near bounded automata, Tur ng mach nes reg ster mach nes rams, and rasps re at onships to computab ty and forma anguages Prerequ s te CSE 355.

CSE 556 Expert Systems. (3) S
Know edge acqu's tion and representat on ru e based systems frame-based systems va dat on of know edge bases nexact reason- ng and expert database systems Prerequ s te. CSE 471

CSE 560 Software Engineering. 3) F, S
Software eng neer ng foundat ons forma representat ons n the soft ware process; use of formal sms n creat ng a measured and struc- tured work ng env'ronment Lecture ab Prerequ s te CSE 360

CSE 562 Parallel and Distributed Software Engineering. (3 A
Software eng neer ng character st cs part cu ar to para e and d str b uted systems Too s and techn ques to support software eng neer ng nvo v ng para e process ng and d str buted systems Prerequ s te CSE 560

CSE 563 Software Requirements and Specification. 3 A
Exam nat on f the def n t ona stage of software deve opment; ana y s s of spec f cat on representat ons forma methods, and techn ques emphas z ng mportant app cat on ssues Prerequ s te CSE 560

CSE 564 Software Design. 3 A
Exam nat on of software des gn ssues and techn ques nc udes a survey of des gn representat ons and a c mpar son of des gn methods Prerequis'te. CSE 560

CSE 565 Software Verification, Validation, and Testing. 3 A
Test p ann ng requ rements based and c de based test ng techn ques too s re ab ty mode s and stat st ca test ng Prerequ s te CSE 560.

CSE 566 Software Project, Process, and Quality Management. 3) A
Pro ect management r sk management conf gurat on management qua ty management and s mu ated project management exper ences Prerequ s te. CSE 560

CSE 570 Advanced Computer Graphics I. 3) F
H dden surface a gor thms ght ng mode s and shad ng techn ques User nterface des gn An mat on techn ques Fracta s and stochast c mode s Raster algor thms Prerequ s te CSE 47

CSE 571 Artificial Intelligence. 3 S
Def nit ons of nte gence computer prob em so v ng game p ay ng pattern recogn t on theorem pr v ng and semant c nformat on process ng evo utionary systems heur st c p ogramm ng Prerequ s te CSE 471

CSE 573 Advanced Computer Graphics II. 3) S
Mode ng of natura phenomena terra n c ouds f re water, and trees Part cle systems, deformation of so ds ant a as ng and vo ume v su al zat on. Lectu e ab Pre equ s te CSE 470

CSE 574 Planning and Learning Methods in AI. 3 F
Reason ng about t me and act on, p an synthes s and execut on mprov ng p anning performance app cat ons to manufactur ng nte gent agents. Prerequ s te CSE 471 equ va ent

CSE 575 Decision-Making Strategies in AI. 3 S
Automat c know edge acqu s t on automat c ana ys s synthes s of strateg es d str buted p ann ng/prob em so v ng, causa mode ng pred ct ve human mach ne env ronments Prerequ s te. CSE 471 or 571 or equ va ent

CSE 576 Topics in Natura Language Processing. 3) S
Comparat ve pars ng strateg es sc p g and reference prob ems, nonf rst order og ca semant c representati s, a d d scourse struc ture Prerequ s te CSE 476 or nstructor approva

CSE 577 Advanced Computer Aided Geometric Design I. 3 F
Genera nterpo at on, rev ew of curve terpo at on and approx mat on sp ne curves v sua smoothness f curves parameter zat on of curves ntroduct on to surface nterpo at n and approx mat on Pre requ s tes CSE 470 and 477 *or* nstructor approva

CSE 578 Advanced Computer-Aided Geometric Design II. 3 S
Coons patches and Bez er patches tr angu ar patches arbitrar ly ocated data methods, geometry process ng of surfaces; h gher d mens ona surfaces Prerequ s tes CSE 470 and 477 *or* nstructor approva

CSE 579 NURBs: Nonun form Rat'onal B Splines. 3) S
Project ve geometry, NURBs-based mode ng bas c theory of co cs and rat ona Bez er curves rat ona B-sp nes surfaces rat ona sur faces stereograph c maps quadr cs GES data spec f cat n Prerequ s tes. CSE 47 477

Department of Electrical Engineering

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REGENTS' PROFESSORS
BALANIS FERRY

PROFESSORS
ALLSTOT BACKUS CROUCH, DeMASSA EL-GHAZALY GOODNICK, GORUR HEYDT HIGG NS, KARADY, KOZ CK PALA S, PAN, ROEDEL SADOWSKY, SCHRODER SPANIAS THORNTON

ASSOCIATE PROFESSORS
ABERLE ALLEE, B RD, CHAKRABARTI, COCHRAN EL-SHARAWY GREENEICH GROND N, HOLBERT, MORRELL RODRIGUEZ, SHEN, SI SKROMME, TSAKAL S, TYLAVSKY, ZHANG

ASSISTANT PROFESSORS
CAPONE, DUMAN KARAM, VAS LESKA KAFEDZ SKA, YAZD

The professiona 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 minuscule 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 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.

NOTE: For the Genera Stud es requ rement courses and codes (such as L1 N3 C and H see Genera Stud es " page 85 For graduat on requ rements ee 'Un vers ty Graduat on Requ rements page 81 For an exp anat on of add t ona omn bus courses offered but not sted n th s cata og see C a s f cat on of Courses " page 58

ELECTRICAL ENGINEERING—B.S.E.

The goal of the Electrical Engineering undergraduate program is to prepare the graduates for entry level positions as electrical engineers for the broad range of opportunities available in industrial, commercial, and governmental organizations, and to prepare the graduates for continued learning experiences either in a formal graduate program or in continuing education applications

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.

The engineering design experience is structured around three backbone courses employing engineering teams: ECE 100 Introduction to Engineering Design (freshman year), ECE 300 Intermediate Engineering Design junior year), and EEE 490 Senior Design Laboratory. The integrated experience is strengthened with required courses, EEE 120 Digital Design Fundamentals, EEE 225/226 Assembly Language Programming and Microprocessors, EEE 303 Signals and Systems, and EEE 360 Energy Conversion and Transport Students focus on design pertaining to specific electrical engineering areas in their senior technical electives before the culminating, capstone design experience in EEE 490.

DEGREE REQUIREMENTS

A minimum of 128 semester hours is necessary for the B S E. degree in Electrical Engineering A minimum of 50 upper division semester hours is required.

GRADUATION REQUIREMENTS

A student must earn a grade of "C" or higher 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 CSE 100; ECE 300, 301, 334, 352, all courses with an EEE prefix; and all other courses used as technical electives.

In addition to fulfilling school and major requirements, students must satisfy all university graduation requirements. See "University Graduation Requirements," page 81.

COURSE REQUIREMENTS

The specific course requirements for the B.S.E. degree in Electrical Engineering follow.

First-Year Composition

Choose among the course combinations below . . 6 or 3
- ENG 1 First Year Composition 3
- ENG 1 2 First Year Composition 3

or

- ENG 105 Advanced First Year Composition 3
- Elective chosen with an advisor 3

or

- ENG 107 English for Foreign Students 3
- ENG 108 English for Foreign Students (3)

Total . . . . . 6 or 3

General Studies/School Requirements

Humanities and Fine Arts/Social and Behavioral Sciences

ECN 111 Macroeconomic Principles *SB* 3
or ECN 112 Microeconomic Principles *SB* (3)
HU courses 6–10
SB courses 3–7

Minimum total 16

Literacy and Critical Inquiry

ECE 300 Intermediate Engineering Design *L1* 3
EEE 490 Senior Design Laboratory *L2* 3

Total 6

Natural Sciences/Basic Sciences

CHM 114 General Chemistry for Engineers *S1/S2* . . . 4
or CHM 116 General Chemistry *S1/S2* (4)
PHY 121 University Physics I: Mechanics *S1/S2*[2] 3
PHY 122 University Physics Laboratory I *S1/S2*[2] 1
PHY 131 University Physics II Electricity and Magnetism *S1/S2*[3] 3
PHY 132 University Physics Laboratory II *S1/S2*[3] 1
PHY 241 University Physics III 3

Total 15

Numeracy and Mathematics

ECE 100 Introduction to Engineering Design *N3* . . . 4
MAT 270 Calculus with Analytic Geometry I *N1* 4
MAT 271 Calculus with Analytic Geometry II *N1* 4
MAT 272 Calculus with Analytic Geometry III *N1* 4
MAT 274 Elementary Differential Equations N1 *N1* 3
MAT 342 Linear Algebra 3
MAT 362 Advanced Mathematics for Engineers and Scientists I 3

Total 25
General Studies/school requirements total 62

Engineering Core

ECE 301 Electrical Networks I 4
ECE 314 Engineering Mechanics 4
ECE 334 Electronic Devices and Instrumentation 4
ECE 352 Properties of Electronic Materials 4
EEE 225 Assembly Language Programming and Microprocessors (Motorola) 4
or EEE 226 Assembly Language Programming and Microprocessors Intel) (4)

Total 20

[1] A minimum grade of "C" is required

[2] Both PHY 121 and 122 must be taken to secure S1 or S2 credit

[3] Both PHY 131 and 132 must be taken to secure S1 or S2 credit

Electrical Engineering Major

The following courses are required to fulfill the Electrical Engineering major:

CSE 100 Principles of Programming *N3* . 3
EEE 120 Digital Design Fundamentals 3
EEE 302 Electrical Networks II . 3
EEE 303 Signals and Systems 3
EEE 340 Electromagnetic Engineering I .4
EEE 350 Random Signal Analysis 3
EEE 360 Energy Conversion and Transport 4

Total 23

Technical Electives in Electrical Engineering

The program in Electrical Engineering requires a total of 17 hours of technical electives. With department approval, a maximum of two technical electives may be taken outside electrical engineering. Qualified students may choose from approved courses in business, 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 dean to enroll in EEE graduate level courses. To ensure breadth of knowledge, students *must select courses from at least three of the following six areas. In addition, to ensure depth, two courses must be taken in one area*

Communications
EEE 407 Digital Signal Processing 4
EEE 455 Communication Systems 4
EEE 459 Data Communication Systems 3

Control
EEE 480 Feedback Systems 4
EEE 487 Introduction to State Space Methods 3

Electromagnetics
EEE 440 Electromagnetic Engineering II . . . 4
EEE 443 Antennas 3
EEE 445 Microwaves 4
EEE 448 Fiber Optics 4

Electronic Circuits
EEE 405 Filter Design 3
EEE 425 Digital Systems and Circuits 4
EEE 433 Analog Integrated Circuits 3

Power Systems
EEE 460 Nuclear Concepts for the 21st Century 3
EEE 463 Electrical Power Plant 3
EEE 470 Electric Power Devices 3
EEE 471 Power System Analysis 3
EEE 473 Electrical Machinery 3

Solid-State Electronics
EEE 434 Quantum Mechanics for Engineers 3
EEE 435 Microelectronics 3
EEE 436 Fundamentals of Solid State Devices 3
EEE 437 Optoelectronics 3
EEE 439 Semiconductor Facilities and Cleanroom Practices 3

With department approval Computer Science and Engineering courses at or above the 300 level may be substituted for one of the above areas

Electrical Engineering
Program of Study
Typical Four-Year Sequence

First Year

First Semester
CHM 114 General Chemistry *S1/S2* 4
or CHM 116 General Chemistry *S1/S2* (4
ECE 100 Introduction to Engineering Design *N3* 4
or EEE 120 Digital Design Fundamentals 3
ENG 101 First Year Composition 3
MAT 270 Calculus with Analytic Geometry I *N1* 4

Total 15

Second Semester
EEE 120 Digital Design Fundamentals 3
or ECE 100 Introduction to Engineering Design *N3* 4
ENG 102 First Year Composition 3
MAT 271 Calculus with Analytic Geometry II *N1* 4
PHY 121 University Physics I. Mechanics *S1/S2* 3
PHY 122 University Physics Laboratory I *S1/S2*[1] 1

Total 14

Second Year

First Semester
CSE 100 Principles of Programming *N3* 3
ECN 111 Macroeconomic Principles *SB* 3
or ECN 112 Microeconomic Principles *SB* 3
MAT 272 Calculus with Analytic Geometry III *N1* 4
MAT 274 Elementary Differential Equations *N1* 3
PHY 131 University Physics II Electricity and Magnetism *S1/S2*[1] 3
PHY 132 University Physics Laboratory II *S1/S2*[1] . . . 1

Total 17

Second Semester
ECE 301 Electrical Networks I 4
EEE 225 Assembly Language Programming and Microprocessors Motorola) 4
or EEE 226 Assembly Language Programming and Microprocessors Intel) 4
MAT 362 Advanced Mathematics for Engineers and Scientists I 3
PHY 241 University Physics III 3
HU, SB, and awareness area course 3

Total 17

Third Year

First Semester
ECE 300 Intermediate Engineering Design *L1* 3
EEE 302 Electrical Networks II 3
EEE 340 Electromagnetic Engineering I 4
MAT 342 Linear Algebra 3
HU, SB, and awareness area course s[3] 4

Total 17

Second Semester
ECE 334 Electronic Devices and Instrumentation . . . 4
ECE 352 Properties of Electronic Materials 4
EEE 303 Signals and Systems 3
EEE 360 Energy Conversion and Transport 4

Total 15

Fourth Year

First Semester
ECE 343 Engineering Mechanics 4
EEE 350 Random Signal Analysis 3
HU, SB, and awareness area course[3] 3
Technical electives 7

Total 17

Second Semester
EEE 490 Senior Design Laboratory *L2* 3
HU, SB, and awareness area course[3] 3

NOTE: For the General Studies requirement courses, and codes (such as L1, N3 C and H see General Studies, page 85 For graduation requirement , see "University Graduation Requirements" page 81 For an explanation of additional omnibus courses offered but not listed in this catalog see "Classification of Courses" page 58.

Technical e ect ves	10
Total	16

Both PHY 21 and 122 must be taken to secure S1 or S2 credit

[2] Both PHY 131 and 132 n ust be taken to secure S1 or S2 cred't

[3] Enginee ing studc nts may not use aerospace studies AES or military science MIS courses to satisfy HU or SB requirements See "Degree Requirements," page 199

ELECTRICAL ENGINEERING (EEE)

EEE 120 Digital Design Fundamentals. (3) F S SS
Number systems, conversion methods, b nary and comp ement ar th met c, Boo ean a gebra c rcu t m n m zat on ROMs PLAs f pf ops synchronous sequent a c rcuits Lecture ab Cross sted as CSE 120. Cred t s a owed on y for CSE 120 or EEE 120. Prerequ s te computer teracy

EEE 225 Assembly Language Programming and Microprocessors (Motorola). 4 F S SS
Assemb y language programm ng ncluc ng nput/output program m ng and except on nterrupt hand ng Reg ster eve computer orga- n'zat'on, I O nterfaces, assemb ers and nkers Motoro a based ass gnments Lect re ab Cross sted as CSE 225. Cred t s a owed on y for CSE 225 r EEE 225 Prerequ s tes. CSE 100 or 200 CSE/ EEE 120

EEE 226 Assembly Language Programming and Microprocessors (Intel). (4 F S
CPU memory per phera dev ce nterfaces and programm ng System buses, nterrupts ser a and para el O, DMA, coprocessors nte based ass gnments Lecture ab Cross sted as CSE 226 Cred t s a owed on y for CSE 226 or EEE 226 Prerequ s tes CSE 100 or 200 CSE EEE 120

EEE 302 Electrical Networks II. 3) F S, SS
Ana ys s of near and non near networks Ana yt ca and numer cal methods Prerequ s te ECE 301 Pre r corequ s te MAT 362

EEE 303 Signals and Systems. 3) F S SS
ntroduct on to cont nuous and d screte t me s gna and system ana y s s, l near systems Four er and z-transforms Prerequ s te EEE 302 Pre or corequ s te MAT 342

EEE 340 Electromagnetic Engineering I. 4 F S SS
Stat c and t me vary ng vector f elds bounda y va ue prob ems d e ec tr c and magnet c mater a s Maxwe s equat ons boundary cond t ons Prerequ s tes. MAT 362; PHY 131 132

EEE 350 Random Signal Analysis. 3 F S
Probab st c and stat st ca ana ys s as app ed to e ectr ca s gna s and systems. Pre or corequ s te EEE 303 or MAE 317

EEE 360 Energy Conversion and Transport. 4 F, S
Three phase c rcu ts Energy supp y systems Magnet c c rcu t ana y s s, synchronous generators transformers nduct on and DC mach nes. Transm ss on L ne Mode ng and Des gn Lecture ab. Pre requ s te EEE 302

EEE 405 Filter Design. 3 F
Pr nc p es of a t ve and pass ve ana og f ter des gn, frequency doma n app ox mat ons sens t vity and synthesis f f ters Prerequ s te EEE 303

EEE 407 Digital Signal Processing 4 F
Time and frequency doma n ana ys s d fference equat ons z trans form F R and R D g ta F ter Des gn D screte Four er Transform FFT and random sequences Lecture, ab. Prerequ s tes EEE 303; MAT 342

EEE 425 Digita Systems and Circuits. (4 F S
D g ta og c gate ana ys s and des gn Propagat on de ay t mes, fan out, power d ss pat on no se marg ns Des gn of MOS and b po ar og c fam es nc ud ng NMOS, CMOS standard and advanced TTL, ECL and B'CMOS nverter comb nat ona and sequent a ogic c rcu t des gn MOS memor es VLS c rcu ts Computer s mu at ons us ng PSP CE Lecture ab Prerequ s te ECE 334

EEE 433 Analog Integrated Circu ts. 3 S
Ana ysis des gn, and app cat ons of modern ana og c rcu ts us ng ntegrated b p lar and f e d effect trans stor techno og es Prerequ s te ECE 334.

EEE 434 Quantum Mechanics for Engineers. 3 F
Angu ar momentum wave packets Schroed nger wave equat o probab ty, prob ems n one d mens on, pr nc p es of wave mechan cs scatter ng tunne ng centra forces, angu ar momentum hydrogen atom perturbat on theory var at ona techn ques Prerequ s tes ECE 352, EEE 340.

EEE 435 Microelectronics. 3 S
Pract ce of so d state dev ce fabr cat on techn ques nc ud ng th n f lm and ntegrated c rcu t fab at on pr nc p es Lecture ab Pre or coreq u s te EEE 436

EEE 436 Fundamentals of Solid-State Devices. 3) F S
Sem conductor f ndamenta s pn junct ons meta semiconductor con- tacts meta ox de-sem conductor capac tors and f e d-effect trans s- tors, b po ar junct n trans stors Prerequ site ECE 352

EEE 437 Optoelectronics. 3 N
Bas c operat ng pr nc p es of var ous types of optoe ectron c devices wh'ch p ay mportant ro es n commerc a and commun cat on e ec tron cs ght em tt ng d odes n ect on asers and photodetectors Pre requ s te EEE 436.

EEE 439 Semiconductor Facilit es and Cleanroom Practices. (3) F M crocontam nat on contro ed env ronments, c eanroom ayout and systems, mode ng codes and eg s at on, u trapure water product on mater a s personne and operat ons hazard management, advanced concepts Prerequ s te EEE 435 or nstructor approva

EEE 440 Electromagnetic Engineering II. 4 F, S
Second ha f of an ntroductory urse n e ectromagnet c theory and ts app cat n n e ectr ca eng eer ng Ana yt ca and numer ca so u t on of boundary va ue prob ems Advanced transm ss on nes wavegu des; antennas rad at n and scatter ng Lecture ab Prereq- u s te EEE 340 or equ va ent

EEE 443 Antennas. 3 S
Fundamenta pa ameters eng neer ng pr nc p es and rad at on nte- gra s; near w re antennas oops and arrays numer ca computat ons measurements Prerequ s te EEE 340 or equ va ent.

EEE 445 Microwaves. 4 F
Wavegu des c rcu t theory for wavegu d ng systems, m crowave dev ces systems and energy sources str p lines and m crostr ps, mpedance match ng transformers measurements Lecture, lab Pre requ s te. EEE 340 or equ va ent

EEE 448 F ber Optics. 4 F
Pr nc p es of f ber opt c commun cat ons Lecture lab Prerequ s tes EEE 303 340

EEE 455 Communication Systems. (4 F S
Signa ana ys s techn ques app ed to the operat on of e ectrica com mun cat on systems An ntroduct on to and overv ew of modern d g ta and ana og c mmun cat ons Lecture, ab Prerequ s te EEE 350.

EEE 459 Data Communication Systems. 3) S
System character st cs Commun cat ons med a Commun cat on codes Data val d ty check ng L ne protoco s term na s and system conf gurat ons Examp es Prerequ s te EEE 303

EEE 460 Nuclear Concepts for the 21st Century. (3) N
Rad at on nteract ons damage dose and nstrumentat on Cosm c rays sate te effects soft errors transmutat on dop ng F ss on reac tors nuc ear power TM Chern by Rad oact ve waste Prerequ s te. PHY 241 or 361

EEE 463 Electrical Power Plant. 3 F
Nuc ear foss and so ar energy sources Ana ys s and des gn of steam supp y systems e ectr ca generat ng systems and aux l ary systems Power plant eff c ency and operat on Prerequ s tes: ECE 301 340 or PHY 241

EEE 470 Electric Power Devices. 3 F
Analys s of dev ces used for short c rcu t protect on nc ud ng c rcu t breakers relays, and current and vo tage transducers Protect on aga nst sw tch ng and ghtn ng over vo tages nsu ation coord nat on. Prereq s te· EEE 360

EEE 471 Power System Analysis. 3) S
Rev ew of transm ss on ne parameter ca cu at on Zero sequence mpedance symmetr ca components for fault ana ys s short c rcu t ca cu at on rev ew of power f ow ana ys s power system stab ty and power system cont o con epts P erequ s te EEE 360.

EEE 473 Electrical Machinery. 3 F
Operat ng pr nc p es construct ona deta s, and des gn aspects of convent ona DC and AC mach nes transformers and mach nes used n computer d sc dr ves pr nters wr st watches and automob es Pre requ s te EEE 360

EEE 480 Feedback Systems. (4 F S
Ana ys s and design of near feedback systems Frequency response and root locus techn ques, ser es compensat on and state var ab e feedback. Lecture ab Prerequ s te EEE 303

EEE 482 Introduction to State Space Methods. 3 F
D screte and cont nuous systems in state space form contro ab l ty stab ity, and po e p acement Observab ty and observers. Pre or corequ's'te· EEE 480

EEE 490 Senior Design Laboratory. (3) F S
Project oriented ab ratory Each student must complete one or m re des gn projects dur ng the semester Lecture ab Prerequ s tes ECE 300 334 EEE 303 senior status. *Genera Studies· L2*

EEE 506 Digital Spectral Analysis. 3 S
Pr nc p es and app cat ons of d'gita spectra ana ys s, east squares, random sequences, parametr c and nonparametr c methods for spectra est mat on Prerequ s tes. EEE 407, 554.

EEE 507 Multidimensional Signal Processing. (3) F
Process ng and representat on of mu t d mens ona s gna s Des gn of systems for process ng mu t'd'mens ona data ntroduct on to mage and array process ng ssues. Prerequ s te EEE 407 or nstructor approva .

EEE 508 Digital Image Processing and Compression. 3 S
Fundamentals of d g tal mage percept on representat on, process ng, and compress on Emphas s on mage c d ng tech 'ques S gna s nc ude st' p ctures and motion video Prerequ s tes. EEE 350 and 407 *or* equ va ents

EEE 511 Artificial Neural Computation Systems. 3) F
Networks for computat on earn ng funct on representat ons from data, earn'ng a gor thms and analys s funct on approx mat on and nformation representat on by networks app cat ons in contro sys tems and signa ana ys s Prerequ s te nstructor approva

EEE 523 Advanced Analog Integrated Circuits. (3 F
Ana ys s and des gn of ana og ntegrated c rcuits ana og c rcu t b ocks reference c rcu ts, operat onal amp f er c rcu ts feedback and non near c rcu ts. Prerequ s te EEE 433 or equiva ent

EEE 525 VLSI Design. 3) F, S
Ana ysis and des gn of Very Large Sca e ntegrated (VLS C rcu ts Phys cs of sma dev ces fabr cat on, regu ar structures, and system t m ng Open on y to graduate students

EEE 526 VLSI Architectures. (3 F
Spec a purpose arch tectures for s gna processing Des gn of array processor systems at the system leve and processor eve H gh eve synthesis Prerequ s te· CSE 330 or EEE 407 or nstructor approva

EEE 527 Analog to Digital Converters. 3) F
A deta ed 'ntroduct on to the des gn of Nyqu st rate, CMOS analog to digita converters Prerequ s te EEE 523

EEE 530 Advanced Silicon Processing. 3 S
Th n f ms CVD, ox dat on d ffus on on mp antat on for VLS , meta zat on s c des advanced ithography dry etch ng, rapid therma pro cess ng Pre- or corequ s te EEE 435

EEE 531 Semiconductor Device Theory I. (3 F
Transport and recomb nat on theory pn and Schottky barr er d des b po ar and junct on f e d effect trans stors and MOS capac tors and trans stors Prerequ s te EEE 436 or equ'va ent

EEE 532 Semiconductor Device Theory II. 3) S
Advanced MOSFETs charge coupled devices, so ar ce s photode tectors l ght em tt ng d odes m crowave dev ces and modu at n doped structures Prerequ's te EEE 531

EEE 533 Semiconductor Process/Device Simu ation. 3 F
Process s mu at on concepts ox dat on on mp antat on d ffus on dev ce s mu at on concepts pn junct ons MOS dev ces, b po ar tran s stors Prerequ s te EEE 436 r equ va ent

EEE 534 Semiconductor Transport. 3 S
Carr er transport n sem conductors Ha effect h gh e ectr c f e d Bo tzmann equat on corre at on funct ons and carr er carr er nterac t ons Prerequ s tes. EEE 434 436 or 531

EEE 536 Semiconductor Characterization. 3 S
Measurement techn ques for sem conductor mater a s and dev ces E ectr ca opt ca phys ca and chem ca character zat on methods Prerequ s te EEE 436 or equ va ent

EEE 537 Semiconductor Optoelectronics I. 3 F
Electron c states in sem conductors, quantum theory of rad at n absorpt on processes, rad at ve processes nonrad at ve processes, photo um nescence and photonic dev ces Prerequ s tes EEE 434 436 or 531

EEE 538 Semiconductor Optoelectronics II. 3 S
Mater a and dev ce phys cs of sem conductor asers, ght em tt ng d odes and photodetectors Emerg ng mater a and dev ce techno ogy n I I V sem conductors Prerequisite· EEE 537

EEE 539 Introduction to Solid-State Electron cs. (3 F
Crysta att ces, rec procal att ces quantum stat st cs att ce dynam cs equ brium, and nonequ l br um processes n sem'conductors Prerequ site· EEE 434

EEE 541 Electromagnetic Fields and Guided Waves. (3) N
Po ar zat on and magnet zat on d e ectr c conduct ng anisotrop c and sem conduct ng med a dual ty un queness and image theory p ane wave funct ons wavegu des resonators and surface gu ded waves Prerequ s te EEE 440 or equ va ent

EEE 543 Antenna Analysis and Design. 3 F
mpedances, broadband antennas frequency ndependent antennas m n atur zat on, aperture antennas, horns ref ectors ens antennas and cont nuous sources des gn techn ques Prerequ s te· EEE 443 or equ va ent

EEE 544 High Resolution Radar. (3) N
Fundamentals w deband coherent des gn waveforms, and process ng stepped frequency; synthet c aperture radar SAR nverse synthet c aperture radar SAR mag ng Prerequ s tes EEE 303 and 340 *or* equ va ents

EEE 545 Microwave Circuit Design. 3) S
Ana ys s and des gn of m crowave attenuators n phase and quadrature phase power d v ders, mag c tee s, d rect ona coup ers phase sh fters, DC b ocks, and equa zers Prerequ s te EEE 445 or nstructor approva

EEE 546 Advanced Fiber-Optics. (3) N
Theory of propagat on n f bers, coup ers and connectors, d str but on networks, modu at on no se and detect on system des gn and f ber sensors Prerequ s te EEE 448 or nstructor approva

EEE 547 Microwave Solid-State Circuit Design I. 3 S
App catio of sem conductor character stics to pract ca des gn of m crowave m xers detectors, m ters, sw tches attenuators mu t p ers phase sh fters and amp f ers Prerequ s'te· EEE 545 or nstructor approva

EEE 548 Coherent Opt cs. (3 N
D ffract on enses opt ca processing ho ography e ectro opt cs and ase s Prerequ s te EEE 440 or equ va ent

EEE 549 Lasers. (3 N
Theory and des gn of gas, so d and sem conductor asers. Prerequ s te EEE 448 or nstructor approva

EEE 550 Transform Theory and Applications. 3 N
ntroduct on to abstract tegrat on funct on spaces and comp ex ana ys s the context of ntegra transform theory App cat ons to s g- na ana ys s commun cat on theory and system theory Prerequ s te· EEE 303

EEE 551 Information and Coding Theory. 3 N
Fundamenta theorems of nformat on theory for sources and chan- ne s convo utiona and burst codes Prerequ s tes EEE 553, 554.

EEE 552 Digital Communications I. (3 S
Fundamenta s of d'g'ta commun cat ons comp ex s gna theory mod u at on; opt ma coherent and ncoherent rece vers coded modu at on and the V terb' a gor thm Prerequ s tes EEE 455, 554

EEE 553 Error-Correcting Codes. 3 S
Appl cat on of modern a gebra to the des gn of random error detect ng and error-correct ng b ock codes Prerequ s te EEE 455

EEE 554 Random Signal Theory I. 3 F
Appl cat on of stat st ca techn ques to the representat on and ana ys s of e ectr ca s gna s and to commun cat ons systems ana ys s Prereq u s te EEE 350 or instructor approva .

EEE 555 Random Signal Theory II. 3 N
Pr cess ng of signa s in the presence of no se Random s gna s cor- relat on, frequency spectra, est mat on f ter ng no se predict on and trans ents Prerequis'te EEE 554

NOTE: For the Genera Stud'es requ rement courses and codes such as L1, N3 C, a d H), see Genera Stud es " page 85. For graduat on requ rements, see ' U vers ty Graduat on Requ rements page 81 For an exp anat on f add t'ona omn bus courses offered but not sted in th s cata og see C ass f cat on of Courses " page 58

EEE 556 Detection and Estimation Theory. 3 S
Comb nat n f the c ass cat techn ques of stat st ca nference and the random process character zat n of commun cat on radar and other modern data process ng systems Prerequ s tes EEE 455, 554

EEE 558 Digital Communications II. 3) F
C nt nuat on of EEE 552 Advanced top cs n d g ta commun cat ns synchron zat o mu t path and fad ng equa zat on m sce aneous top cs Prereq s te EEE 552

EEE 571 Power System Transients. 3 N
S mp e sw tch ng trans ents Trans ent ana ys s by dedu t on Damp ng of trans ents Capac tor and reactor sw tch ng Trans ent rec very vo t age Trave ng waves on transm ss on nes L ghtn ng Protect on f equ pment aga nst trans ent overvoltages Introduct on to computer ana ys s of trans ents Prerequ s te EEE 471

EEE 572 Advanced Power Electronics. 3 N
Ana ys s f dev ce operat on nc ud ng thyr stors gate t r off thyr s tors and trans stors Des gn of rect f er and nverter c rcu ts Appl ca t ons such as var ab e speed dr ves HVDC, motor contro and un nterruptab e p wer supp es Prerequ s te. EEE 470

EEE 573 Electric Power Qual ty. (3 S
S nuso da waveshape maintenance study of momentary events, power sy tem harmon cs nstrumentat n f ters power cond t oners, and other power qua ty enhancement methods Prerequ s te EEE 360 or equ va ent

EEE 574 Computer Solution of Power Systems. 3 N
A g r thms for d g ta computation for p wer f ow, fau t, and stab ty ana ys s Sparse matr x and vector programm ng ethods numer ca ntegrat on techn ques stochast c methods s ut on of the least squares prob em Prerequ s te EEE 471

EEE 577 Power Engineering Operations and Planning. 3) F
Ec nom c d spatch, un t comm tment dynam c programm ng power system p ann ng and operat on co tro generat on mode ng AGC, and p wer product n Prerequ s te EEE 471 or graduate stand ng

EEE 579 Power Transmission and Distribution. 3 S
H gh vo tage transm s on l ne e ectr c des gn conductors corona R and TV no e, nsu ators c earances DC character st c feeders volt age drop, and capac tors Prerequ s te EEE 470.

EEE 581 Filter ng of Stochastic Processes. (3 N
M de ng est mat on and f ter ng of stochast c p ocesses, w th emphas s n the Ka man f te and its app cations n s g a pr cess ng and contro Pre equ s tes EEE 482 550 554

EEE 582 L near System Theory. 3 S
Contro ab ty observab ty and rea zation theory for m t var ab e cont nuo s t me systems Stab zat on and asymptot c state est ma t on D sturbance decoup ng no teract ng contro Prereq s te EEE 482

EEE 585 Digital Control Systems. 3 F
Ana ys a d des gn of d g ta and samp ed data c ntr systems, nc ud ng samp ng theory z transf rms the state trans t on method stab ty, des gn and synthes s Prerequ s tes EEE 482 550

EEE 586 Nonlinear Control Systems. 3 N
Stab ty the y c ud ng phase p ne descr b ng funct n L apunov's meth d and frequency d ma n c ter a for cont nuous and d sc ete non near and t me vary ng systems P erequ s te EEE 482.

EEE 587 Optima Control. 3 F
Opt ma contro of systems Ca cu us of var at ons dy am c program- m ng, ear quadrat c regu ator numer ca methods, and Pontryag n s pr nc p e. C oss sted as MAE 507 Cred t s a owed on y for EEE 587 or MAE 5 7 Prerequ s te EEE 482 or MAE 506

EEE 588 Des gn of Multivariable Control Systems. 3 S
Pract ca t s fo des gn ng robust M MO contro ers State feedback and est mat on mode based compensators M MO des gn methodo og es AD ea wor d app cat ns Prerequ s te EEE 480 or equ va ent

EEE 606 Adaptive Signal Processing. 3 F
Pr nc p e app cat ons of adapt ve s gna process g adapt ve near comb ne W ener east squares so ut n grad ent search perfor mance urfaces LMS RLS a gor t ms b ock t me frequency doma n LMS. Prerequ s tes EEE 506, 554

EEE 607 Speech Coding for Mu timedia Communications. 3 S
Speech and a d o cod g a g r thms for app cat ons n w re ess c m mun cat ns and mu t med a c mput ng Prerequ s te EEE 407 Pre or corequ s te EEE 506

EEE 631 Heterojunctions and Superlattices. 3 F
Pr nc p es f heterojunct ns and quantum we structures band l ne ups, opt ca and e ectr ca propert es ntroduct n to heterojunct on devices Prerequ s tes EEE 436, 531

EEE 632 Heterojunction Devices. 3 N
App cat ns of heterostru tures quantum we s and super att ce to modu at n-doped FETs heterostructure b po ar trans stors asers detectors and m du ators Prerequ s tes EEE 434 and 631 or 537)

EEE 641 Advanced E ectromagnetic Field Theory. 3 N
Cy ndr ca wave funct ons, wavegu des and resonators, spher ca wave functions and res ators scatter ng from p anar cy ndr cal, and spher ca surfaces Green s funct ons Prerequis te EEE 541 or equ v a ent

EEE 643 Advanced Topics in Electromagnetic Radiation. 3 S
H gh frequency asymptot c techn ques geometr ca and phys cal the- or es of d ffract on GTD and PTD moment method MM radar cross sect on (RCS pred ct n, Four er transforms n rad at on and synthe s s meth ds Prerequ s te EEE 543

EEE 647 Microwave Solid State Circuit Design II. (3 F
Pract ca des gn of m cr wave free runn ng and vo tage control ed osc' ators us ng Gunn and mpatt d des and trans stors; ana ys's of no se character st cs of the s ator Prerequ s tes EEE 545, 547.

EEE 686 Adaptive Control. 3 N
Ma n top cs covered adapt ve dent f cat on convergence parametr c mode s, perf rmance and robustness propert es of adaptive contro ers pers tence of exc tat on and stab ty. Prerequ s tes: EEE 582 and 586 *or* nstructo approva

EEE 731 Advanced MOS Devices. 3) S
Thresh d vo tage subthresho d current, sca ng, sma geometry effects hot e ectrons and a ternat ve structures Prerequ s te: EEE 531

EEE 732 Advanced Bipolar Devices and Circuits. (3) N
Cr t cal exam nat on of new b po ar dev ce and c rcu t techno ogies Performance trade offs sca ng effects and mode ng techn ques Prerequ s te EEE 531

EEE 770 Advanced Top cs in Power Systems. 3 N
Power system pr b ems of current nterest approached at an advanced te hn ca eve , for mature students Prerequ s tes EEE 577 and 579 *or* equ va ents nstructor approva

Department of Industrial and Management Systems Engineering

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PROFESSORS
BAILEY, DOOLEY HENDERSON, HOGG, HUBELE, KEATS MONTGOMERY, SM TH, UTTAL, WOLFE

ASSOCIATE PROFESSORS
ANDERSON ROWLAND, COCHRAN, MACKULAK MOOR, ROBERTS ROLLIER RUNGER, SHUNK VILLALOBOS YE

ASSISTANT PROFESSORS
CARLYLE FOWLER, MOU

The industrial engineer IE pro vides leadership for American organizations in reestablishing competitiveness in the global n arketp ace through system integration and pro ductivity impro vement. No challenge can be greater than in proving productivity, which is the application of knowl edge and skills to provide improved goods and services to

enhance the quality of life, both on and off the job. This improvement must be achieved without waste of physical and human resources while maintaining the environmental balance. Industrial engineers are the "productivity people" who provide the necessary leadership and skills to integrate technology. This gives IEs a wide range of interests and responsibilities.

As in other engineering fields, industrial engineering is concerned with solving problems through the application of scientific and practical knowledge. What sets industrial engineering apart from other engineering disciplines is its broader scope. An IE relates to the total picture of productivity. An IE looks at the "big picture" of what makes society perform best the right combination of human resources, natural resources, synthetic structures, and equipment. An IE bridges the gap between management and operations, dealing with and motivating people as well as determining what tools should be used and how they should be used.

An IE deals with people as well as things. In fact, industrial engineering is often called the "people oriented profession." It is a primary function of the IE to integrate people and technology oriented systems. Therefore, IEs are active in the fields of ergonomics and human factors.

To be competitive in this global economy, it is essential to emphasize and continually improve the quality of goods and services. Industrial engineering is the only engineering discipline offering course work in designing and implementing quality assurance systems.

The IE's skills are applicable to every kind of organization. IEs learn how to approach, think about, and solve productivity and integration problems regardless of their settings. IEs work in manufacturing facilities, banks, hospitals, government, transportation, construction, and social services. Within this wide variety of organizations, IEs get involved in projects such as designing and implementing quality control systems, independent work groups, the work flow in a medical laboratory, real time production control systems, computer-based management information systems, and manufacturing operating systems, to name a few. A unique feature of most industrial engineering assignments is that they involve interdisciplinary teams. For example, the IE might be the leader of a team consisting of electrical and mechanical engineers, accountants, computer scientists, and planners. This IE program gives the student the skills necessary to direct these teams These skills include team building, brainstorming, group dynamics, and interpersonal relationships.

IEs have a sound background in technology integration, management theory and application, engineering economics and cost analysis. They are well equipped to deal with problems never seen before, making them prime candidates for promotion through the management career path, especially in high tech organizations. In fact, more than half of all practicing IEs are in management positions. This area of expertise has placed the IE in the leadership role in the establishment of a new field of activity called "management of technology."

Industrial engineers are well trained in the development and use of analytical tools, and their most distinctive skill is in the area of model building IEs must quickly learn and understand the problems of their clients In this context, good people skills and good analytic skills are essential. This industrial engineering program offers both

INDUSTRIAL ENGINEERING—B.S.E.

Degree Requirements

A minimum of 128 semester hours is necessary for the B.S.E. degree in Industrial Engineering; including 50 upper division semester hours

Graduation Requirements

In addition to fulfilling school and major requirements, majors must satisfy all university graduation requirements. See "University Graduation Requirements," page 81.

Course Requirements

See "Degree Requirements," page 199, for General Studies, school, and engineering core course requirements.

Industrial Engineering Major

The following courses are required:

ASE	485	Engineering Statistics *N2*	3
CSE	100	Principles of Programming *N3*	3
ECE	380	Probability and Statistics for Engineering Problem Solving *N2*	3
IEE	300	Economic Analysis for Engineers	3
IEE	305	Information Systems Engineering *N3*	3
IEE	360	Manufacturing Processes	3
IEE	361	Manufacturing Processes Lab	1
IEE	374	Quality Control *N2*	3
IEE	394	ST Facilities Analysis and Design or ST Work Analysis and Design 4)	4
IEE	431	Engineering Administration	3
IEE	461	Production Control	3
IEE	475	Simulating Stochastic Systems *N3*	3
IEE	476	Operations Research Techniques/ Applications *N2*	4
IEE	490	Project in Design and Development	3
Technical elective			6
Total			48

Industrial Engineering
Program of Study
Typical Four Year Sequence

First Year

First Semester

CHM	114	General Chemistry for Engineers *S1/S2*	4
ECE	100	Introduction to Engineering Design *N3* or HU SB elective 4	4
ENG	101	First Year Composition	3
MAT	270	Calculus with Analytic Geometry I *N1*	4
Total			15

Second Semester

ECN	111	Macroeconomic Principles *SB* or ECN 112 Microeconomic Principles *SB* (3	3
ENG	102	First Year Composition	3

NOTE: For the General Studies requirement courses, and codes (such as L1, N3 C, and H), see "General Studies" page 85 For graduation requirements see "University Graduation Requirements" page 81 For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses" page 58

MAT 271 Calculus with Analytic Geometry II *M1* 4
PHY 121 University Physics I Mechanics *S1/S2*[2] ... 3
PHY 122 University Physics Laboratory I *S1/S2*[2] 1
HU, SB, and awareness area course[3] 3
or ECE 100 Introduction to Engineering Design *N3* 4)

Total 17

Second Year

First Semester

CSE 100 Principles of Programming *N3* 3
IEE 300 Economic Analysis for Engineers 3
MAT 242 Elementary Linear Algebra 2
MAT 272 Calculus with Analytic Geometry III *N1* .. 4
PHY 13 University Physics II: Electricity and Magnetism *S1 S2*[4] 3
PHY 132 University Physics Laboratory II *S1/S2*[4] 1

Total 16

Second Semester

ECE 210 Engineering Mechanics I Statics 3
ECE 380 Probability and Statistics for Engineering Problem Solving *N2* 3
IEE 463 Computer Aided Manufacturing and Control... 3
MAT 274 Elementary Differential Equations *M1* 3
Basic science elective[5] 3
HU, SB, and awareness area course[3] 3

Total 18

Third Year

First Semester

ASE 485 Engineering Statistics *M2* 3
IEE 305 Information Systems Engineering *W3* 3
IEE 374 Quality Control *N2* 3
IEE 394 ST: Facilities Analysis and Design 4
or IEE 394 ST: Work Analysis and Design 4
HU SB, and awareness area course s[3] 4

Total 17

Second Semester

ECE 310 Intermediate Engineering Design *L1* 3
ECE 312 Engineering Mechanics II: Dynamics 3
ECE 350 Structure and Properties of Materials 3
IEE 360 Manufacturing Processes 3
IEE 361 Manufacturing Processes Lab 1
IEE 476 Operations Research Techniques Applications *N2* 4

Total 17

Fourth Year

First Semester

ECE 301 Electrical Networks I 4
IEE 431 Engineering Administration 3
IEE 461 Production Control. 3
IEE 475 Simulating Stochastic Systems *N3* 3
HU, SB and awareness area course[3] 3

Total 16

Second Semester

ECE 400 Engineering Communications *L2* 3
IEE 490 Project in Design and Development 3
Technical elective 6

Total 12

[1] Students who have taken no high school chemistry should take CHM 113 and 116

[2] Both PHY 121 and 122 must be taken to secure S1 or S2 credit.

Engineering students may not use aerospace studies AES) or military science (MIS courses to satisfy HU or SB requirements See "Degree Requirements," page 199.

[4] Both PHY 131 and 132 must be taken to secure S1 or S2 credit

[5] 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

INDUSTRIAL AND MANAGEMENT SYSTEMS ENGINEERING (IEE)

IEE 300 Economic Analysis for Engineers. (3 F S
Economic evaluation of alternatives for engineering decisions, emphasizing the time value of money Prerequisites ECE 100; MAT 270.

IEE 305 Information Systems Engineering. 3 F
Emphasis on systems analysis design and implementation of information systems using fourth generation languages and alternative data base structures Prerequisite CSE 100 *General Studies: N3.*

IEE 360 Manufacturing Processes. (3 F S
Production technique and equipment Casting and molding, forming, machining joining and assembly computer-integrated manufacturing, rapid prototyping and electronics manufacturing Cross-listed as MAE 351 Credit is allowed only for EE 360 or MAE 351 Prerequisite: ECE 350

IEE 361 Manufacturing Processes Lab. (1) F S
Series of abs designed to ustrate concepts presented in IEE 360 on production technique and equipment Corequisite IEE 360 (or MAE 351)

IEE 367 Methods Engineering and Facilities Design. (4) F
Analyzing and designing work systems for productivity, including time and motion studies, human factors materials handling, facility layout and location. Lecture lab Prerequisites CSE 100, IEE 300.

IEE 374 Quality Control. 3) F
Control charting and other statistical process control techniques. Organization and management aspects of quality assurance plus acceptance sampling plans Prerequisite. ECE 380. *General Studies N2*

IEE 394 ST: Special Topics. 4 F, S
(a Facilities Analysis and Design
(b) Work Analysis and Design

IEE 431 Engineering Administration. 3) F
Introduction quantitative and qualitative approaches to management functions engineering administration, organizational analysis, decision making and communication Prerequisite: senior standing

IEE 437 Human Factors Engineering. 3) F
Study of the human psychological and physiological factors that underlie the design of equipment and the interaction between people and machines.

IEE 461 Production Control. 3 F
Techniques for the planning control and evaluation of production systems Project management forecasting, inventory control scheduling, enterprise requirements planning Prerequisites: ASE 485 CSE 100, IEE 476.

IEE 463 Computer-Aided Manufacturing and Control. (3 S
Computer control in manufacturing, CIM NC logic controllers group technology, process planning and robotics Prerequisite C programming capability *General Studies N3.*

NOTE: For the General Studies requirement courses, and codes (such as L1 N3 C and H) see "General Studies" page 85. For graduation requirements see "University Graduation Requirements," page 81. For an explanation of additional omnibus courses offered but not listed in this catalog see "Classification of Courses page 58

IEE 475 Simulating Stochastic Systems. 3 F S
Ana ys s f stochastic systems us ng bas c queu ng networks and d s- crete event s mu ation Bas c network mode ng, shared resources, rout ng, assemb y og c Not open to students w th cred t n EE 545 Prerequ s tes· ASE 485; CSE 100 EE 476 *General Stud es N3*

IEE 476 Operations Research Techniques/Applications. (4 F, S
Industr a systems appl cat ons w th operat ons research techn ques Resource a ocat on product m x, product on sh pp ng task ass gn ment market share, mach ne repa r customer serv ce Not open to students with cred t 'n IEE 546 Prerequ s tes ASE 485 CSE 100 *General Stud es. N2*

IEE 490 Project in Design and Development. (3 F S
nd v'dua or team capstone project n creat ve des gn and synthes s Prerequ s te. senior stand ng.

IEE 505 Applications Engineering. (3) F
Develop working know edge of app cat'on systems deve opment too s needed for computer integrated enterpr se nc udes techn ques for app cat on generation n fourth and f fth generat'on software env ron ments. Top'cs inc ude c ent server network systems dec s on support systems, and transact on systems n d str buted env ronment

IEE 511 Analysis of Decision Processes. (3 S
Methods of making dec s ons 'n comp ex env ronments and stat st cal decision theory effects of r sk, uncerta nty and strategy on eng neer ng and managerial decis ons. Prerequ s te ECE 380

IEE 520 Ergonomics Design. (3 S
Human phys o og ca and psycho og ca factors n the des gn of work env ronments and n the employment of people n man mach ne sys tems. Open shop ab ass gnments n add t on to c ass work Prerequ site IEE 437 or 547

IEE 530 Enterprise Modeling. 3) S
Focus on soc a econom c and techn cal m de s of the enterpr se w th emphas s on the management of techno og ca resources. Inc uded are organ zat on econometr c f nanc a and arge sca e mathemat'ca models

IEE 531 Topics in Engineering Administration. 3 S 2000
Cons derat on g ven to ph osoph ca psycho og ca po t cal and soc a mp ıcat ons of administrat ve dec s ons Prerequ s te. EE 532 or ınstructor approva

IEE 532 Management of Technology. 3 F
Top cs nc ude des gn ng a techn ca strategy techno og ca forecast- ing nterfacing market ng eng neer ng and manufactur ng, des gn ng and manag ng nnovat on systems, creat v ty app cat on of bas c management pr nc p es to techno ogy management Prerequ s te EE 431 or 541 or nstructor approva

IEE 533 Scheduling and Network Analysis Models. (3) S
App cation of schedu ng and sequenc ng a gor thms, determ n st c and stochastic network analys s, and f ow a gor thms Prerequ s tes ECE 380· EE 476 or 546)

IEE 541 Engineering Administration. 3) F
ntroduc ng quant tat ve and qua tat ve approaches to management functions, eng neer ng adm n strat on, organ zat ona ana ys s dec s on mak ng, and commun cat'on EE 431 students ne g'b e.

IEE 543 Computer-Aided Manufacturing and Control. 3) S
Computer contro n manufactur ng C M, NC, og c contro ers, group technology, process p ann ng and robot cs. EE 463 students ne g ble. Prerequ'site: C programm ng capab l ty

IEE 545 Simulating Stochastic Systems. 3 F S
Analys s of stochast c systems us ng bas c queu ng networks and d s crete event s mulat on Bas c network mode ng shared resources routing assemb y l gic Not open to students with cred t n EE 475. Prerequ s tes ASE 485 CSE 100 (or equ valent) EE 476 or 546 .

IEE 546 Operations Research Techniques/Applications. (4) F S
Students model and ana yze ndustr a systems app cat ons with oper at ons research techn ques Res urce a ocat on product m x produc t on, sh pp'ng task assignment, market share, machine repa r customer service Not open to students w th cred t n EE 476. Prereq u's'tes: ASE 485 CSE 100.

IEE 547 Human Factors Engineering. (3) F
Study of peop e at work designing for human performance effect ve ness and product vity Cons derat ons of human phys o og ca and psy cho og ca factors. Open on y to st dents w thout prev ous cred t for EE 437

IEE 552 Strategic Techno ogical Plann ng. 3 S
Study f concept of strategy strategy form at o process and strate- g c p ann ng methodo og es w th emphas s on eng neer ng des gn and manufactur ng strategy comp emented w th case stud es An ana yti ca execut ve p ann ng dec s on supp rt system s presented and used throughout course Pre- or corequ s te EE 545 or 566 or 567 r 574 or 575

IEE 560 Database Concepts for Industria Management Systems. 3 S
App cat on of ob ect r ented database techn gy concepts to manu factur ng and enterpr se systems

IEE 561 Production Systems. 3 F S
Understand ng how factor es operate how performance s measured, and how perat ona changes mpact performan e metr cs Opera t ona ph os ph es ncreas ng product on eff c ency through quant ta t ve methods Prerequ s tes ASE 485 or equ va ent), EE 475, 476.

IEE 562 Computer-Aided Manufacturing (CAM) Tools. (3 F
Current top cs n automat on distr buted c ntro , contro code genera t on, contro og c va dat on CAM ntegrat on CAD CAM data struc tures p ann ng for contro systems Top cs vary by semester Prerequ s te IEE 463 or 543 r equ va ent

IEE 563 Systems Analysis for D stributed Systems. 3 S
Ana ys s and des gn of d str buted gr upware app cat ons for manu factur ng and enterpr se systems Prereq s te ECE 380

IEE 564 Planning for Computer-Integrated Manufacturing. 3) F
Theory and use of DEF methodo ogy n p a n ng for f ex b e manufac tur ng robot cs a d rea t me contro S m at on concepts app ed to comp ter ntegrated manufa tur ng p ann ng Prerequ s te EE 463 or 543

IEE 565 Computer-Integrated Manufacturing Research. 3 S
Determ nat on and eva uat on of resea ch areas n mputer nte grated manufactur g, nc d ng rea t me software manufactur ng nformat n systems f ex b e and ntegrated manufactu ng systems robot cs, and c mputer graph cs Prerequ s te EE 564.

IEE 566 S'mulat'on in Manufactur ng. 3 F
Use of s mu at on n computer ntegrated manufactur ng w th an emphas s on mode ng mater a hand ng systems Programm ng dec arat ve and nte gence based s mu at on env ronments Prereq u s te EE 545

IEE 567 Simulation System Analysis. 3 S
S mu ation mode ng f processes nvo v ng d s rete and ont nuous system components Top cs nc ude random numbe generators, out put ana ys s var ance reduct on and stat st ca ssues re ated to s mu ation Prerequ s te· EE 545

IEE 569 Advanced Statistical Methods. 3 F 2000
App cat on f stat st ca nference pr cedures based on ranks to eng neer ng pr b ems Eff c ent a ternat ves to c ass ca stat st a nference constra ned by norma ty assu pt ons P erequ s te ASE 485 or 500

IEE 570 Advanced Quality Control. 3 S
Econom c based acceptan e amp ng mu t attribute ac epta ce samp ng narr w m t gaug ng n nspector error and attr butes accep- tance samp ng pr nc p es of q a ty management and se ected top cs from current terature Prerequ s te ASE 485 or 500 or equ va ent

IEE 571 Qual ty Management 3 F
Tota qua ty concepts, qua ty strateg es q a ty a d compet t ve pos t on, qua ty costs vendor re at s the qua ty manua and qua ty n the serv ces Prerequ s te IEE 431 or 541

IEE 572 Design of Engineering Experiments. 3 F S
Ana ys s of var ance and exper menta des gn Top cs nc ude genera des gn methodo ogy ncomp ete b cks nfound ng fract ona rep cat on and response surface methodo ogy Prerequ s te ASE 485 or 500

IEE 573 Reliability Engineer ng. 3 S
Nature of re ab ty t me to fa ure dens t es ser es para e standby systems comp ex system e ab ty Bayes an re ab ty, and sequen t a re ab ty tests Prerequ s te ECE 380

IEE 574 Applied Determ'nistic Operat ons Research Models 3 F, S
Advanced techn ques n operat ons research are deve oped for the so ut on of comp ex 'ndustr a systems pr b em . Goa programm ng, nteger programm ng heu st c methods dynam and non near p o- gramm ng Prerequ s tes EE 476 or 546 MAT 242

IEE 575 Applied Stochastic Operations Research Models. 3 S
Students formu ate and so ve nd str a systems prob ems w th st chast c components us'ng ana yt ca techn ques Convo ut on, c nt nu ous time Markov cha ns, queues w th batch ng pr or t es ba k ng open closed queu ng networks Prerequ s tes ASE 485 EE 476 (or 546)

IEE 577 Dec sion and Expert Systems Methodologies. 3 F
App cation of art f c a nte gence methodo og es n dec s on support systems Top cs nc ude neura networks, fuzzy og c systems, and expert systems Prerequ s te CSE 100 or equ va ent

IEE 578 Regression Analysis. 3 F
A course n regress on mode bu d ng r ented toward eng neers/ phys ca sc ent sts Top cs c ude near regress on d agnost cs b ased and robust f tt ng non near regress on Prerequ s te ASE 485 or 500.

IEE 579 Time Series Analysis and Forecasting. 3 F 1999
Forecast ng t me ser es by the Box Jenk ns and exponent a smooth- ng techn ques ex sting d g ta compute programs are ut zed to aug- ment the theory Prerequ tes ASE 485 or 500 EE 461

IEE 582 Response Surfaces and Process Optimization. 3) S
An introduct on to response surface method and ts app cat ons Top ics inc ude steepest ascent canon ca ana ys s des gns and opt ma ity cr ter a. Prerequ s te EE 572

IEE 672 Advanced Topics in Experimental Design. 3 S 2000
Eng neer ng app cat ons of factor a and fract ona factor a des gns w th random zat on restr ct ons ana ys s techn'ques n parameter compar son m ss'ng data unba anced des gns P erequ s te EE 572 or instructor approva

IEE 677 Regression and Linear Models. 3 S 2001
Genera inear mode s appl cat ns theory nc ud g east squares, max mum ke hood est mat on propert es of est mat rs, kel hood rat o tests and computat ona procedures Prerequ s te EE 578 or nstructor approva

IEE 679 Time Series Analysis and Control. 3 F 2000
dent f cat on est mat on d agnost c check ng techn ques for AR MA mode s transfer funct ons m t p e t e ser es mode s f r feedback and feedforward contro schemes Prerequ s'te. EE 579 r nstructor approva

IEE 681 Reliabi ity, Availability, and Serviceability. 3 F 2000
Organ zing hardware and software ntegr ty and fau t to erant des gn maintenance des gn and strategy Markov mode s fau t free ana ys s and mi tary standards Prerequ s te. ECE 380

Department of Mechanical and Aerospace Engineering

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ASSISTANT PROFESSORS
CHAPSKY LEE, MCNEILL PERALTA PHELAN

The Department of Mechanical and Aerospace Engineer ing is the administrative home for two undergraduate majors: Aerospace Engineering and Mechanical Engineer ing.

Both majors build on the broad exposure to the engineer- ing, 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 govern- ment laboratories (e g , NASA) and in a wide range of aerospace and mechanical industries The Mechanical Engi neering 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 the development of fundamental knowledge that will have long lasting utility in our rapidly changing technical society.

DEGREE REQUIREMENTS

All degree programs in the department require that stu dents attain a minimum GPA of 2 00 in the engineering core and in the major and take a minimum of 50 upper division semester hours in order to be eligible for graduation. Also, the department may require additional or remedial course work for those students who have demonstrated a trend toward academic difficulties.

GRADUATION REQUIREMENTS

In addition to fulfilling school and major requirements, majors must satisfy all university graduation requirements See "University Graduation Requirements," page 81.

COURSE REQUIREMENTS

General Studies

See "Course Requirements," page 208, for General Stud ies, school, and engineering core course requirements.

Engineering Core Options

Among the options listed on page 208 as part of the engi neering core requirements students in the Department of Mechanical and Aerospace Engineering are required to take the following.

ECE	100 Introduct on to Engineering Des gn *N3*	4
ECE	210 Engineering Mechanics I. Stat cs	3
ECE	300 Intermediate Engineering Des'gn *LI*	3
ECE	301 Electrical Networks I.	4
ECE	312 Engineering Mechanics II: Dynamics	3
ECE	313 Introduction to Deformable Sol ds	3
ECE	340 Thermodynamics	3
ECE	350 Structure and Properties of Materials .	3
Total		26

AEROSPACE ENGINEERING—B.S.E.

The goa of the Aerospace Engineering program is to pro vide students with an education in technological areas criti cal to the design and development of aerospace vehicles and systems. The program emphasizes aeronautical engineering with topics in required courses covering aerodynamics, aerospace materials, aerospace structures, propulsion, flight

mechanics, aircraft performance, and stability and control. Astronautic topics such as orbital mechanics, attitude dynamics, spacecraft control, and rocket propulsion are also covered in required courses

Design is integrated throughout the curriculum beginning with ECE 100 Introduction to Engineering Design and followed later by ECE 300 Intermediate Engineering Design, both of which focus on basic design theory as well as professional practice. These required courses are followed by topic specific design content in aerospace engineering courses in the junior and senior years. The senior capstone design course integrates design and analysis topics from the earlier courses and completes the required design sequence. This sequence includes a minimum of 20 semester hours of required design. In addition, many of the aerospace technical electives have design content.

Laboratory experience is provided in the areas of aerodynamics, aerospace structures, and vibrations. Laboratory facilities include four major wind tunnels, an integrated mechanical testing laboratory, a controls laboratory, and a vibrations laboratory.

Aerospace Engineering Major

Aerospace Engineering students are required to take the following two courses in addition to those required for the major:

MAT 242	Elementary Linear Algebra	2
PHY 361	Introductory Modern Physics	3

The Aerospace Engineering major consists of the following courses

ECE 384	Numerical Analysis for Engineers I	2
ECE 386	Partial Differential Equations for Engineers	2
EEE 350	Random Signal Analysis	3
MAE 317	Dynamic Systems and Control	3
MAE 361	Aerodynamics I	3
MAE 413	Aircraft Performance, Stability, and Control	3
MAE 415	Vibration Analysis	4
MAE 425	Aerospace Structures	4
MAE 444	Fundamentals of Aerospace Design	3
MAE 460	Gas Dynamics	3
MAE 462	Space Vehicle Dynamics and Control	3
MAE 463	Propulsion	3
MAE 464	Aerospace Laboratory	3
MAE 468	Aerospace Systems Design *L2*	3
Area of emphasis technical electives)		6
Total		48

Aerospace Engineering Areas of Emphasis

To further the design experience, all Aerospace Engineering students must choose at least one technical elective from the following list of courses:

MAE 426	Design of Aerospace Structures	3
MAE 461	Aerodynamics II	3
MAE 465	Rocket Propulsion	3
MAE 466	Rotary Wing Aerodynamics and Performance	3
MAE 467	Aircraft Performance	3
MAE 469	Projects in Astronautics and Aeronautics	3

The remaining technical electives may be selected from among any of the courses listed in the following course tables or from courses listed under the Mechanical Engineering areas of emphasis The courses are grouped so that the student may select an elective package 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 that would support a career objective not covered by the following categories:

Aerodynamics. Select from these courses

MAE 372	Fluid Mechanics	3
MAE 435	Turbomachinery	3
MAE 461	Aerodynamics II	3
MAE 463	Propulsion	3
MAE 466	Rotary Wing Aerodynamics and Performance	3
MAE 471	Computational Fluid Dynamics	3
MAE 490	Projects in Design and Development *L2*	3
MAT 421	Applied Computational Methods *N3*	3

Aerospace Materials. Select from these courses:

MAE 455	Polymers and Composites	3
MSE 355	Introduction to Materials Science and Engineering	3
MSE 420	Physical Metallurgy	3
MSE 440	Mechanical Properties of Solids	3
MSE 441	Analysis of Material Failures	3
MSE 450	X ray and Electron Diffraction	3
MSE 471	Introduction to Ceramics	3

Aerospace Structures. Select from these courses

MAE 404	Finite Elements in Engineering	3
MAE 426	Design of Aerospace Structures	3
MAE 455	Polymers and Composites.	3
MAE 490	Projects in Design and Development *L2*	3

Computer Methods. Select from these courses:

ASE 485	Engineering Statistics *N2*	3
CSE 310	Data Structures and Algorithms II	3
CSE 422	Microprocessor System Design II	4
CSE 428	Computer Aided Processes	3
IEE 463	Computer Aided Manufacturing and Control *N3*	3
IEE 475	Simulating Stochastic Systems *N3*	3
MAE 404	Finite Elements in Engineering	3
MAE 406	CAD CAM Applications in MAE	4
MAE 471	Computational Fluid Dynamics	3
MAE 541	CAD Tools for Engineers	3
MAT 421	Applied Computational Methods *N3*	3
MAT 423	Numerical Analysis I *N3*	3
MAT 425	Numerical Analysis II *N3*	3

Design. Select from these courses:

MAE 341	Mechanism Analysis and Design	3
MAE 404	Finite Elements in Engineering	3
MAE 406	CAD CAM Applications in MAE	4
MAE 426	Design of Aerospace Structures	3
MAE 435	Turbomachinery	3
MAE 442	Mechanical Systems Design	3
MAE 446	Thermal Systems Design	3
MAE 455	Polymers and Composites	3
MAE 466	Rotary Wing Aerodynamics and Performance	3
MAE 467	Aircraft Performance	3
MAE 490	Projects in Design and Development *L2*	3
MSE 440	Mechanical Properties of Solids	3
MSE 441	Analysis of Material Failures	3

NOTE: For the General Studies requirement courses and codes such as L1 N3 C, and H, see General Studies, page 85 For graduation requirements see University Graduation Requirements " page 81 For an explanation of additional common business courses offered but not listed in this catalog see Classification of Courses " page 58.

Mechanical. Any courses listed under "Mechanical Engineering Areas of Emphasis" may be selected

Propulsion. Select from these courses

MAE 382 Thermodynamics . . . 3
MAE 388 Heat Transfer . . . 3
MAE 434 Internal Combustion Engines . . . 3
MAE 435 Turbomachinery . . . 3
MAE 436 Combustion . . . 3
MAE 461 Aerodynamics II . . . 3
MAE 465 Rocket Propulsion . . . 3
MAE 466 Rotary Wing Aerodynamics and Performance . 3
MAE 471 Computational Fluid Dynamics . . . 3
MAE 490 Projects in Design and Development *L2* . . 3

System Dynamics and Control. Select from these courses:

CSE 428 Computer Aided Processes . . . 3
EEE 480 Feedback Systems . . . 4
EEE 482 Introduction to State Space Methods . . . 3
MAE 41 Control System Design . . . 3
MAE 447 Robotics and Its Influence on Design . . . 3
MAE 469 Projects in Astronautics or Aeronautics . . . 3
MAE 490 Projects in Design and Development *L2* . . . 3

TYPICAL FOUR-YEAR SEQUENCE

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

Aerospace Engineering
Program of Study
Typical Four-Year Sequence

First Year

First Semester

CHM 14 General Chemistry for Engineers *S S2* 4
or CHM 116 General Chemistry *S1/S2* 4
ECE 100 Introduction to Engineering Design *V3* . . . 4
or HU SB elective
ENG 101 First Year Composition . . . 3
MAT 270 Calculus with Analytic Geometry I *M1* . . . 4

Total . . . 15

Second Semester

ENG 10 First Year Composition . . . 3
MAT 42 Elementary Linear Algebra . . . 2
MAT 271 Calculus with Analytic Geometry II *M1* . . . 4
PHY 121 University Physics I Mechanics *S1 S2* . . . 3
PHY 122 University Physics Laboratory I *S1 S2* . . . 1
HU, SB, and awareness area course . . . 3
or ECE 100 Introduction to Engineering Design *V3* 4

Total . . . 16

Second Year

First Semester

ECE 210 Engineering Mechanics I Statics . . . 3
ECE 350 Structure and Properties of Materials 3
MAT 27 Calculus with Analyt Geometry III *M1* 4
MAT 4 Elementary Differential Equations *M* . 3
PHY 131 University Physics II. Electricity and Magnetism *S1 S2* . . . 3
PHY 132 University Physics Laboratory II *S1 S2*[3] . 1

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 384 Numerical Analysis for Engineers I . . . 2
ECE 386 Partial Differential Equations for Engineers . . 2

Total . . . 17

Third Year

First Semester

ECE 300 Intermediate Engineering Design *L1* . . . 3
MAE 317 Dynamic Systems and Control . . . 3
MAE 361 Aerodynamics I . . . 3
MAE 425 Aerospace Structures . . . 4
HU, SB, and awareness area course[2] . . . 3

Total . . . 16

Second Semester

EEE 350 Random Signal Analysis . . . 3
MAE 413 Aircraft Performance, Stability, and Control . . . 3
MAE 444 Fundamentals of Aerospace Design . . . 3
MAE 460 Gas Dynamics . . . 3
HU, SB, and awareness area course[2] . . . 3

Total . . . 15

Fourth Year

First Semester

MAE 415 Vibration Analysis . . . 4
MAE 462 Space Vehicle Dynamics and Control . . . 3
MAE 463 Propulsion . . . 3
PHY 361 Introductory Modern Physics . . . 3
Required design technical elective . . . 3

Total . . . 16

Second Semester

MAE 464 Aerospace Laboratory . . . 3
MAE 468 Aerospace Systems Design *L2* . . . 3
Technical electives . . . 3
HU, SB, and awareness area courses[2] . . . 7

Total . . . 16

[1] Both PHY 121 and 122 must be taken to secure S1 or S2 credit

[2] Engineering students may not use aerospace studies AES or military science (MIS courses to satisfy HU or SB requirements See "Degree Requirements," page 199

[3] Both PHY 131 and 132 must be taken to secure S1 or S2 credit

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. Furthermore, since all manufactured products must be constructed of solid materials and because most products contain parts that transmit forces, mechanical engineering is involved in

the structural integrity and materials selection for 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. Therefore, a major strength of a mechanical engineering education is the flexibility it provides in future employment opportunities for its graduates.

The undergraduate curriculum includes the study of: the principles governing the use of energy, the principles of design, instruments and control devices; and the application of these studies to the creative solution of practical, modern problems.

Design is integrated throughout the curriculum, beginning with ECE 100 Introduction to Engineering Design and followed later by ECE 300 Intermediate Engineering Design, both of which focus on basic design theory as well as professional practice. These required courses are followed by topic specific design content in mechanical engineering courses in the junior and senior years. The senior capstone design course combines the design topics from the earlier courses and completes the required design sequence. In addition, many of the mechanical technical electives have design content.

Laboratory experience is provided in the areas of thermofluid systems, mechanics of materials, and controls. Laboratory facilities include a thermal systems laboratory, an integrated mechanical testing laboratory, a controls laboratory, and a manufacturing laboratory.

Mechanical Engineering Major

Mechanical Engineering students are required to select the following supplemental courses:

ECE	384	Numerical Analysis for Engineers I 2
ECE	386	Partial Differential Equations for Engineers 2
EEE	350	Random Signal Analysis 3
MAT	242	Elementary Linear Algebra 2
PHY	361	Introductory Modern Physics 3

The Mechanical Engineering major requires the following departmental courses.

MAE	317	Dynamic Systems and Control 3
MAE	318	Dynamic Systems and Control Laboratory 1
MAE	371	Fluid Mechanics 3
MAE	388	Heat Transfer 3
MAE	422	Mechanics of Materials 4
MAE	441	Principles of Design 3
MAE	443	Engineering Design 3
MAE	490	Projects in Design and Development *L2* 3
MAE	491	Experimental Mechanical Engineering 3
Area of emphasis technical electives)		 15
Total		 41

Mechanical Engineering Areas of Emphasis

Technical electives may be selected from among any of the following courses or from courses listed under the Aerospace Engineering areas of emphasis. The courses are grouped to assist a student in assembling an elective package of closely related courses. Students preferring a broader technical background may choose courses from different areas. With prior approval of the advisor and department, a student may select a general area and a corresponding set of courses not listed that would support a career objective not covered by the following categories.

Aerospace. Any courses listed under Aerospace Engineering areas of emphasis may be selected.

Biomechanical. Select from these courses.

BME	411	Biomedical Engineering I . . . 3
BME	412	Biomedical Engineering II . . . 3
BME	416	Biomechanics . . . 3
BME	419	Biocontrol Systems . . . 3
EEE	302	Electrical Networks II . . . 3
EEE	434	Quantum Mechanics for Engineers 3

Computer Methods. Select from these courses.

ASE	485	Engineering Statistics *N2* 3
CSE	310	Data Structures and Algorithms II 3
CSE	422	Microprocessor System Design II 4
CSE	428	Computer Aided Processes 3
IEE	463	Computer Aided Manufacturing and Control *N3* . . . 3
IEE	475	Simulation Stochastic Systems *N3* . . . 3
MAE	404	Finite Elements in Engineering . . . 3
MAE	406	CAD CAM Applications in MAE . . . 4
MAE	471	Computational Fluid Dynamics . . . 3
MAE	541	CAD Tools for Engineers . . . 3
MAT	421	Applied Computational Methods *N3* . . . 3
MAT	423	Numerical Analysis I *N3* . . . 3
MAT	425	Numerical Analysis II *N3* . . . 3

Control and Dynamic Systems. Select from these courses.

CSE	428	Computer Aided Processes 3
EEE	360	Energy Conversion and Transport 4
IEE	463	Computer Aided Manufacturing and Control *N3* 3
MAE	413	Aircraft Performance, Stability, and Control . . . 3
MAE	417	Control System Design 3
MAE	462	Space Vehicle Dynamics and Control . . . 3
MAE	467	Aircraft Performance 3

Design. Select from these courses.

MAE	341	Mechanism Analysis and Design 3
MAE	351	Manufacturing Processes 3
MAE	404	Finite Elements in Engineering 3
MAE	406	CAD CAM Applications in MAE 4
MAE	413	Aircraft Performance, Stability, and Control . . . 3
MAE	417	Control System Design . . . 3
MAE	434	Internal Combustion Engines . . . 3
MAE	435	Turbomachinery . . . 3
MAE	442	Mechanical Systems Design 3
MAE	446	Thermal Systems Design 3
MAE	447	Robotics and Its Influence on Design 3
MAE	462	Space Vehicle Dynamics and Control 3
MAE	467	Aircraft Performance 3

Energy Systems. Select from these courses:

EEE	360	Energy Conversion and Transport 4
MAE	372	Fluid Mechanics . . . 3
MAE	382	Thermodynamics 3
MAE	434	Internal Combustion Engines 3
MAE	435	Turbomachinery . . . 3

NOTE: For the General Studies requirement courses, and codes such as L1 N3 C and H) see General Studies, page 85. For graduation requirements see University Graduation Requirements" page 81. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses" page 58.

MAE 436 Combustion . . . 3
MAE 446 Thermal Systems Design . . 3

Engineering Mechanics. Select from these courses:

MAE 341 Mechanism Analysis and Design . . 3
MAE 402 Introduction to Continuum Mechanics . . . 3
MAE 404 Finite Elements in Engineering . . . 3
MAE 413 Aircraft Performance, Stability, and Control 3
MAE 415 Vibration Analysis . . . 4
MAE 426 Design of Aerospace Structures. . . 3
MAE 442 Mechanical Systems Design . . 3
MAE 460 Gas Dynamics . . . 3
MAE 461 Aerodynamics II . . . 3
MAE 471 Computational Fluid Dynamics . . . 3
MAT 421 Applied Computational Methods *N3* . . . 3
MAT 423 Numerical Analysis I *N3* . . . 3
MSE 440 Mechanical Properties of Solids . . . 3

Manufacturing. Select from these courses:

CSE 428 Computer Aided Processes . . . 3
IEE 300 Economic Analysis for Engineers . . . 3
IEE 374 Quality Control *N2* . . . 3
IEE 461 Production Control . . . 3
IEE 463 Computer Aided Manufacturing and Control *N3* . . . 3
MAE 341 Mechanism Analysis and Design. . . 3
MAE 351 Manufacturing Processes . . . 3
MAE 404 Finite Elements in Engineering . . . 3
MAE 442 Mechanical Systems Design . . . 3
MAE 447 Robotics and Its Influence on Design . . . 3
MAE 455 Polymers and Composites . 3
MSE 355 Introduction to Materials Science and Engineering . . . 3
MSE 420 Physical Metallurgy . . . 3
MSE 431 Corrosion and Corrosion Control . . . 3
MSE 440 Mechanical Properties of Solids . . . 3

Stress Analysis, Failure Prevention, and Materials. Select from these courses:

MAE 341 Mechanism Analysis and Design. . . . 3
MAE 404 Finite Elements in Engineering . . . 3
MAE 426 Design of Aerospace Structures. . . 3
MAE 447 Robotics and Its Influence on Design . . . 3
MAE 455 Polymers and Composites . . . 3
MSE 355 Introduction to Materials Science and Engineering . . . 3
MSE 420 Physical Metallurgy . . . 3
MSE 431 Corrosion and Corrosion Control . . 3
MSE 440 Mechanical Properties of Solids . . . 3
MSE 450 X ray and Electron Diffraction . . . 3

Thermosciences. Select from these courses

MAE 372 Fluid Mechanics . . . 3
MAE 382 Thermodynamics . . . 3
MAE 433 Air Conditioning and Refrigeration. . . . 3
MAE 434 Internal Combustion Engines . . . 3
MAE 435 Turbomachinery. . . . 3
MAE 436 Combustion. . . . 3
MAE 446 Thermal Systems Design . . . 3
MAE 460 Gas Dynamics. . . . 3
MAE 463 Propulsion . . . 3
MAE 471 Computational Fluid Dynamics . . . 3

Mechanical Engineering
Program of Study
Typical Four-Year Sequence

First Year

First Semester

CHM 114 General Chemistry for Engineers *S1/S2* . . . 4
or CHM 116 General Chemistry *S1/S2* (4)
ECE 100 Introduction to Engineering Design *N3* . . . 4
or HU, SB elective
ENG 101 First Year Composition . . . 3
MAT 270 Calculus with Analytic Geometry I *N1* . . . 4

Total . . . 15

Second Semester

ENG 102 First-Year Composition . . . 3
MAT 242 Elementary Linear Algebra. . . . 2
MAT 271 Calculus with Analytic Geometry II *N1* . . . 4
PHY 121 University Physics I Mechanics *S1/S2*[1] . . . 3
PHY 122 University Physics Laboratory I *S1/S2*[1] . . . 1
HU, SB, and awareness area course[2] . . . 3
or ECE 100 Introduction to Engineering Design *N3* 4)

Total . . . 16

Second Year

First Semester

ECE 210 Engineering Mechanics I. Statics . . . 3
ECE 350 Structure and Properties of Materials . . . 3
MAT 272 Calculus with Analytic Geometry III *N1* . . . 4
MAT 274 Elementary Differential Equations *N1* . . . 3
PHY 131 University Physics II Electricity and Magnetism *S1/S2* . . . 3
PHY 132 University Physics Laboratory II *S1/S2*[3] . . . 1

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 386 Partial Differential Equations for Engineers . . . 2

Total . . . 15

Third Year

First Semester

ECE 300 Intermediate Engineering Design *L1* . . . 3
MAE 317 Dynamic Systems and Control . . . 3
MAE 318 Dynamic Systems and Control Laboratory. . . . 1
MAE 371 Fluid Mechanics. . . . 3
MAE 422 Mechanics of Materials. . . . 4
HU, SB, and awareness area course[2] . . . 3

Total . . . 17

Second Semester

ECE 384 Numerical Analysis for Engineers I . . . 2
EEE 350 Random Signal Analysis . . . 3
MAE 388 Heat Transfer . . . 3
MAE 441 Principles of Design . . . 3
HU, SB and awareness area course[2]. . . . 3
Technical elective. . . . 3

Total . . . 17

Fourth Year

First Semester

MAE 491 Experimental Mechanical Engineering . . . 3
PHY 361 Introductory Modern Physics . . . 3
HU, SB, and awareness area courses)[2] . . . 4

Technical electives	6
Total	16

Second Semester

MAE 443 Engineering Design	3
MAE 490 Projects in Design and Development L2	3
HU, SB, and awareness area course	3
Technical electives	6
Total	15

[1] Both PHY 121 and 122 must be taken to secure S1 or S2 credit

[2] Engineering students may not use aerospace studies AES or military science MIS courses to satisfy HU or SB requirements See "Degree Requirements," page 199

[3] Both PHY 131 and 132 must be taken to secure S1 or S2 credit

MECHANICAL AND AEROSPACE ENGINEERING (MAE)

MAE 317 Dynamic Systems and Control. 3 F S
Modeling and representations of dynamic physical systems including transfer functions block diagrams and state equations Transient response Principle of feedback control and linear system analysis, including root locus and frequency response Prerequisite ECE 312 Corequisite for Mechanical Engineering majors only MAE 318 Prerequisite: ECE 386

MAE 318 Dynamic Systems and Control Lab. 1) F S
Series of laboratory designed to illustrate concepts presented in MAE 317 Lab. Corequisite for Mechanical Engineering majors only MAE 317

MAE 341 Mechanism Analysis and Design. 3 A
Positions, velocities and accelerations of machine parts cams gears flexible connectors and rolling contact Introduction to synthesis Prerequisite ECE 312

MAE 351 Manufacturing Processes. 3 F S
Production techniques and equipment Casting and molding, forming machining joining and assembly computer integrated manufacturing rapid prototyping and electronics manufacturing. Crosslisted as EE 360 Credit is allowed only for EE 360 or MAE 351 Prerequisite ECE 350

MAE 361 Aerodynamics I. 3 A
Fluid statics conservation principles streamline functions velocity potential vorticity inviscid flow Kutta Joukowski theorem airfoil theory and panel methods Prerequisites ECE 312 34

MAE 371 Fluid Mechanics. 3 F S
Introductory concepts of fluid motions fluid statics control volume forms of basic principles viscous internal flows Prerequisites ECE 312 340.

MAE 372 Fluid Mechanics. 3 A
Application of basic principles of fluid mechanics to problems viscous and compressible flow Prerequisites ECE 384, 386, MAE 361 (or 371)

MAE 382 Thermodynamics 3 A
Applied thermodynamics gas mixtures psychrometrics property relations power and refrigeration cycles, and reactive systems Prerequisite ECE 340

MAE 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 361 or 371

MAE 402 Introduction to Continuum Mechanics. 3 A
Application of the principles of continuum mechanics to such fields as flow in porous media biomechanics electromagnetic continua and magneto fluid mechanics Prerequisites ECE 313 MAE 361 or 371); MAT 242 or 342

MAE 404 Finite Elements in Engineering 3 A
Introduction to ideas and methodology of finite element analysis Applications to solid mechanics heat transfer fluid mechanics and vibrations Prerequisites ECE 313 MAT 242 or 342

MAE 406 CAD/CAM Applications in MAE. 4 A
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 3 hours lecture 3 hours lab Prerequisites MAE 441 instructor approval

MAE 413 Aircraft Performance, Stability, and Control. 3 S
Aircraft performance cruise climbing and turning flights energy maneuverability 6 DOF equations for aircraft aerodynamic stability derivatives, flight stability control Prerequisites. MAE 317 361

MAE 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 422 or 425 ; MAT 242 or 342

MAE 417 Control System Design. 3 A
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

MAE 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 or 342 Prior or corequisite ECE 386

MAE 425 Aerospace Structures. 4 A
Stability, energy methods finite element methods, torsion, unsymmetrical bending and torsion of multicelled structures design of aerospace structures Lecture lab Prerequisites ECE 313; MAT 242 or 342

MAE 426 Design of Aerospace Structures 3 A
Flight vehicle loads design of semi-monocoque structures local buckling and crippling, fatigue aerospace materials composites joints and finite element applications. Prerequisites: MAE 361 425

MAE 433 Air Conditioning and Refrigeration. 3 A
Air conditioning processes, environmental control; heating and cooling loads psychrometry refrigeration cycles Prerequisite MAE 388 or MET 432 or instructor approval

MAE 434 Internal Combustion Engines. 3 A
Performance characteristics, combustion carburetion and fuel injection and the cooling and control of internal combustion engines Computer modeling Lab Prerequisite MAE 388

MAE 435 Turbomachinery. 3 A
Design and performance of turbomachines, including steam gas and hydraulic turbines centrifugal pumps compressors fans and blowers. Prior or concurrent requisite MAE 361 or 371

MAE 436 Combustion. 3 A
Thermochemical and reaction rate processes combustion of gaseous and condensed phase fuels Applications to propulsion and heating systems Pollutant formation Prerequisite MAE 388

MAE 441 Principles of Design. 3 F S
Conceptual and embodiment design frameworks and elements of synthesis material selection, failure modes manufacturability tolerances common mechanisms and machine elements Lecture lab project Prerequisites ECE 300 350 Prior or corequisite MAE 422 or 425.

MAE 442 Mechanical Systems Design. 3 A
Application of design principles and techniques to the synthesis modeling and optimization of mechanical electromechanical and hydraulic systems Prerequisites MAE 422 or 425 , 441

MAE 443 Engineering Design. (3 F S
Group projects to design engineering components and systems Problem definition ideation modeling and analysis decision making and documentation activities emphasized 6 hours lab Prerequisite MAE 441

NOTE: For the General Studies requirements courses, and codes (such as L1 N3, C, and H), see "General Studies page 85 For graduation requirements, see University Graduation Requirements" page 81 For an explanation of additional common business courses offered but not listed in this catalog see Classification of Courses page 58.

MAE 444 Fundamentals of Aerospace Design. 3 S
Des gn theory and design tools app ied to aerospace eng neer ng. Eng neer ng draw ngs so d mode ing RFP's Federa Av at on Regu ations and m l tary specif cat ons a rcraft siz ng rap d prototyp ng Lab projects Prerequ s tes ECE 300 MAE 361 425 Pre or corequ s te· MAE 413

MAE 446 Thermal Systems Design. 3) A
App cat on of engineer ng prnc p es and techn ques to the mode ng and analys s of thermal systems and components Opt m zat on tech n ques are presented and their use demonstrated Prerequ s te ECE 300, MAE 388.

MAE 447 Robotics and Its Influence on Design. (3 A
Robot app cat ons conf gurat ons s ngu ar pos t ons, and work space modes of contro v s on, programming exerc ses des gn of parts for assemb y. Prerequ s te MAE 317

MAE 455 Polymers and Composites. (3 F
Re at onship between chem stry, structure and propert es of eng neer ng po ymers. Des gn, propert es and behav or of f ber compos te systems Cross sted as MSE 470 Cred t s a owed on y for MAE 455 or MSE 470 Prerequ s te ECE 350

MAE 460 Gas Dynamics. 3) A
C mpress b e f ow at subson c and superson c speeds· duct f ow· nor mal and ob que shocks perturbat on theory and w nd tunne des gn Prerequ s tes ECE 386 MAE 361 (or 371

MAE 461 Aerodynamics II. (3) A
T anson c/hypersonic f ows w ng theory Nav er Stokes, am nar turbu- ent shear flows pressure drop n tubes separat on drag v scous nv sc d nteract on and w ng des'gn Prerequ s te MAE 460

MAE 462 Space Vehicle Dynamics and Control. 3 F
Attitude dynam cs and contro aunch veh c es orbita mechan cs orb ta transfer rendezvous space m ssion des gn, space structures, spacecraft contro systems des gn Prerequ site. MAE 317

MAE 463 Propulsion. (3) A
Fundamenta s of gas turb ne eng nes and des gn of components Pr nc p es and design of rocket propu s on and alternat ve dev ces Lecture des gn projects Prerequ s te ECE 386 Pre or corequ s te MAE 361 or 371)

MAE 464 Aerospace Laboratory. (3) F S
Aerody am c f w parameters flow over a rfo s and bod es of revo u tion f ow v sua zat on computer-a ded data acqu s'tion and process ng; boundary ayer theory. 1 hour ecture, 4 hours ab Prerequ s tes. ECE 386, MAE 361 460

MAE 465 Rocket Propulsion. 3) A
Rocket fl ght performance nozz e des gn; combust on of qu d and so d prope ants component des gn; advanced propu s on systems, nterp anetary m ss ons test ng. Prerequ s te MAE 361 or 371

MAE 466 Rotary Wing Aerodynamics and Performance. 3 A
Introduct on to hel copter and prope er analys s techn ques Momen tum b ade e ement and vortex methods. Hover and forward f ght Gr und effect autorotat on and compress b ty effects. Prerequ s tes: ECE 386 and MAE 361 *or* nstructor approva

MAE 467 Aircraft Performance. (3 A
ntegrat on of aerodynam c and propu s ve forces nto a rcraft perfor mance des gn Est mat on of drag parameters for des gn Eng ne, a r fo select on Conceptua des gn methodol gy Lecture, des gn projects. Prerequ's te· MAE 361 or 371 Pre- or corequ s te MAE 441.

MAE 468 Aerospace Systems Design. (3) F S
Group projects re ated to aerospace veh c e des gn work ng from m s- s on defin t on and cont nu ng through pre m nary des gn Prerequ s tes MAE 361, 413, 463 *General Stud es. L2*

MAE 469 Projects in Astronautics or Aeronautics. 3 F, S
Var ous mu t d sc p nary team projects ava ab e each semester Projects nc ude des gn of h gh speed rotocraft autonomous veh c es qu d fue ed rockets, m cro aer a veh cles sate tes. Prerequ s te nstructor approva

MAE 471 Computational Fluid Dynamics. 3 A
Numer ca so ut ons for se ected prob ems in f uid mechan cs Prereq u sites ECE 384· MAE 361 (or 371)

MAE 490 Projects in Design and Development. (3 F, S
Capstone projects n fundamenta or app ed aspects of eng neer ng Prerequ s tes MAE 441 491. *General Stud es L2*

MAE 491 Experimental Mechanical Engineering. (3) F S
Exper'menta and ana yt ca stud es f phenomena and performance of f u d f ow heat transfer, thermodynam cs refr'gerat on and mechan cal power systems 6 hours ab Prerequ s tes EEE 350 MAE 388

MAE 498 PS: Pro-Seminar. 1 3) N
Spec a top cs for advanced students App cat on of the eng neer ng d sc p nes t des gn and ana ys s of modern techn cal dev ces and systems. Prerequ s te nstructor approva .

MAE 504 Laser Diagnostics. 3 S
Fundamenta s of opt cs and the nteract on of ght with matter Laser sources aser spectroscopy, veloc metry, part c e s z ng, and surface character zation

MAE 505 Perturbation Methods. 3 N
Non inear osc at ons stra ned coord nates renorma zat on mu tip e sca es boundary ayers matched asymptot c expans ons turn ng po nt prob ems and WKBJ method Cross sted as MAT 505 Cred t s al owed on y for MAE 505 or MAT 505

MAE 506 Advanced System Model ng, Dynamics, and Control. 3) S
Lumped parameter m del ng of phys ca systems w th examples. State variab e representat ons and dynam c response Introduction to modern contro Prerequ s te ASE 582 or MAT 442

MAE 507 Optimal Control. 3) F
Opt ma contro of systems Ca cu us of var at ons, dynam c program ming near quadrat c regu ator numer ca methods, and P ntryag n s pr nc p e. Cross sted as EEE 587 Cred t s a owed on y for EEE 587 or MAE 507. Prerequ s te. EEE 482 or MAE 506

MAE 509 Robust Multivar'able Control. (3 S
Character zat on of u certa nty n feedback systems robustness ana ys s, synthes s techn ques mu tivariab e Nyqu st cr ter a computer a ded ana ys s and des gn Prerequ'sites· MAE 417 506

MAE 510 Dynamics and Vibrations. 3) F
Lagrange's and Ham ton s equat ons r g d body dynam cs, gyroscop c mot on and sma osc at'on theory

MAE 511 Acoustics. 3 F
Pr nc p es under y ng the generat on transmiss on and recept on of acoust c waves Appl cat ons to no se contro arch tectura acoust cs random v brations and acoust c fat gue.

MAE 512 Random V brations. 3 S
Rev ew f probab ty theory random processes, stat onarity, power spectrum wh te no se process random response of s'ng e and mu t p e DOF systems, and Markov processes s mu at on Prerequ s te MAE 510 or nstructor approva

MAE 515 Structural Dynam cs. 3) S
Free v brat on and forced response of d screte and cont nuous sys- tems exact and approx mate methods of so ut on, f n te e ement mod e ng, and computat na techn ques Prerequ s te MAE 510 or nstructor approval

MAE 517 Nonlinear Oscillations. 3) F
Ex stence stab ty, and b furcat on of so ut ons of non near dynam ca systems Methods of analys s of regu ar and chaot c responses Pre requ s te MAE 510 or nstructor approva

MAE 518 Dynamics of Rotor-Bearing Systems. (3 S
Natura wh r frequency cr t ca speed, and response ana ys s of r g d and flex ble rotor systems Bear ng nf uence and representat on Sta b l ty ana ys's Methods of ba anc'ng

MAE 520 Solid Mechanics. 3 F
ntroduct on to tenso s k nemat cs k net cs and const tut ve assump- t ons ead ng to e ast c, p ast c, and viscoe ast c behav or App cat ons

MAE 521 Structural Optimization. (3) N
Linear and non near programm ng Prob em formu at on. Constra ned and unconstra ned opt m zat on. Sens t'v'ty ana ysis Approx mate techn ques FEM based opt ma des gn of mechan ca and aerospace structures. Cross- sted as CEE 533 Cred t s a owed on y for CEE 533 MAE 521 Prerequ s te nstructor approva

MAE 522 Variational Principles of Mechanics (3) S
V rtua work stat onary, and comp ementary potent a energ es Ham ton's pr nc'p e App cat on of these and d'rect methods to v'bra t ons, e ast c ty and stab ty Prerequ s te: MAE 520 or equ va ent

MAE 523 Theory of Plates and Shells. 3) F
Linear and non near theor es of p ates Membrane and bend ng theo r es of shel s She s of revo ut on Prerequ s te MAE 520

MAE 524 Theory of Elasticity. 3 S
Formu at on and so ut on of 2 and 3 d mens ona boundary va ue prob ems Prerequ s te MAE 52

MAE 527 Finite Element Methods in Engineering Science. 3 F
D scret zat on, nterpo at on e ementa matr ces assemb y and com puter mp ementat on App cat on to so d and f u d mechan cs, heat transfer and t'me dependent prob ems Prerequ s te ASE 582

MAE 536 Combustion. 3) N
Thermodynam cs chem ca k net cs of combust n Exp os on and gnit on theor es React ve gas dynam s. Structure p opagat on, and stab ty of flames Exper menta methods Prerequ s te MAE 436 or nstructor approval

MAE 540 Advances in Engineering Design Theory. 3 F
Survey of research n eng neer ng des gn process art fact and des gn know edge forma and nforma g c heur st c and numer ca searches, theory of structure and comp ex ty Prerequ s te graduate stand ng.

MAE 541 CAD Too s for Engineers. 3 F
E ements of computer techn ques requ red to deve op CAD software Data structures nc ud ng sts, trees and graphs Computer graph cs nc ud ng 2 and 3 d mens onal a gor thms and user nterface tech n ques

MAE 542 Geometric Modeling in CAD/CAM. 3) S
Geometr c and so d mode ng c rve and surface des gn CAD data base arch tectures and ntegrat on of so d mode ng nto eng neer ng processes Prerequ s te. MAE 541 r nstructor approva

MAE 544 Mechanical Design and Failure Prevention. 3 F
Modes of mechan ca fa ure app cat n of pr nc ples of e ast c ty and p astic ty n mult ax a state of stress t des gn synthes s, fai ure theo r es, fat gue creep, mpact Prerequ s te· MAE 443

MAE 546 CAD/CAM Applications in MAE 4 F
So ut on of eng neer ng p ob ems with the a d of state of the art soft ware too s n so d mode ng eng eer ng ana ys s and manufactur'ng se ect on of mode ng parameters re ab ty tests on software Open on y to students w thout prev ous cred t for MAE 406 3 hours ecture 3 hours ab Prerequ s te nstructor approva

MAE 547 Mechanical Design and Control of Robots. 3 N
Homogene us transformat ons 3 d mens onal k nemat cs ge metry of mot on forward and nverse k nemat cs workspace and motion tra-jector es dynam cs, contro and stat c forces

MAE 548 Mechanism Synthesis and Analysis. (3 S
A gebra c and graph ca methods for exact and approx mate synthes s of cam gear, and nkage mechan sms des gn opt m zat on methods of planar mot on ana ys s character st cs of p ane mot on spat a k ne-mat cs.

MAE 557 Mechanics of Composite Materials. 3) S
Ana ysis of composite mater a s and app cat ons M cromechan ca and macromechan ca behav or C ass ca am nat n theory deve - oped w th nvest gat on of bend ng extens on coup ng

MAE 560 Propuls on Systems. 3 N
Des gn of air breath ng gas turb ne eng nes f r a rcraft propu s on m ss on ana ysis cyc e ana ys s; e g ne s z ng component design

MAE 561 Computational Fluid Dynamics. (3 S
F n te-d fference and f n te vo ume techn ques for so v ng the sub son c, transon c and superson c f w equat ons The method of char acter st cs Numer cal gr d generat on techn ques Prerequ s te: MAE 571 or nstructor approva

MAE 563 Unsteady Aerodynamics. 3 S
Unsteady ncompress b e and compress ble f w W ngs and bod es n osc l atory and trans ent mot ons Kerne funct on approach and pane methods Aeroe ast c app cat ons Prerequ s te MAE 460 or 461

MAE 564 Advanced Aerodynamics. 3 F
Perturbat on method L near zed sub n c and superson c f ows Th n w ng/s ender body theor es L'ft ng surface the ry Pane method com putat on. Prereq s te MAE 46 or 461

MAE 566 Rotary W'ng Aerodynamics. 3 F
Introduct on to he copter and prope er ana ys s techn ques Momen tum b ade e ement and vortex methods Hover and forward f ght Ground effect autorotat on and compress b ty effects Prerequ s te. MAE 361

MAE 571 Fluid Mechanics. (3 F
Bas c k nemat c dynam c and thermodynam c eq at ons of the f u d cont nuum and the r app cat on to bas c f u d mode s

MAE 572 Inviscid Flu'd Flow. 3) S
Mecha cs of f u ds for f ows n wh ch the effects of v scos ty may be gnored P tent a f ow theory waves and nv sc d compress b e flows Prerequ s te MAE 571

MAE 573 V scous Fluid Flow. 3 F
Mechan cs of f u ds for f ows wh ch the effects of v scos ty are s gn f cant Exact and approx mate solut ons of the Nav er Stokes system am'nar f ow at ow and h gh Reyno ds number Prerequ s te MAE 571

MAE 575 Turbulent Shear Flows. 3) F
Homogeneous sotrop c and wa turbu ence Exper menta resu ts ntroduct on to turbu ent f ow ca cu at ons Prerequ s te MAE 571.

MAE 577 Turbulent Flow Modeling. 3 S
Reyno ds equat o s and the r c osure Mode ng of s mple and c m p ex turbu ent f ows ca cu at ons of nterna and externa f ows and app cat on to eng neer ng prob ems Prerequ s te MAE 571

MAE 581 Thermodynamics. 3 F
Bas c concepts and aws of c ass ca equ br um thermodynam cs app cat ons to eng neer ng systems Introduct on to stat st ca thermo dynam cs

MAE 582 Statistical Thermodynamics. 3 A
K net c and quantum theory Stat st ca mechan cs ensemble theory Structure and thermodynam cs of non nteract ng and nteract'ng part c es Bo tzmann ntegro-d fferent a equat on Prerequ s te· graduate stand ng

MAE 585 Conduction Heat Transfer. 3 F
Basic equat ons and concepts of conduct on heat transfer Mathemat ca formu at on and so ut on ana yt ca and numer ca) of steady and unsteady one and mu t d mens'ona heat conduct on and phase change prob ems Prerequ's tes ECE 386; MAE 388

MAE 586 Convection Heat Transfer. 3 S
Bas c concepts and govern ng equat ons Ana ys s of am nar and tur-bu ent heat transfer for nterna and externa f ows Natura and m xed convect on Prerequ's'te: MAE 388

MAE 587 Radiation Heat Transfer. 3) F
Advanced concepts and so ut on methodo og es for rad at on heat transfer nc ud ng exchange of therma rad at on between surfaces rad at on n absorb ng, em tt ng and scatter ng med a and rad at on comb ed w th co duct on and convect on Prerequis te MAE 388

MAE 588 Two-Phase Flows and Boiling Heat Transfer. 3 S
Poo and f ow bo ng heat transfer condensat on heat transfer var ous m de s of vapor l qu d mixture f ws gas so d m xture f ows and exper menta measurement techn ques

MAE 589 Heat Transfer. 3 F
Bas c concepts; phys ca and mathemat cal models for heat transfer. App cations to conduct ve, co vect ve rad at ve and comb ned mode heat transfer Prerequ s te MAE 388

MAE 594 Graduate Research Conference. 1 F, S
Top cs n contemporary research. Requ red every semester of a departmenta graduate students reg stered for 9 or more semester hours Not for degree cred t

MAE 598 ST: Special Topics. 1 3 F S
Spec a top cs courses nc ud ng the fo w ng wh ch are regu ar y offered are open t qua f ed students

a Advanced Spacecraft Contro
b Aeroe ast c ty
c Aerospace Veh c e Gu dance and Contro
d Boundary Layer Stab ty
e Hydrodynam c Stab ty
f) P ast c ty
g Po ymers and Compos tes

NOTE: For the Genera Stud es requ rement, c urses and codes such as L1 N3, C, and H), see Genera Stud es " page 85 For graduat on requirements see Un vers ty Graduat on Requ rements " page 81 For an exp anat on of add t ona omn bus courses offered but not sted n th s cata og, see C ass f cat on of Courses page 58

Programs in Engineering Special Studies

Daniel F. Jankowski
Director

The programs leading to the B S.E. degree in Engineering Special Studies are administered by the Dean of the College of Engineering and Applied Sciences

PURPOSE

The major of Engineering Special Studies accommodates 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. The major is a School of Engineering program. Unlike the departmental major areas, however, there is not a separate faculty The faculty teaching and advising in these programs are from the various departments within 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.

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

ENGINEERING SPECIAL STUDIES—B.S.E.

Premedical Engineering. In the past decade, the interrelation between engineering and medicine has become vigorous and exciting Our rapidly expanding technology dictates that engineering will continue to become increasingly involved in all branches of medicine. As this develops, so will the need for physicians trained in the engineering sciences medical men and women with a knowledge of computer technology, transport phenomena biomechanics, bioelectric phenomena, operations research, and cybernetics This 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. The following courses are required in the premedical engineering option and have been selected to meet all university and school requirements. Note: In order to fulfill medical school admission requirements, BIO 182 General Biology is also required in addition to the degree requirements and is best taken in summer session before the Medical College Admission Test (MCAT).

First-Year Composition

Choose among the course combinations below .... 6 or 3
- ENG 101 First Year Composition 3)
- ENG 102 First Year Composition 3
  or
- ENG 105 Advanced First Year Composition 3
- Elective chosen with an advisor 3

or

- ENG 107 English for Foreign Students 3
- ENG 108 English for Foreign Students 3

Total .. 6 or 3

General Studies/School Requirements

Humanities and Fine Arts Social and Behavioral Sciences

ECN 111 Macroeconomic Principles *SB* ... 3
or ECN 112 Microeconomic Principles *SB*[1] 3)
HU, SB, and awareness area courses ... 13

Total ... 16

Literacy and Critical Inquiry

BME 413 Biomedical Instrumentation *L2* ... 3
BME 423 Biomedical Instrumentation Laboratory *L2* 1
ECE 300 Intermediate Engineering Design *L1* 3

Total ... 7

Natural Sciences

PHY 12 University Physics I Mechanics *S1/S2*[3] ... 3
PHY 122 University Physics Laboratory I *S1/S2*[3] ... 1
PHY 131 University Physics II Electricity and Magnetism *S1 S2*[4] ... 3
PHY 132 University Physics Laboratory II *S1/S2*[4] ... 1

Total ... 8

Numerics/Mathematics

ECE 100 Introduction to Engineering Design *N3* ... 4
MAT 242 Elementary Linear Algebra ... 2
or ECE 384 Numerical Analysis for Engineers I 2
or ECE 386 Partial Differential Equations for Engineers 2
MAT 270 Calculus with Analytic Geometry I *N1* ... 4
MAT 271 Calculus with Analytic Geometry II *N1* ... 4
MAT 272 Calculus with Analytic Geometry III *N1* ... 4
MAT 274 Elementary Differential Equations *N1* ... 3

Total ... 21
General Studies school requirements total ... 52

Engineering Core

ECE 210 Engineering Mechanics I: Statics ... 3
ECE 301 Electrical Networks I ... 4
ECE 334 Electronic Devices and Instrumentation 4
ECE 340 Thermodynamics ... 3
ECE 350 Structure and Properties of Materials ... 3

Total ... 21

Engineering Special Studies Program Major—Premedical Engineering Option

BIO 81 General Biology *S1 S2* ... 4
BME 201 Introduction to Bioengineering *L1* ... 3
BME 318 Biomaterials ... 3
BME 331 Biomedical Engineering Transport I Fluids 3
BME 334 Bioengineering Heat and Mass Transfer ... 3
BME 416 Biomechanics ... 3
BME 417 Biomedical Engineering Capstone Design I ... 3
BME 435 Physiology for Engineers ... 4

BME 470 Microcomputer Applications in Bioengineering . . 4
BME 490 Biomedical Engineering Capstone Design II . . 3
CHM 113 General Chemistry *S1/S2* . . 4
CHM 116 General Chemistry *S1/S2* . . 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
ECE 380 Probability and Statistics for Engineering Problem Solving *N2* . . 3
Technical elective . . 1

Total . . 53

[1] ECN 111 or ECN 112 must be included to fulfill the HU and SB requirements.

[2] Engineering students may not use aerospace studies (AES) or military science (MIS) courses to fulfill HU and SB requirements. See "Degree Requirements," page 199.

[3] Both PHY 121 and 122 must be taken to secure S1 or S2 credit.

[4] Both PHY 131 and 132 must be taken to secure S1 or S2 credit.

Premedical Engineering
Program of Study
Typical Four-Year Sequence

First Year

First Semester

CHM 113 General Chemistry *S1/S2* . . 4
ECE 100 Introduction to Engineering Design *N3* . . 4
ENG 101 First Year Composition . . 3
MAT 270 Calculus with Analytic Geometry I *N1* . . 4

Total . . 15

Second Semester

CHM 116 General Chemistry *S1/S2* . . 4
ENG 102 First Year Composition . . 3
MAT 271 Calculus with Analytic Geometry II *N1* . . 4
PHY 121 University Physics I: Mechanics *S1/S2*[1] . . 3
PHY 122 University Physics Laboratory I *S1/S2* . . 1

Total . . 15

Second Year

First Semester

BIO 181 General Biology *S1/S2* . . 4
BME 201 Introduction to Bioengineering *L1* . . 3
ECE 210 Engineering Mechanics I Statics . . 3
MAT 272 Calculus with Analytic Geometry III *N1* . . 4
PHY 131 University Physics II: Electricity and Magnetism *S1/S2*[2] . . 3
PHY 132 University Physics Laboratory II *S1/S2*[2] . . 1

Total . . 18

Second Semester

CHM 331 General Organic Chemistry . . 3
CHM 335 General Organic Chemistry Laboratory . . 1
ECE 301 Electrical Networks I . . 4
ECE 350 Structure and Properties of Materials . . 3
ECN 111 Macroeconomic Principles *SB* . . 3
or ECN 112 Microeconomic Principles *SB* (3
MAT 274 Elementary Differential Equations *N1* 3

Total . . 17

Third Year

First Semester

BME 331 Biomedical Engineering Transport I Fluids . . 3
BME 435 Physiology for Engineers . . 4
CHM 332 General Organic Chemistry . . 3
ECE 300 Intermediate Engineering Design *L1* . 3
ECE 340 Thermodynamics . . 3

Total . . 16

Second Semester

BME 318 Biomaterials . . 3
BME 334 Bioengineering Heat and Mass Transfer . . 3
CHM 336 General Organic Chemistry Laboratory . 1
ECE 334 Electronic Devices and Instrumentation 4
MAT 242 Elementary Linear Algebra *N1* . . 2
or ECE 384 Numerical Analysis for Engineers 2
or ECE 386 Partial Differential Equations for Engineers 2
HU, SB, and awareness area course s) . . 4

Total . . 17

Fourth Year

First Semester

BME 413 Biomedical Instrumentation *L2* . 3
BME 416 Biomechanics . . 3
BME 417 Biomedical Engineering Capstone Design I . . 3
BME 423 Biomedical Instrumentation Laboratory *L2* . . 1
HU, SB, and awareness area courses[3] . . 6

Total . . 16

Second Semester

BME 470 Microcomputer Applications in Bioengineering .4
BME 490 Biomedical Engineering Capstone Design II .3
ECE 380 Probability and Statistics for Engineering Problem Solving *N2* . . .3
HU, SB, and awareness area course . . 3
Technical elective . . 1

Total . . 14
Degree requirements total . . 128

[1] Both PHY 121 and 122 must be taken to secure S1 or S2 credit

[2] Both PHY 131 and 132 must be taken to secure S1 or S2 credit

[3] Engineering students may not use aerospace studies AES or military science (MIS) courses to satisfy HU or SB requirements See "Degree Requirements," page 199

NOTE: For the General Studies requirement, courses and codes (such as L1, N3 C, and H) see "General Studies" page 85. For graduation requirements, see University Graduation Requirements," page 81. For an explanation of additional common business courses offered but not listed in this catalog, see "Classification of Courses" page 58.

College of Extended Education

Bette F. DeGraw, D.P.A.
Dean

PURPOSE

The College of Extended Education was created in 1990 to extend the resources of ASU throughout Maricopa County, the state, and the region. The College of Extended Education is a university wide college which oversees ASU's Extended Campus and forms partnerships with other ASU colleges to meet the instructional and informational needs of a diverse community.

For the most current information, visit the college s Web site at www asu edu/xed

ASU EXTENDED CAMPUS

The ASU Extended Campus goes beyond the boundaries of ASU's three physical campuses to provide access to aca demic credit and degree programs for working adults through flexible schedules; a vast network of off campus sites; classes scheduled days, evenings, and weekends, plus innovative delivery technologies including television, the Internet, and independent learning. The Extended Campus also offers a variety of professional continuing education and community outreach programs.

DEGREE PROGRAMS

ASU offers several degree programs through the ASU Extended Campus Convenient times and locations as well as today's innovative technologies make it easier for work ing adults and other nontraditional students to earn a degree. The College of Extended Education facilitates the delivery of these programs All courses and degrees are offered through the respective university academic departments. These courses are published each fall and spring semester in the *Extended Campus Catalog* and in the *Schedule of Classes*

Bachelor of Interdisciplinary Studies. This interdisciplinary degree program enables students to take an active role in creating their educational plan and defining their career goals. The program is offered for selected corporate employees at Motorola University West. It emphasizes self assessment and appraisal of opportunities to support aca demic and career goals

For more information, call 480 965 9797 or write

PATR CIA FELDMAN
COLLEGE OF EXTENDED EDUCAT ON
INSTRUCTIONAL PROGRAMS
AR ZONA STATE UN VERSITY
PO BOX 874001
TEMPE AZ 85287-4001

College of Architecture and Environmental Design. The faculty in the School of Planning and Landscape Architec ture in the College of Architecture and Environmental Design offer the Bachelor of Science in Design degree with a major in Housing and Urban Development primarily at the ASU Downtown Center, although some courses may be available at other locations and via cable television See the fall and spring issues of the *Extended Campus Catalogs* for complete schedu ing information. For information about this progran , call 480 965 7167 or write

SCHOOL OF PLANN NG AND LANDSCAPE
ARCHITECTURE
ARIZONA STATE UN VERSITY
PO BOX 872005
TEMPE AZ 85287 2005

College of Business. The Technology M.B.A is an evening program designed specifically for technology professionals. The degree pr ogram is offered at the ASU Research Park. Cases, applications, and examples emphasize technology, global competition, and rapid organizational change The evening M.B A. is offered at the ASU Dow ntow n Center. It is designed to meet the needs of working professionals and combines theoretical concepts with practical applications Call the College of Business at 480 965 3332 for detailed information about these degree programs.

College of Education. Three education degrees the Bach elor of Arts in Education degree in Elementary Education and two Master of Education degrees are available through the Off Can pus Degree Program. These degree programs are targeted to specific audiences To learn more about these education degrees, call 480 965 1644.

College of Public Programs. The College of Public Pro grams offers a Master of Public Administration (M.P.A.) degree This interdisciplinary program is designed to pro vide professional training for careers in public administra tion and management Opportunities for c ompleting course work leading to an M.P.A. are offered during evening hours at the ASU Main Campus and the ASU Downtown Center. For more information about this program, call 480 965 3926 or write

DR D CK NSON McGAW
SCHOOL OF PUBL C AFFA RS
ARIZONA STATE UN VERSITY
PO BOX 87063
TEMPE AZ 85287-0603

School of Social Work. The School of Social Work, in cooperation with the College of Extended Education, offers a Bachelo of Socia Work degree in Tucson. This program is grant funded for a five year period and offers a part time curriculum des gned to increase the number of trained child welfare social workers in the rural areas of Arizona. For more information, call 520/884 5507, extension 19

Technology-Delivered Degree Program

The faculty in the Department of Electrical Engineering offer the Master of Science in Engineering via interactive television. This degree program meets the needs of the part time student who is working full time in industry Ten graduate courses are required; six should constitute a major, two courses a minor, and two courses should be taken outside the Department of Electrical Engineering After completing the required hours of course work, students in this program must pass a comprehensive examination covering topics in the major. Using the department's three year schedule of courses, students are able to complete course requirements over the interactive television system. For more information, call 480/965 3590.

On-Campus Evening Degree Programs

College of Liberal Arts and Sciences. The College of Liberal Arts and Sciences offers six evening degree programs: the B.A. degree in English, History, Political Science, and Sociology, and B.A and B.S. degrees in Psychology. For more information about these programs, call 480/965 3986 and request "degree programs."

College of Public Programs. The faculty in the Department of Communication in the College of Public Programs offers B.A. and B.S. degrees in Communication through the College of Extended Education's Evening Degree Program. For more information, call 480 965 5095

Winter Session

The College of Extended Education schedules the winter session courses in collaboration with ASU's academic departments. The condensed, three-week session is offered between the fall and spring semesters. For more information about winter session, call 480 965 9797.

CERTIFICATE PROGRAMS

Certificate programs provide opportunities for those seeking to advance their careers, to begin a new career, to reenter the workplace, or to simply develop new knowledge A practical choice for career development, certificate programs are recognized by employers as evidence of professional skill or accomplishment.

Computer Technology Certificates

Whether your need is for career advancement, skills enhancement/maintenance, or launching a new career, Computer Technology Programs offers five certificates designed to build professional capabilities. The certificates range from basic computer skills competency to advanced operating systems engineering. For more information, call 480/965 9200.

Gerontology Certificate Program

The Certificate in Gerontology, offered by the Graduate College, is available to graduate students enrolled in master's or doctoral degrees in disciplines such as Communication, Exercise Science, Nursing, Psychology, Social Work, and Sociology. Unclassified graduate students may pursue the certificate. This program consists of 24 credit hours evenly divided between required and elective course work.

The Gerontology Program has an affiliated faculty of over 60 members who are based in 22 different departments throughout the university. Students can work on independent study or participate with faculty in their aging related research

Increased longevity means that by the year 2040 there could be more than 30 million Americans over the age of 85. The certificate is designed for individuals interested in learning more about the aging process For more information, call 480 965 3225 (ASU Main) or 602/543 6600 ASU West)

Human Performance Improvement Certificate Program

The Human Performance Improvement Certificate Program is offered by the College of Extended Education and the American Society of Training and Development This program is designed to provide a well rounded understanding of the human performance improvement field for those in a human resource capacity. Individuals can receive a Human Performance Improvement Certificate after completing the six courses of the program or may elect to enroll in one or more classes on a per class basis For more information, call 480 945 3046.

Nonprofit Management Certificate Program

The Nonprofit Management Institute is offered by the College of Extended Education and the United Way. This program is designed to enhance the management skills of those who serve nonprofit human services groups, hospitals, government agencies, churches, private schools, art organizations, environmental groups, and others in the nonprofit sector.

Individuals can receive a Certificate in Nonprofit Management along with 13 Continuing Education Units CEUs) after completing 130 hours of the program. The individual class option permits participants to enroll in one or more classes on a per class basis Additional full- and half day workshops are also provided to help those in the nonprofit sector achieve excellence in managing nonprofit organizations. For more information, call 480 965 3046

Post-Master's Family Nurse Practitioner Certificate Program

In keeping with the demand for more primary health care providers, ASU offers this program to master's in Nursing) prepared nurses with commensurate interests and experience. The 31 semester hour program is one year in length and begins in May The curriculum is approved by the Arizona State Board of Nursing; Arizona State University, College of Nursing Curriculum Committee, and faculty; Arizona State University's Graduate College; and the program is also approved by the Arizona Board of Regents It meets educational requirements for national certification examinations. Classes and practica are offered at various locations throughout the metropolitan area, including ASU Main, ASU Downtown Center, and multiple clinical sites Classes are scheduled during the days, evenings, and weekends With only 10 student positions available per year, admission to the program is competitive. For more information, call the College of Nursing's Post Master's Family Nurse Practitioner Certificate Program Office at 480 965 7787.

COLLEGE UNITS BY PROGRAM AREA

Degree Programs and Credit Courses

The College of Extended Education facilitates the delivery of several degree programs and credit courses. All courses and degrees are offered through the respective university academic departments. These courses are published each fall and spring semester in the *Extended Campus Catalog* and in the *Schedule of Classes*.

Academic and Professional Programs. As a convenience to students, courses are conducted off campus in locations throughout the state, and on campus in the evening, and during the winter intersession.

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 registration fees and tuition for off-campus courses are the same as for those offered on campus. (See resident and nonresident rates in the current *Schedule of Classes*.) Before the 21st calendar day of each semester, 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, resident registration fees or full-time nonresident registration fees and tuition. Off-campus credit courses and programs that commence on or after the 21st calendar day of the start of each semester require full-time and part-time students to pay registration fees and tuition separate from (but in addition to) those courses starting before the 21st calendar day of the semester.

ASU offers several degree programs through the ASU Extended Campus. Convenient times and locations as well as today's innovative technologies make it easier for working adults and other nontraditional students to earn a degree. For details, see "Degree Programs," page 254.

For more information about Academic and Professional Programs, call 480/965-9797.

Distance Learning Technology. Distance Learning Technology uses a variety of technologies. Semester-based courses are offered through Instructional Television Fixed Service (ITFS), cable television, public television, satellite, microwave, videotape, and the Internet. In addition, independent learning courses are offered (print- or Internet-based). Distance Learning Technology makes it possible for many people to access and share educational resources locally, regionally, nationally, and internationally through a variety of electronic technologies and distribution systems. In addition to distance learning courses, other products and services are available including teleconferencing and video production.

Many students are unable to attend class on campus due to schedule or commuting difficulties and prefer to participate in distance learning courses at convenient locations such as the work site or home. ASU's distance learning course schedule consists of approximately 120 courses offered by various ASU colleges each semester, and these courses are available for credit at a variety of remote locations, including students' homes. Students participating in televised courses from the work site or home can interact with faculty and students in the classroom on campus while

The Mercado, home to ASU's Downtown Center

Tim Trumble photo

class is in session via teleconferenc ng technology. Video tapes of most courses are available through University Libraries Video Resources. Other student support services are available to assist off campus students.

Cable/Public Television. ASU offers credit courses that require students to view televised class sessions and com plete work assignments at home Exams usually are held on campus. Courses are available throughout the Phoenix area via KAET Channel 8, Cox Communications, Insight Cable, Cable America, People's Choice Television, or other cable providers ASU's televised courses are also available n the university residence halls

Interactive Instructional Television Program (IITP). Stu dents employed by companies participating in the IITP may take courses for credit at the work site. A daily courier ser vice circulates course materials between faculty on campus and their students at remote sites Exams typically are held at the work site. E ich company has an on site coordinator to assist with registration, to provide information, and to proc tor exams. A Master of Science in Engineering degree with an emphasis in electrical engineering is available through the IITP. More information about the televised Master of Science in Engineering degree is available from the College of Engineering and Applied Sciences at 480 965 3506

Interactive Television (Public Sites) Certain sites are open to the public Students can participate in most televised courses at locations such as ASU West, ASU East, ASU Downtown Center, select community college campuses, Cactus Shadows High School, and the G la River Indian Community. Each public site has an on site coordinator to assist with registration, to provide information, and to proc tor exams.

Internet Courses. Some departments on campus are offering Internet courses through the Extended Campus, allowing students to participate from any location in the world. Through the World Wide Web, students can access lectures, participate in class assignments, interact with the instructor, collaborate with other students, and earn ASU credit at times and locations that are convenient. Students register for Internet courses through the normal university admissions registration process Certain computer hardware s ftware may be required for Internet courses. Further information is available from Distance Learning Technology at 480/ 965-6738.

Independent Learning These courses allow students to pur sue ASU credit and to fulfill degree requirements or to enhance occupational, professional, and intellectual skills. Independent Learning courses are appropriate for students who are seeking flexibility in progressing through university courses Any individual with a high school diploma or GED may enroll; however, enrollment in Independent Learning is not the same as admission to ASU. For ASU degree seeking students, enrollment in these courses requires advisor's and dean's approval. Generally ASU students may take one course at a time other students can participate in two. A maximum of 60 semester hours earned by independent learning and/or by comprehensive examination may be applied toward the baccalaureate degree at ASU. Indepen dent Learning courses are not applicable toward graduate credit, and pass fail options are not available Students have up to one year to complete courses Further information regarding registration, lesson formats, submission of assign ments, correspondence with instructors and other course details are available in a catalog from the Independent Learning office at 480 965 6563.

Professional and Continuing Education

Professional and Continuing Education activities focus on professional and personal development as well as life long learning. Programs are planned and developed to com plement the missions of the college and the university These programs can be customized and transported to reach numerous target populations and levels of need.

Professional continuing education programs are provided to meet the educational needs of various professions, the community, and public and private organizations. These ongoing programs are intended to improve professional competence and address current issues and trends, and are offered to adult learners in collaboration with ASU colleges, other educational providers, professional associations, and public and private organizations. In addit on, the Elderhostel Program, a series of challenging, thought provoking col lege level courses, is offered to people over 55 For more information about any of the programs, call 480 965 3046.

Computer Technology Programs offers computing train ing classes in the latest versions of software and courseware as well as a full range of short, streamlined courses in pro gressive levels. Development of programs for specialized markets, such as executives, small business owners, retirees and youth, is ongoing Classes are offered at the ASU Downtown Center, on the ASU Main campus, and in the Sun Cities and Mesa, as well as in many work sites For more information, call 480 965 9200.

Lifelong learning programs provide an informative expe rience that enriches lives. All programs are open to the pub lic and adults of any age or educational background can learn in an nformal, noncompetitive environment Pro grams in the Sun Cities area are geared toward the retire ment communities and include a variety of courses. For an international educational travel experience, ASU and Trave Learn partner to provide programs to 15 exciting destina tions, including Costa Rica, Egypt, Indonesia, and Kenya. For more information about lifelong learning programs, call 480 965 3046.

Global and Community Outreach

American English and Culture Program. The American English and Culture Program (AECP features an intensive course of study designed for adult international students who want to become proficient in English as a second lan guage for academic, professional, or personal reasons. Applicants must be at least 18 years of age and must have 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 appli cants. Students are required to take an English placement test before the beginning of classes. Certificates of achieve ment are awarded on completion of the course. Admission to the program does not constitute regular admission to ASU

Beginning, intermediate, and advanced courses provide instruction in listening, reading, speaking, structure, and writing Academ c advising and orientation to Arizona and the United States are integra parts of the program.

Program wide social activities each cycle include a field trip, a picnic, a cultural activity visits to museums, histori cal sites, or musical presentations.

Advanced level students may be permitted to enroll con currently in up to two ASU credit classes with the approval of the director Several special classes are offered through the AECP. Classes in conversation, speech improvement, and the Test of English as a Foreign Language (TOEFL) are offered during 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. Inquir ies concerning admission requirements, enrollment, and fee schedules should be sent to

AMERICAN ENGLISH AND CULTURE PROGRAM
DEPARTMENT 4
ARIZONA STATE UNIVERSITY
PO BOX 873106
TEMPE AZ 85287-3106

For more information, call 480 965 3106.

Extended Campus Programs. Extended Campus Pro grams was established in response to the rapidly expanding demand for educational services in Maricopa County and throughout Arizona Analyzing community needs for course offerings, workshops and seminars, the unit oversees the planning, organizing, and staffing necessary to satisfy these educational needs.

A primary goal of this unit is to ensure that qualified stu dents have access to effective, appropriate university pro grams. Extended Campus Programs focuses on developing and maintaining education, business, government, profes sional, and community linkages in the furtherance of the university's and college's missions.

The major components of Extended Campus Programs are the classes and events at the ASU Downtown Center and emerging programs in the East Valley, Scottsdale, and Ahwatukee. For more information, call 480 965 3046.

ASU Downtown Center. The ASU Downtown Center is a university wide resource located in downtown Phoenix that serves as an educational, applied research, and community service facility

Responding to the needs of business, industry, and state and local governments, the center offers traditional and interdisciplinary upper division undergraduate and gradu ate level courses. The center also offers professional and continuing education programs, lectures, and community forums, and serves as a meeting location for conferences, workshops and seminars.

ASU faculty, staff, and students can take advantage of the center's computer lab A lab assistant is available during posted hours. They can also access the ASU library online catalog and ASU library information and resources. Library books may be ordered and returned through the center. Text books for all courses held at the center are available at one of the ASU libraries usually at the beginning of each semes ter.

Accommodations for small or large meetings or confer ences are available at attractive rates and can include bever ages, food service, and professional equipment. Advice in logistics planning is available as are a wide range of related services. The center is available for use by outside organiza tions, subject to the limits of university policies and proce dures. Contact the center's facility scheduler for details.

For more information about the programs and services provided at the center, call 480 965 3046 or write

ASU DOWNTOWN CENTER
502 E MONROE ST
PHOENIX AZ 85004 2337

Several ASU programs and partnerships are located at the Downtown Center

Professional and Continuing Education. Professional and Continuing Education is part of the Extended Campus and the College of Extended Education. This brings the resources of ASU to many who may not be pursuing a tradi tional degree and are seeking professional and personal enrichment. See "Professional and Continuing Education," page 257, for a description.

Joint Urban Design Program The Joint Urban Design Pro gram, located in the ASU Downtown Center, is a partner ship between the ASU colleges of Architecture and Environmental Design and Extended Education. The pro gram directs institutional and public resources toward devel oping an understanding of issues that affect the urban quality of Phoenix For more information, call 480/ 965 3046

Center for Urban Inquiry. The Center for Urban Inquiry, a partnership with the College of Public Programs, serves as a resource for analysis and implementation of public policy in metropolitan Phoenix. The center works closely with ASU researchers and organizations such as the Joint Urban Design Program, the Morrison Institute for Public Policy, University Libraries, local government, state agencies, and other independent organizations to build a comprehensive database on policy issues for urban planners and community leaders. For more information, call 480 965 3046.

Advanced Public Executive Program. The Advanced Public Executive Program of the ASU College of Public Programs is housed at the ASU Downtown Center. This program is designed to provide public managers and administrators with analytical approaches and skills through short courses and seminars to help mobilize ideas, people, and resources in support of public programs. For more information, call 480 965 4006.

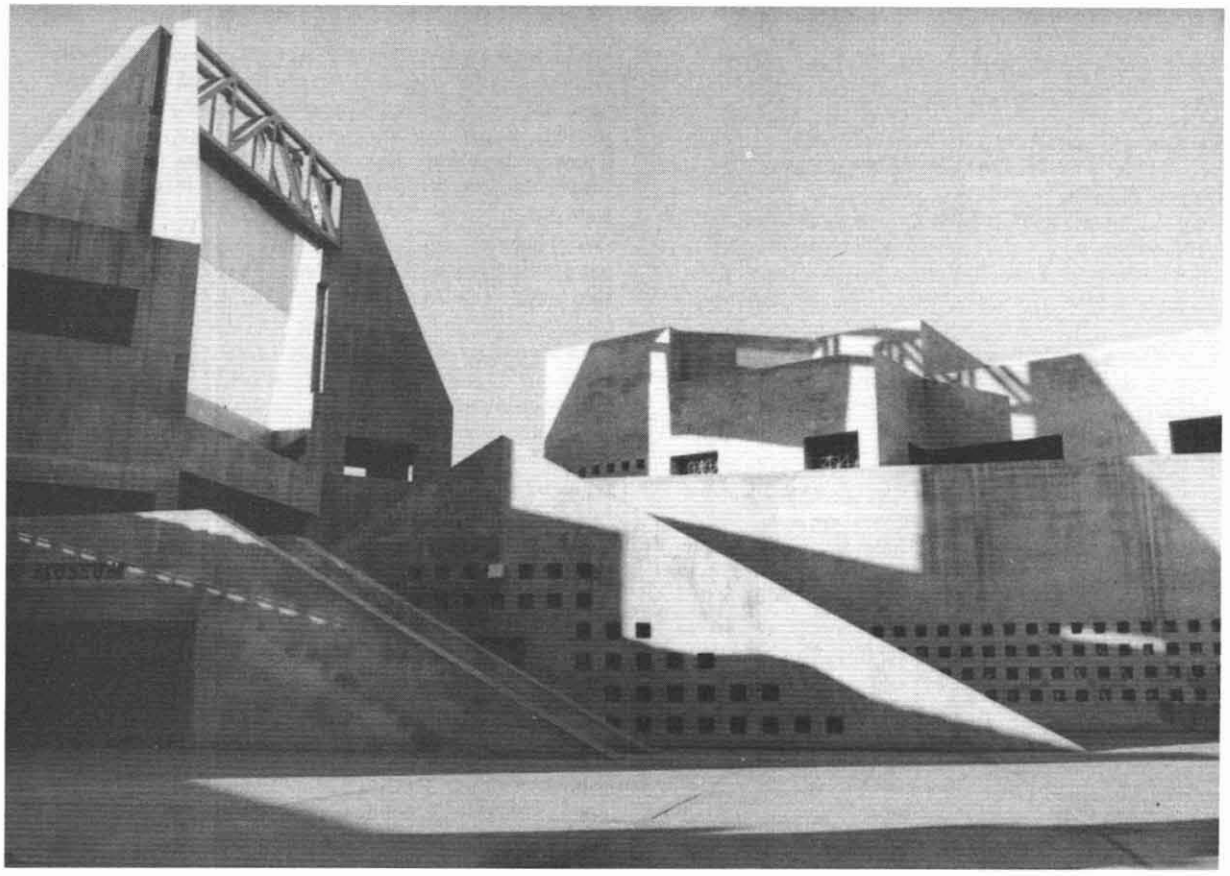
Office of Youth Preparation and Project PRIME. The office of Youth Preparation and Project PRIME (Project to Improve Minority Education are housed at the Downtown Center with evaluation support services located at the His panic Research Center. The programs are designed to increase the pool of college eligible minority students, who have historically been underrepresented in higher education, by providing instructional and support services to seventh through twelfth grade students and their families at targeted Arizona schools For more information, call 480/965 8510.

Arizona Drug and Gang Prevention Resource Center The Arizona Drug and Gang Prevention Resource Center serves as a centralized source for individuals, schools, and commu nities throughout Arizona to support, enhance, and initiate prevention efforts.

For information about planning, mobilizing, training, and evaluating community prevention efforts, contact the center at 480/727 2 72.

College of Fine Arts

J. Robert Wills, Ph.D.
Dean



Nelson Fine Arts Center

John MacIsaac photo

PURPOSE

The Co ege of Fine Arts provides both preprofessional and professional education in the arts disciplines and 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 contemporary artist and scholar The arts, as an integral part of the curriculum, offer the student a rewarding educational experience balanced and strengthened by studies in related fine arts areas, the humanities, social sciences, and the natural sciences

In addition to professional curricula offered in each department and school, the co lege provides courses designed to meet the specific educational needs of students pursuing majors in other colleges throughout the university. 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 a myriad of concerts, art exhibitions, music and dance concerts, dramatic productions, operas, 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 2,800 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 the university requirements for admission may matriculate in the College of Fine Arts Separate admission 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. The university standards for evaluation of transfer credit are listed under "Transfer Credit," page 63 Transfer students are encouraged to contact their department or school or the College of Fine Arts Undergraduate Student Academic Services (GHALL 127) to ensure a smooth transition to the College of Fine Arts 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 began 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 45 hours of work taken at the university must be upper division credits While attending a community college, it is suggested that students select courses similar to ASU General Studies 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. Every candidate for the bachelor's degree must earn a minimum of 30 semester hours in resident credit at ASU 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.

ADVISING

Advising is handled as a decentralized activity within the college To offer personalized attention, each academic unit establishes its own graduation advising procedures. Students are encouraged to make appointments through the central office of their department or school.

Baccalaureate Degrees

The three baccalaureate degrees differ in curricula with respect to the amount of specialization permitted in the major field. The B.A degree provides a broad, scholarly, humanistic program, while the other two programs place greater emphasis upon the major field. See the "College of Fine Arts Baccalaureate Degrees and Majors" table, page 261, for more information.

The university General Studies curriculum plays an integral role within the educational mission of the university and as such constitutes an important component of all undergraduate degrees in the College of Fine Arts. See "General Studies," page 85, for more information

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 consult with 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 submitted scores from either the Pre-Professional Skills Test PPST) or the ACT. Further details on admission requirements and procedures for the PTPP can be found under "College of Education," page 177.

Minors

The College of Fine Arts provides an opportunity for students majoring in other disciplines to sustain their interest in the arts through a structured program of required courses and electives leading to a minor. The minor is not intended as a substitute for professional work in the arts, but as a complement to various liberal arts and preprofessional curricula

College of Fine Arts Baccalaureate Degrees and Majors

Major	Degree	Administered by
Art Concentrations: art history, photographic studies, studio art	B A	School of Art
Art Concentrations: art education, ceramics, drawing, fibers, intermedia, metals, painting, photography, printmaking, sculpture	B.F.A.	School of Art
Dance Concentrations: choreography, dance education, dance studies, performance	B.F A.	Department of Dance
Music	B A	School of Music
Music Education*	B.M.	School of Music
Concentrations: choral general, instrumental, string		
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 Concentrations: acting, design/technical theatre, directing stage management, history theory and criticism	B.A	Department of Theatre
Theatre Concentration. theatre education	B.F.A.	Department of Theatre
Theory and Composition Concentrations: composition, theory	B.M.	School of Music

* This major requires more than 120 semester hours to comp ete

Minors are offered in Art History, Dance, Music, and Theatre. The total number of semester hours required for a minor ranges from 18 to 22. Students should contact the rel evant academic unit for specific requirements and guide lines regarding the minor

Graduate Degrees

Master's programs range from 30 to 60 semester hours, depending upon the degree chosen Doctoral programs vary in scope and curricula. See the "College of Fine Arts Gradu ate Degrees and Majors" table, page 262, for more informa tion. See the *Graduate Catalog* for specific requirements.

UNIVERSITY GRADUATION REQUIREMENTS

In addition to fulfilling college and major requirements, students must meet all university graduation requirements. For more information, see "University Graduation Require ments," page 81.

General Studies Requirement

All students enrolled in a baccalaureate degree program must satisfy a university requirement of a minimum of 35 semester hours of approved course work in General Studies, as described under "General Studies," page 85. Note that all three General Studies awareness areas are required. Consult your advisor for an approved list of courses General Studies courses are listed in the "General Studies" section, page 87, in the course descriptions, in the *Schedule of Classes* and in the *Summer Sessions Bulletin.*

Courses in the major or in a related field area may not be used to satisfy both the major and core area portions of the General Studies requirement. Concurrent listings in the lit eracy areas, numeracy (computer applications) areas, and awareness areas are an exception. Students are encouraged to consult with an academic advisor to ensure that they comply with all necessary requirements.

COLLEGE DEGREE REQUIREMENTS

College of Fine Arts degree requirements supplement the General Studies requirement Descriptions of additional required courses follow. Students are encouraged to consult with an academic advisor to ensure that they comply with all necessary requirements

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 courses may be in art, dance, music, or theatre A student may concurrently fulfill this requirement and the humanities and fine arts portion of the General Stud ies requirement by selecting approved courses as indicated in the *Schedule of Classes*. This requirement may also be met by taking *any* College of Fine Arts course outside of the student's major

All B.A. degrees require the equivalent of 16 semester hours in one foreign language except for the B.A degrees in Theatre and Art with a concentration in studio art. Foreign language study is strongly recommended but not required for these degree programs 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 anguage study at the level above completed work.

Candidates for the B M degree in Performance with a concentration in piano acc mpany ng or voice and in The ory and Composition with a concentration in theory have specific foreign language requirements, which are stated

College of Fine Arts Graduate Degrees and Majors

Major	Degree	Administered by
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
Composition	M M	School of Music
Creative Writing	M F A *	Creative Writing Committee
Dance	M.F.A.	Department of Dance
Music Concentrations: ethnomusicology, music history and literature, music theory	M.A.	School of Music
Music Education Concentrations choral music, general music, instrumental music, jazz studies	M.M	School of Music
Music Concentrations choral conducting; composition, music education; solo performance (instrumental, keyboard, voice)	D M.A.	School of Mus c
Performance Concentrations: music theatre musical direction; music theatre performance; performance pedagogy; piano accompanying; solo performance instrumental, keyboard, voice)	M M	School of Music
Theatre	M.A.	Department of Theatre
Theatre Concentrations: performance, scenography, theatre for youth	M F A	Department of Theatre
Theatre Concentration: theatre for youth	Ph D	Department of Theatre

* This program is administered by the Graduate College See "Creative Wr ting M F A. ." page 302 Playwr ting is an opt on for students in this program offered by the faculty in the Department of Theatre Fiction, nonfiction, poetry, and screenwr ting are a so options in this pro gram offered by the faculty in the Department of Engl sh

with each of the degree requirements. There is no foreign language requirement for other concentrations of the B.F.A. or B M. degrees.

MAJOR REQUIREMENTS

The minimum requirement for a baccalaureate degree is the completion of 120 semester hours with a minimum cumulative GPA of 2.00. Of these 120 semester hours, at least 45 must be selected from upper division courses.

Several 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 degree credit, all course work in the major discipline must show an earned grade of "C" (2.00) or higher.

In addition to the general information given below, con sult the school and departmental sections that follow for specif c degree requirements.

Bachelor of Arts (B.A.) Degree. The B.A. degree requires 45–60 semester hours for the major Depending on the major, 18 to 24 hours must be selected from upper division (300 or 400 level) courses. The semester hour require ments in the major are distributed between a field of specialization (30 to 53 hours) and one or more related fields (an additional 15 hours) The exact content of the ma or is selected by a student in consultation with an advi sor under rules and regulations of the department or school concerned. Auditions and/or interviews are required for admission to the B.A. in Theatre with concentrations degree program. Consult the Department of Theatre for specific information An entrance audition is a so required for admission to the B.A. in Music degree program

Bachelor of Fine Arts (B.F.A.) Degree. The B.F A. degree requires 52 to 79 semester hours for the major At least 30 of these hours, depending on the major, must be selected from upper division (300 or 400 level) courses The curriculum for the major is designed as preprofessional study in art, dance, or theatre education Auditions and/or interviews are required for admission to the B.F A. degree programs in Dance and Theatre. Consult these departments for specific information.

Bachelor of Music (B.M.) Degree. The B.M degree requires 79 semester hours for the major The required num ber of upper division (300 or 400 level) courses is depen dent upon the area of specialization The curriculum for the major is designed to provide a broad yet concentrated prep aration with a choice of specialization among the areas of jazz, music education, music performance, music theatre, music therapy, piano accompanying, and theory compo sition. An entering undergraduate music student, regardless of the area of specialization, must perform an entrance audi tion in his or her primary performing medium (voice or instrument)

ACADEMIC STANDARDS

The terms of disqualification, reinstatement, and appeals are consistent with those set forth by the university under "Retention and Academic Standards," page 77, except for degree programs in Theatre For all concentrations in the B.A. degree in Theatre, a student must have a minimum GPA of 2.50 in the major and an overall GPA of 2.00 to enroll in upper division courses and to remain in good standing. For the B F A degree in Theatre with a concentration in theatre education, a student must have a minimum GPA of 3 00 in the ma or to enroll in upper-division courses and to remain in good standing. In addition, a student disqualified in any program is normal y not eligible for reinstatement for two semesters

SPECIAL PROGRAMS

Working closely with faculty, visiting scholars, and artists in residence, students in all fields of the College of Fine Arts participate in dynamic, innovative programs Students receive a great deal of individua attention to their creative work and artistic development

The School of Art is one of the largest programs of its kind in the country and offers students a wide range of specialties in media, art history, and art education. The faculty are nationally recognized and provide excellent instruction in a curriculum with many different educational opportunities. Some of the unique offerings are bookmaking and paperhanging, digital, film, neon, video animation, and foundry. In addition, internships are available in galleries and museums throughout the Phoenix area The Children's Art Workshop is an on campus program taught by students in art education for school age children in the metropolitan area Northlight Gallery, a teaching gallery, hosts exhibitions organized and curated by students. Visiting artists and guest lecturers enrich the basic curriculum . Graduates of the School of Art have been accepted to top graduate schools and many are in eadership positions in art, education, and industry.

Recognized as one of the top programs in the country, the Department of Dance emphasizes the choreography, performance, and theory of modern dance. Nationally prominent faculty and visiting artists create repertory for dance majors and for the Dance Arizona Repertory Theatre (DART), a student touring outreach company. An ambitious performance program offers several concerts to the public each year with additional works created and performed by graduate and undergraduate students. Students work closely with renowned artists and companies who visit the campus annually and with researchers in the areas of dance science, dance in relation to technology dance music composition, labanotation, sound and video production ASU students and faculty have consistently taken top honors at the regional and national festivals of the American College Dance Festiva Association

Performers, teachers, conductors, composers, and scholars recognized both nationally and internationally make up the faculty of the School of Music. 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 has inaugurated a redesigned B.A. degree program that allows a 54 hour concentration in acting, design/technical theatre, directing stage management, or history theory and criticism. A strong feature of the new B A degree program is the broad liberal arts education, which cultivates in the student the ability to understand human behavior and values in societies of the past and present, an essential element in the creation of and response to theatre. Students interested in theatre education enroll in a B.F.A. degree program designed to allow work in both the Department of Theatre and the College of Education Special strengths of the department include internationally acclaimed programs in theatre education and theatre for youth, an outstanding playwriting area that infuses each specialization with new script work, multiethnic courses and programs in acting and directing, an acting program that allows work with nationally acclaimed directors and acting coaches, and a nationally recognized scenography area that provides for further specialization in costume, lighting, or scene design as well as theatre technology.

Production is at the core of ASU theatre and the quality of the faculty, student body and facilities often attracts professionals to ASU. The department recently premiered productions by three Pulitzer prize winning playwrights Four to six subscription series plays are produced in the 500 seat Galvin Playhouse and the smaller Lyceum Theatre An additional eight to 14 student directed shows are presented as part of the scholarship series The Youth Arts Festival brings many multitalented artists and thousands of students to campus.

Theatre for youth artists, students, and scholars are attracted to ASU by the opportunities to work on national K 12 theatre curricula and research projects, theatre tours to area schools, and opportunities to teach on and off campus The Child Drama Special Collection in Hayden Library, which includes rare books, plays, and personal and national association archives, is the most complete and extensive collection of its kind in the English speaking world and also contributes to the international recognition of the theatre for youth faculty

Since theatre is a collaborative art form, students at the undergraduate level are required to learn and participate in all phases of theatre, specializing in an area of their choosing. In the theatre education and theatre for youth programs, both undergraduate and graduate students are challenged to excel in every aspect of theatrical training Students are offered acting, directing, and other production opportunities for main stage, studio, and touring shows, as well as research and teaching possibilities on and off campus Students in the B.A. and M.F.A scenography programs are actively involved in all aspects of design and technology for main stage and studio productions and have received regional and national awards for their work. The M.F.A. degree in Theatre with a concentration in performance challenges performing artists to reinvigorate the classics, develop new works, explore new theatrical forms, and discover changing relationships between art and technology

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 degree 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 the 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 the schools in which they are interested.

School of Art

Julie F. Codell
Director
(ART 102) 480/965-3468
www.asu.edu/cfa/art

PROFESSORS
ALQUIST, BATES, BRITTON, CODELL, COLLINS, ECKERT, ERICKSON, FAHLMAN, FRONSKE, GASOWSKI, GILLINGWATER, JAYAKADA, LOVELESS, MAGENTA, MESSINGER, PILE, PRENTEL, RISSEEUW, SCHMIDT, SHARER, STOKROCKI, SWEENEY, TAYLOR, WEISER, WHITE, YOUNG

ASSOCIATE PROFESSORS
COCKE, de MATTEIS, DUNCAN, GULLY, HAJCEK, JENKINS, KLETT, KRONENGOLD, MAXWELL, PITTSLEY, SCHLEIF, SCHOEBEL, SCHUTTE, SEGURA, SERWINT, SMITH, UMBERGER, VERSTEGEN

ASSISTANT PROFESSORS
BROWN, MCIVER, PESSLER, WOLFTHAL

LECTURER
HOKIN

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 Undergraduate Advising office.

BACHELOR OF ARTS DEGREE

The faculty in the School of Art offer three concentrations for students in the B.A. degree in Art program: art history, photographic studies, and studio art. These concentrations are intended to give the student a broadly based general education in the field with some specialized work at the upper division level.

MAJOR REQUIREMENTS

The major in Art consists of 45 to 48 semester hours, depending on the concentration, and includes the requirements listed below for each concentration. B.A. programs are especially suited for individuals pursuing interdisciplinary studies or a minor in another discipline. All courses in the major must be completed with a "C" or higher.

GRADUATION REQUIREMENTS

In addition to fulfilling the major requirements, students must meet all university graduation requirements and college degree requirements. See "University Graduation Requirements," page 81, and "College Degree Requirements," page 261.

Art History

Related Subject Field. Select three courses (nine semester hours) from those with the prefix APH, ARA, ARE or from the following:

ART	111	Drawing I 3
ART	112	Two Dimensional Design 3
ART	113	Color 3
ART	115	Three Dimensional Design . . . 3
ART	201	Photography I. 3
ART	260	Ceramics for Nonmajors 3
ART	274	Wood I. 3
ART	294	ST Special Topics 3

Also required is an approved upper division elective. Six semester hours of ART courses are recommended.

Specialization. The following courses make up the specialization:

ARS	101	Art of the Western World I *HU, H* . . . 3
ARS	102	Art of the Western World II *HU, H* . . . 3
ARS	480	Research Methods *L2* 3
ARS	498	PS Art History 3
Total		 12

Also required is at least one course from each of the following areas: ancient, baroque, medieval, modern, non-Western, and renaissance art.

This concentration 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 semester hours in related fields. At least 18 of the 45 semester hours must be upper division credit. Satisfactory completion of ARS 480 Research Methods is required before the senior year. Demonstrated proficiency 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 "Department of Languages and Literatures," page 385. (ASL is not acceptable for Art History majors.)

Art History Minor

The School of Art offers a minor in Art History consisting of 18 semester hours of course work, including 12 upper division electives A minimum grade of "C" is required of all classes in the minor and for those pursuing a minor, a minimum overa l GPA of 2 00 is required. Courses may not be double counted in a major and the minor, and a minimum of 12 hours of resident credit at ASU Main is required. A "Minor Approval Form" must be submitted.

ARS 100 or ARS 300 may be used toward a minor.

Required Courses. Select two of the following four required courses:

ARS	101	Art of the Western World I *HU, H*	3
ARS	102	Art of the Western World II *HU H*	3
ARS	201	Art of Asia *HU H*	3
ARS	202	Art of Africa, Oceania, and the Americas *HU H*	3

Elective Courses. Students pursuing an art history minor will select four three semester hour upper division courses. A seminar is strongly recommended for those considering graduate study. Students need to be aware of necessary lower division prerequisites for all upper division courses.

Studio Art

Core Curriculum. The following courses make up the core curriculum:

ARS	101	Art of the Western World I *HU, H*	3
ARS	102	Art of the Western World II *HU H*	3
ART	111	Drawing I	3
ART	112	Two Dimensional Design	3
ART	113	Color	3
ART	115	Three Dimensional Design	3
Total			18

Specialization. Eighteen semester hours of ART courses, including 12 upper division semester hours are required. Courses in area of specialization must have a focus.

Art History. Nine semester hours of ARS courses are required, which must include three semester hours of non-Western art. At least six semester hours must be upper division ARS courses.

Photographic Studies

Art History. The following art history courses are required:

ARS	101	Art of the Western World I *HU H*	3
ARS	102	Art of the Western World II *HU, H*	3
ARS	450	19th Century Photography *HU*	3
ARS	451	20th Century Photography *HU*	3
ARS	454	Research and Writing in Photography	3
ARS	458	Critical Theories in the Visual Arts *HU*	3
ARS	494	ST History of Photography	3
ARS	elective (modern art		3
Total			24

Photography The following photography courses are required:

ARA	202	Introduct on to Photo Aesthetics	3
ARA	494	ST Advanced Photo Aesthetics	3
ART	201	Photography I	3
ART	301	Photography II	3
ART	304	Advanced Photography	3
ART	409	Photographic Exhibition	6
ART	494	ST 19th Century Photo Processes	3
Total			24

This concentration consists of 48 semester hours as approved by the student's advisor. Demonstrated proficiency 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 "Department of Languages and Literatures," page 385

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, intermedia, metals, painting, photography, printmaking, and sculpture.

Core Curriculum. All students in this degree program follow the same core curriculum in art for the first two semesters:

ARS	101	Art of the Western World I *HU H*	3
ARS	102	Art of the Western World II *HL, H*	3
ART	111	Drawing I	3
ART	112	Two Dimensional Design	3
ART	113	Color	3
ART	115	Three Dimensional Design	3
Total			18

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 completed with a "C" or higher. The specific requirements for each 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 Art courses that do not have the same title and description as ASU catalog courses must have the approval of the School of Art Standards Committee.

GRADUATION REQUIREMENTS

In addition to fulfilling the major requirements, students must meet all university graduation requirements and college degree requirements. See "University Graduation Requirements," page 81, and "College Degree Requirements," page 261.

NOTE: For the General Studies requirement, courses and codes (such as L1 N3 C and H see General Studies page 85 For graduation requirements see University Graduation Requirements, page 81 For an explanation of additional omnibus courses offered but not listed in this catalog see 'Classification of Courses " page 58

Art Education

Core Curriculum. See "Core Curriculum," page 265 for the courses that make up the core curriculum.

Specialization. The following courses make up the specialization

ARE	450 Studio Art: Art History I	3
ARE	460 Disciplines of Art Education	3
ARE	470 Art Criticism: Aesthetics	3
ARE	482 Studio Art: Art History II	3
ARE	486 Art Education: Strategies and Applications	3
ARE	494 ST: Special Topics	3
ARE	496 Methods and Assessment of Learning in Art	3
Total		21

Area of Proficiency. Twenty one semester hours are required with a minimum of 15 semester hours in a specific area of studio or art history. Twelve of these semester hours must be upper division credits

Art History. Six semester hours of ARS upper division electives are required with one course in art during the 20th century

Additional Requirements. The following courses are additional requirements:

ART	201 Photography I	3
ART	223 Painting I	3
ART	231 Sculpture I	3
	or ART 261 Ceramic Survey 3	
	or ART 272 Jewelry I 3	
	or ART 274 Wood I 3	
	or ART 276 Fibers I 3	
Total		9

The concentration in art education consists of 75 semester hours with 21 semester hours in art education and 21 semester hours in an art proficiency approved by an art education advisor The art proficiency courses must include a minimum of 15 semester hours in a specific area of studio art or art history. Twelve of these semester hours must be upper division credits. The art proficiency can be in art history, ceramics, drawing, fibers, intermedia, metals, painting, photography, printmaking, or sculpture Teaching experience is provided in the Children's Art Workshop, which is an on campus program based in studio and art history for children ages five to 15 Participation in the workshop is part of the requirements for ARE 486 Art Education: Strategies and Applications. ARE 486 meets the state certification requirements for the elementary methods class, and ARE 496 Methods and Assessment of Learning in Art meets the requirements for the secondary methods class in the subject area. Both of these courses have prerequisites

A student pursuing a B F.A degree 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 semester hours are required in the College of Education. Students must make special application to the professional education program in the College of Education three months before 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) or the ACT 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 as follows.

ARE	450 Studio Art: Art History I	3
ARE	482 Studio Art: Art History II	3
ARE	486 Art Education: Strategies and Applications	3
ARE	496 Methods and Assessment of Learning in Art	3
Total		12

The B.F A degree 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 based on a 2.50 GPA, completion of foundations courses (ART 111, 112, 113, and 115), completion of 12 semester hours of art history courses (ARS 101 and 102 and two upper division courses), and a "B" or higher in ARE 450 and 460. In addition, undergraduate and postbaccalaureate students seeking K 12 certification should check requirements and deadlines for admission to the College of Education professional program.

Student teaching in art education occurs only in 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. degree in Art with a concentration in art education without certification or may reapply after meeting deficiencies in knowledge and skills related to the teaching of art

Ceramics

Core Curriculum. See "Core Curriculum," page 265, for the courses that make up the core curriculum.

Specialization. The following courses make up the special ization.

ART	231 Sculpture I	3
ART	261 Ceramic Survey	3
ART	360 Ceramic Throwing	3
ART	364 Ceramic Handbuilding I	3
ART	365 Ceramic Handbuilding II	3
ART	460 Ceramic Clay	3
ART	463 Ceramic Glaze	3
ART	466 Special Problems in Ceramics	6
Total		27

Art History. Six semester hours of upper division ARS, including three semester hours of a 20th century elective and three semester hours of non Western art are required.

Additional Requirements. One of the following four courses is required:

ART	211 Drawing II	3
ART	214 Life Drawing I	3
ART	227 Watercolor I	3
ART	443 Intermedia	3

Two of the following three courses (six semester hours) are required:

ART 272 Jewelry I . . . 3
ART 274 Wood I . . . 3
ART 276 Fibers I . . . 3

Art Electives. Fifteen semester hours of ARA, ARE, ARS, and ART courses are required

Drawing

Core Curriculum. See "Core Curriculum," page 265, for the courses that make up the core curriculum.

Specialization. The following courses make up the specialization:

ART 211 Drawing II . . . 3
ART 214 Life Drawing I . . . 3
ART 223 Painting I . . . 3
ART 227 Watercolor I . . . 3
ART 311 Drawing III . . . 3
ART 314 Life Drawing II . . . 3
ART 315 Life Drawing III . . . 3
ART 494 ST: Drawing/Painting . . . 3

Total . . . 24

Also required are six semester hours of ART 411 and/or 414 and three semester hours in printmaking.

Art History. Three semester hours of non Western art are required as well as six semester hours of upper division ARS courses.

Additional Requirements. Two of the following six courses (six semester hours) are required:

ART 201 Photography I . . . 3
ART 231 Sculpture I . . . 3
ART 261 Ceramic Survey . . . 3
ART 272 Jewelry I . . . 3
ART 274 Wood I . . . 3
ART 276 Fibers I . . . 3

Art Electives. Nine semester hours of ARA, ARE, ARS, or ART courses are required.

Fibers

Core Curriculum. See "Core Curriculum," page 265, for the courses that make up the core curriculum.

Specialization. The following courses make up the special ization:

ART 276 Fibers I . . . 3
ART 376 Fibers: Loom Techniques . . . 3
ART 377 Surface Design . . . 3
ART 476 Fibers, Multiple Harness Weaving . . . 6
ART 477 Printed Textiles . . . 6

Total . . . 21

Art History. Six semester hours of upper-division ARS courses are required, including a 20th century elective.

Additional Requirements. Three of the following six courses (nine hours are required:

ART 201 Photography I . . . 3
ART 231 Sculpture I . . . 3
ART 261 Ceramic Survey . . . 3
ART 272 Jewelry I . . . 3
ART 274 Wood I . . . 3
ART 354 Screen Printing I . . . 3

Art Electives. Twenty one semester hours of ARA, ARE, ARS, and ART courses are required

Intermedia

Core Curriculum. See "Core Curriculum," page 265, for the courses that make up the core curriculum.

Specialization. The following courses make up the special ization:

ART 439 Mixed Media . . . 3
ART 441 New Media Concepts . . . 3
ART 443 Intermedia . . . 3

Total . . . 9

Two of the following five courses (six semester hours) are required:

ART 231 Sculpture I . . . 3
ART 261 Ceramic Survey . . . 3
ART 272 Jewelry I . . . 3
ART 274 Wood I . . . 3
ART 276 Fibers I . . . 3

Two of the following nine courses six semester hours) are required

ART 201 Photography I . . . 3
ART 211 Drawing II . . . 3
ART 214 Life Drawing I . . . 3
ART 223 Painting I . . . 3
ART 227 Watercolor I . . . 3
ART 351 Intaglio I . . . 3
ART 352 Lithography I . . . 3
ART 354 Screen Printing I . . . 3
ART 355 Photo Process for Printmaking I . . . 3

Two of the following ten courses (six semester hours) are required:

ART 439 Mixed Media . . . 3
ART 441 New Media Concepts . . . 3
ART 442 Folk/Outsider Art . . . 3
ART 443 Intermedia . . . 3
ART 444 Computer Art I A3* . . . 3
ART 446 Computer Art II A3* . . . 3
ART 448 Computer Animation I* . . . 3
ART 449 Computer Animation II* . . . 3
ART 450 Computer Animation III* . . . 3
ART 494 ST Intermedia Elective* . . . 3

* Special application required

Art History. Three semester hours of non Western ARS 438 Art of the 20th Century I and ARS 439 Art of the 20th Century II are required

NOTE: For the General Studies requirement courses and codes (such as L1 N3 C, and H, see "General Studies" page 85 For graduation requirements see "University Graduation Requirements page 81 For an explanation of additional commonbus courses offered but not listed in this catalog see 'Classification of Courses" page 58

Art Electives. Twenty one semester hours of ARA, ARE, ARS, and ART courses are required

Admission to upper division computer graphics courses is by portfolio only. Application dates are September 15 to October 15 for spring enrollment and February 15 to March 15 for fall enrollment.

Metals

Core Curriculum. See "Core Curriculum," page 265, for the courses that make up the core curriculum.

Specialization. The following courses make up the special ization

ART	271 Jewelry I	3
ART	372 Jewelry II	3
ART	373 Metalworking I	3
ART	472 Advanced Jewelry	6
ART	473 Advanced Metalworking	6
ART	494 ST Metals	3
Total		24

Art History. Six semester hours of upper division ARS courses are required, including a 20th century elective.

Additional Requirements. Three of the following six courses (nine semester hours) are required:

ART	201 Photography I	3
ART	223 Painting I	3
ART	231 Sculpture I	3
ART	261 Ceramic Survey	3
ART	274 Wood I	3
ART	276 Fibers I	3

Art Electives. Eighteen semester hours of ARA, ARE, ARS, and ART courses are required.

Painting

Core Curriculum. See "Core Curriculum," page 265, for the courses that make up the core curriculum.

Specialization. The following courses make up the special ization.

ART	211 Drawing II	3
ART	214 Life Drawing I	3
ART	223 Painting I	3
ART	227 Watercolor I	3
ART	311 Drawing III	3
ART	314 Life Drawing II	3
ART	323 Painting II	3
ART	324 Painting III	3
	or ART 327 Watercolor II (3	
ART	325 Figure Painting	3
ART	423 Advanced Painting	3
	or ART 427 Advanced Watercolor (3)	
Total		30

One of the following five courses (three semester hours) is required:

ART	327 Watercolor II	3
ART	411 Advanced Drawing	3
ART	423 Advanced Painting	3
ART	425 Advanced Figure Painting	3
ART	494 ST: Drawing/Painting	3

Art History. Nine semester hours of ARS courses are required and must include three semester hours of non Western art. At least six semester hours must be upper-division ARS courses.

Additional Requirements. Two of the following six courses (six semester hours) are required:

ART	201 Photography I	3
ART	231 Sculpture I	3
ART	261 Ceramic Survey	3
ART	272 Jewelry I	3
ART	274 Wood I	3
ART	276 Fibers I	3

Art Electives. Nine semester hours of ARA, ARE, ARS, and ART courses are required

Photography

Core Curriculum. See "Core Curriculum," page 265, for the courses that make up the core curriculum

Specialization. The following courses make up the special ization:

ARA	202 Introduction to Photo Aesthetics	3
ART	201 Photography I	3
ART	301 Photography II	3
ART	304 Advanced Photography	3
Total		12

Three of the following ten courses (nine semester hours) are required:

ART	305 Color Photography I	3
ART	401 Nonsilver Photography	3
ART	403 Senior Photographic Projects	3
ART	404 Portraiture Photography	3
ART	405 Advanced Color Photography	3
ART	406 Photo Techniques	3
ART	407 View Camera	3
ART	408 Digital Photographic Images	3
ART	409 Photographic Exhibition	3
ART	494 ST. Photo	3

Art History. ARS 450 and 451 are required, as well as six semester hours of additional ARS courses, including a non Western elective.

Additional Requirements. The following courses are additional requirements:

ART	211 Drawing II	3
ART	214 Life Drawing I	3
ART	223 Painting I	3
ART	227 Watercolor I	3
ART	443 Intermedia	3
Total		15

One of the following five courses three hours) is required:

ART	231 Sculpture I	3
ART	261 Ceramic Survey	3
ART	272 Jewelry I	3
ART	274 Wood I	3
ART	276 Fibers I	3

Art Electives. Eighteen semester hours of ARA, ARE, ARS, and ART courses are required.

Printmaking

Core Curriculum. See "Core Curriculum," page 265, for the courses that make up the core curriculum.

Specialization. The following courses make up the specialization:

ART 211	Drawing II	3
	or ART 214 Life Drawing I	3
ART 351	Intaglio I	3
ART 352	Lithography I	3
ART 354	Screen Printing I	3
Total		12

Three of the following nine courses (nine semester hours) are required:

ART 355	Photo Process for Printmaking I	3
ART 451	Advanced Intaglio	3
ART 452	Advanced Lithography	3
ART 454	Advanced Screen Printing	3
ART 455	Advanced Photo Processes for Printmaking	3
ART 456	Fine Printing and Bookmaking I	3
ART 457	Fine Printing and Bookmaking II	3
ART 458	Papermaking	3
ART 459	Monoprinting	3

Two of the following five courses (six semester hours) are required:

ART 214	Life Drawing I	3
ART 311	Drawing III	3
ART 314	Life Drawing II	3
ART 315	Life Drawing III	3
ART 411	Advanced Drawing	3

Art History. Six semester hours of upper division ARS courses are required.

Additional Requirements. Two of the following eight courses (six semester hours) are required:

ART 201	Photography I	3
ART 223	Painting I	3
ART 227	Watercolor I	3
ART 231	Sculpture I	3
ART 261	Ceramic Survey	3
ART 272	Jewelry I	3
ART 274	Wood I	3
ART 276	Fibers I	3

Art Electives. Eighteen semester hours of ARA, ARE, ARS, and ART courses are required.

Sculpture

Core Curriculum. See "Core Curriculum," page 265, for the courses that make up the core curriculum.

Specialization. The following courses make up the specialization:

ART 223	Painting I	3
ART 231	Sculpture I	3
ART 274	Wood I	3
ART 331	Sculpture II	3
ART 332	Sculpture III	3
ART 431	Special Problems in Sculpture	3
Total		18

Four of the following nine courses (12 semester hours) are required (note that all are repeatable except ART 333).

ART 333	Foundry Casting Methods	3
ART 374	Wood II	3
ART 431	Special Problems in Sculpture	3
ART 432	Neon Sculpture	3
ART 436	Architectural Sculpture	3
ART 437	Film Animation	3
ART 438	Experimental Systems in Sculpture	3
ART 474	Advanced Wood	3
ART 494	ST: Special Topics	3

Art History. Six semester hours of upper division ARS courses are required.

Additional Requirements. Two of the following three courses are required:

ART 261	Ceramic Survey	3
ART 272	Jewelry I	3
ART 276	Fibers I	3

Art Electives. Fifteen semester hours of ARA, ARE, ARS, and ART courses are required.

GRADUATE PROGRAMS

The faculty in the School of Art offer programs leading to the M.A. degree in Art, with a concentration in art education or art history, and the Master of Fine Arts degree with a concentration in ceramics, drawing, fibers, intermedia, metals, painting, photographic studies, photography, printmaking, sculpture, or wood. In cooperation with the College of Education, the Doctor of Education degree is offered with a concentration in art education. Consult the *Graduate Catalog* for requirements for all graduate degrees.

ART AUXILIARY (ARA)

ARA 202 Introduction to Photo Aesthetics. (3 F S
Slide lecture course in understanding photography as a fine art form.

ARA 303 Art Appreciation and Human Development. (3 F
Foundations of art for children and young adults. Emphasis on learning, development, and understanding art in historical and cultural contexts. 3 hours lecture discussion. Prerequisites: ENG 101, 102; junior standing. *General Studies: HU*

ARA 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.

ARA 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*

ARA 494 ST: Special Topics. 3 F S
(a) Advanced Photo Aesthetics

ART EDUCATION (ARE)

ARE 301 Studio Art and Human Development. 3 A
The study of human development in studio art from early childhood to adult years.

NOTE: For the General Studies requirement courses and codes (such as L1, N3, C, and H), see "General Studies" page 85. For graduation requirements see "University Graduation Requirements" page 81. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses" page 58.

ARE 450 Studio Art: Art History I. 3 A
Art trad t ons before the 20th century as a bas s fo stud o and art h s tory nstruct on 2 hours ecture, 2 hours stud o Pre or corequ site ARE 460

ARE 460 Disciplines of Art Education. 3 A
Explorat ons n art educat on s d sc p nes h story and peop e s art mak ng deve opment at d verse age evels and ab t es Lecture, dis cuss on Prerequ s tes ARE 101 and 102 and ART 113 and 115 *or* nstructor approval

ARE 470 Art Criticism: Aesthetics. 3 F
Trad t ns of aesthet cs and art cr t c sm conceptua ssues n contem porary art educat on n the v s a arts 2 hour ecture 2 hours stud o Prerequ s te ARE 460 or nstructor approva .

ARE 482 Studio Art: Art History II. 3 S
Art trad t ons of the 20th century as a bas s f r stud o and a t h story nstruct on 2 hours ecture 2 hours stud o Must be taken before enro ment n ARE 486 Students are recommended t take ARE 470 concurrently Prerequ s te ARE 450.

ARE 486 Art Education: Strategies and Applications. 3 F
The mplementat on and eva uat on of art n truct n f K 12 popula t on nc udes teach ng of Saturday c asses 'n the Ch dren s Art Work shop Prerequ s te ARE 482.

ARE 494 ST: Special Topics. 3) A

ARE 496 Methods and Assessment of Learning in Art. 3 S
Ind v dua or group research on the assessment of art earn ng ncor porat ng theory and pract ce Prerequ tes ARE 470 and 486 *or* nstructor approva

ARE 510 Art Education Colloquium. 3 N
H stor cal f undat ons of art educat on and facu ty presentat ons regard ng tea h ng and research re ated to the v sua arts

ARE 520 Issues in Teaching Art History. 3 A
Crit ca exam nat on of ssues concern ng teach ng art h story to d ffer ent popu at ons of students H stor ca and ph os ph ca foundat ons and emphas s on devel p ng nqu ry nto h stor ca and cu tura con texts of art Recommended to be taken before ARE 525

ARE 525 Research on Teaching Art History. 3 A
Rev ew of emp r ca a d h stor ca resear h research methods, earn ng theory and assessment of earn ng art h story P ot stud es on the effects of nstruct on upon earn ng Recommended to be taken after ARE 520.

ARE 530 Issues in Teaching Studio Art. 3 A
Cr tica exam nation of ssues c ncern ng teach ng m t cu tura art to d fferent populat ons of students H stor ca and ph osoph ca founda t ons rev ewed Recommended to be take before ARE 535 Lecture, d scuss on

ARE 535 Research on Teaching Studio Art. 3) A
Rev ew of emp r ca and h stor ca research methods earn ng theory and assessment of learn ng n stud o art, nc ud ng deve pmenta stud es and the m tat n P t stud es n the effects of nstruct on upon earn ng Recommended to be taken after ARE 530

ARE 540 Teaching Art in Cultural Contexts 3 A
Re at onsh p of mu t cu tu a perspect ves to teach ng earn ng art cr t c sm ae thet cs stud o art and art history

ARE 610 Issues and Trends in Art Education. 3 N
Doctora leve nvest gat on of h st r ca and contemporary ssues re ated to teach ng and research n art educat on.

ARE 611 Curriculum Development in Art Education. 3 N
Doctora eve nqu ry nto the ph osoph ca psycho ogica and soc o log ca foundat ons of curr cu m deve opment

ART HISTORY (ARS)

ARS 100 Introduction to Art. 3 F S, SS
Deve opment of understand ng and enjoyment of art and ts re at on sh p to everyday fe through the study f pa nt ng scu pture arch tec ture and des gn May not be taken for cred t by student who has comp eted ARS 300 nor used as art h story red t by Art ma ors *Gen era Stud es. HU*

ARS 101 Art of the Western World I. 3 F S SS
H story of Western art from the Pa eo th c per d throug the M dd e Ages *Genera Stud es HU H*

ARS 102 Art of the Western Wor d II. (3) F S SS
H story of Western art from the Rena ssance to t e present *Genera Stud es. HU H.*

ARS 201 Art of Asia. (3 A
H story of the art of the As an cu tures w th emphas s on China Japan, and ndia Meets non Western art h story requ rement *Gen era Studies HU H*

ARS 202 Art of Africa, Oceania, and the Americas. (3) A
H story of art of Afr ca Ocean a and the New World. Meets non-West ern art h story requ rement *General Stud es HU H*

ARS 300 Introduction to Art. (3) F, S
Course content same as ARS 100 but requ res a h gher eve of accompl shment and comprehens on. May not be taken for cred t by student who has comp eted ARS 100 nor used as art h story credit by Art ma ors *General Stud'es HU.*

ARS 302 Art of Africa, Oceania, and the Americas. (3) A
H story of art of Afr ca, Oceania and the New Wor d. Meets non West ern art h story requ rements Not open to students who have taken ARS 202 Prerequ s tes· ARS 101 102. *General Studies: HU H.*

ARS 310 The Renaissance in Tuscany. (3) SS
Course taught n Florence, ta y H story of arts n Tuscany with focus on city of F orence from 14th through 16th centur es Lecture, tours Comp et on of ARS 101 and 102 suggested

ARS 340 Art in America. (3) A
Amer can art from colonial t mes through the Second World War Not avai able to students who have had ARS 444, 542, or 543. Prerequi s tes ARS 101 and 102 *or* 'nstructor approval. *General Studies. HU, H*

ARS 384 Art History Internships. (3) A
nst tut ona y based pract cum w th n an art museum or professiona v sua arts organ zation nternsh p

ARS 400 History of Printmaking. 3) A
H story of the pr nt as an art form and ts re ation to other modes and forms of artist c express on Prerequisites ARS 101 and 102 *or* instructor approval. *Genera Stud es HU, H*

ARS 402 Art of Ancient Egypt. 3) N
Aesthet c ph osoph ca and cu tura bas s of Egyptian art from pre Dynast c per od through New Kingdom Emphasis on scu pture and arch tectural monuments. Prerequ s tes ARS 101 and 102 *or* instruc tor approval *Genera Stud es: HU H*

ARS 404 Greek Art. 3) A
H story of art, arch tecture of Aegean civi zat ons (Cyc ad c M noan Mycenaean) and of Greece to end of He lenist'c per od Prerequ sites ARS 101 and 102 *or* nstructor approva *General Studies· HU H*

ARS 406 Roman Art. 3 A
Art and arch tecture of Etrur a the Roman Repub ic and the Roman Emp re Prerequ s tes ARS 101 and 102 *or* nstructor approva . *Gen era Stud es. HU H.*

ARS 410 Early Christian and Byzantine Art. (3) A
Art and arch tecture of the ear y church and the Byzant ne Emp re from the 4th to the 15th century Prerequ s tes ARS 101 and 102 *or* nstructor approva *Genera Stud es: HU*

ARS 412 Early Medieval Art. (3) N
Pa nt ng sculpture, architecture, and the m nor arts from M grat on, Caro ng an and Otton an per ods cons dered w th n re ig ous social, and econom c contexts Prerequ s tes ARS 101 and 102 *or* instructor approva . *General Stud es HU H*

ARS 414 Romanesque Art. 3) A
Scu pture pa nt ng arch tecture and m nor arts in western Europe, ca 1030–1200 cons dered w th n re 'g ous, econom c and soc a con texts Prerequ s tes ARS 101 and 102 *or* instructor approva *General Stud es HU H.*

ARS 416 Gothic Art. 3) A
Pa nt ng, scu pture and arch tecture n western Europe during the Goth c period Prerequ s tes ARS 101 and 102 *or* instructor approva *General Stud es. HU*

ARS 417 Late Gothic Art in Central Europe. (3) N
Sculpture pa nt ng, and arch tecture of the ate Goth c sty e (ca. 1350–1525), considered w th n re g ous soc a econom c and pol ti ca contexts Prerequ s tes ARS 101 and 102 *or* instructor approval.

ARS 418 Renaissance Art in Northern Europe. (3) A
Graphics pa nt ng, scu pture and arch tecture ca 1450–1550 Refor mat on themes and Rena ssance sty e cons dered w th n rel g ous pol t cal, soc a and econom c contexts Prerequ s tes ARS 101 and 102 *or* nstructor approva . *General Stud es· HU*

ARS 420 Early Renaissance Art in Italy. 3 N
Pa nt ng, scu pture, and arch tecture n Ita y from 1300 to 1500 Pre requ s tes: ARS 101 and 102 *or* nstru tor approva . *Genera Stud es HU, H*

ARS 422 Italian High Renaissance Art and Mannerism. (3 A
H story of tal an art dur ng the 16th century, nc ud ng the ach eve ments and nfluence of Leonardo da V nc Raphae , and M che ange o Prerequ s tes ARS 101 and 102 *or* nstructor approva *General Stud es: HU*

ARS 424 Italian Baroque Art. 3) A
Ital an pa nt ng scu pture and arch tecture of the 17th century Pre requ s tes· ARS 101 and 102 *or* nstructor approva *Genera Stud es HU H.*

ARS 426 Art of the 17th Century in Northern Europe. (3 A
Baroque pa nt ng, scu pture and arch tecture n Flanders the Nether ands, France and Eng and Prerequ s tes ARS 101 and 102 *or* nstructor approva *General Stud es HU H*

ARS 428 Art of the 18th Century. (3) A
H story of pa nt ng scu pture arch tecture graph c arts and the deco rative arts from 1700 to the French Revo ut on 1789 Prerequ s tes ARS 101 and 102 *or* nstructor approval *General Studies HU H*

ARS 430 Art of Spain and Its Colonies. (3) A
Arch tecture, pa nt ng and scu pture from 1500 to 1800 Co on a focus on centra Mex co and the Amer can Southwest Prerequ s te ARS 102 or nstructor approva *Genera Stud es HU H*

ARS 432 From David to Daumier: European Art 1780–1860. 3 F
Crit ca study of the v sua arts n Europe from eve of French Revo u t on to the Paris Wor d s Fa r of 1855 Neoc ass c sm, Rea sm, and Romant c sm. Prerequ s tes ARS 101 and 102 *or* nst uctor approva *General Studies· HU H*

ARS 434 From Courbet to Cézanne: History of European Art 1860–WWI. (3) S
Aesthet c po t ca and soc a forces affecting the v sua arts n the ate 19th century Concentration on Cub sm Express on sm, Impress on sm and Post- mpression sm Prerequ s tes ARS 101 and 102 *or* nstructor approva *General Stud es HU*

ARS 436 Art at the Turn-of-the-Century: 1885–1914. 3 F
H story of European avant garde movements Concentrat on on post mpress on sm, symbo sm, express on sm and cub sm Prerequ s tes ARS 101 and 102 *or* nstructor approva *Genera Stud es HU*

ARS 438 Art of the 20th Century I. (3) A
Deve opments and d rect ons n art between 1900 and Wor d War I Prerequ s tes ARS 101 and 102 *or* nstructor approva *General Stud es HU, H*

ARS 439 Art of the 20th Century II. 3) A
Art since Wor d War w th cons derat on of new concepts and exper mentation w th med a and modes of presentat on Prerequ s tes· ARS 101 and 102 and 438 *or* nstructor approva *General Stud es HU, H*

ARS 442 Critical Issues in American Painting I. 3) A
Explores themes and soc a ssues n Amer can art w th a cr t ca study of Amer can pa nt ng from the 18th century to 1850 Lecture d scus sion Prerequ s tes ARS 101 and 102 *or* nstructor appr va *Genera Stud es. HU.*

ARS 443 Critical Issues in American Painting II. 3 A
Exp ores themes and soc a ssues n Amer can art w th a cr t ca study of Amer can pa nting from 1850 to 1900 Lecture d scuss on. Prereq u s tes· ARS 101 and 102 *or* nstructor approva *General Stud es HU*

ARS 444 Modern American Art, 1900–1945. 3 A
Amer can pa nt ng, scu pture photography and arch tecture 1900–1945 Covers major monuments nc ud ng the E ght modern sm, Pre cisionism, Reg ona sm, and the WPA. Prerequ s tes ARS 101 and 102 *or* nstructor approva *Genera Stud es HU H*

ARS 450 19th-Century Photography. 3 A
H story of photography from the medium s preh story to 1914 person a t es processes mages, and deas Prerequ s tes ARS 101 and 102 *or* nstructor approva . *Genera Stud es· HU*

ARS 451 20th-Century Photography. 3 A
Personalities, processes images, and deas n photography from 1914 to present Prerequ s tes ARS 101 and 102 *or* nstructor approva *General Stud es HU*

ARS 453 Issues n Contemporary Photography. (3 A
A d scuss on sem nar dent fy g defin ng and research ng the ssues and dea that nf uen e the appearance and cr t c sm of contempo rary mage Sem nars ectures presentat ons papers Prerequ s tes ARS 450, 451

ARS 454 Research and Writing in Photography. 3 A
Pr nc p e and pract e of research and wr t ng n the h story and crit c sm f photography Papers requ red Prerequ s tes. ARS 450 and 451 *or* n tructor approva ENG 101 and 102 *or* equ valents

ARS 457 History of Art Criticism. 3 N
Theor es of cr t c sm of the visua arts from ate 18th century to prese t Prereq s tes ARS 101 and 102 *or* nstructor approva *Gen era Stud es H*

ARS 458 Critical Theories in the Visual Arts. (3 N
Exam nes c rrent cr t cal theor es through the r app cation to a l v sua arts May n ude new h st c sm Marx sm deconstruct on, post structura sm sem t c La an an psych ana ys s fem nism post modern sm Lecture d cuss on student presentat ons Prerequ s tes: ARS 101 and 102 *or* nstructor approva *Genera Stud es HU*

ARS 459 Writing Art Criticism. 3 N
Trad t na and contemp rary appr aches to the cr t c sm of art Stu dents w wr te cr t ca essays The atter ha f of the semester w l stress the cr t c sm of contemporary art n var ous med a. Prerequ s te: ARS 458 or nstructor approva

ARS 462 Precolumbian Art I. 3 A
Arch tecture scu pture ceram cs pa nt ng, and other arts of Mesoame ca before Eur pean contact Meets non-Western art h s tory requ rement Prerequ s tes ARS 101 and 102 *or* nstructor approva *Genera Stud es HU, H*

ARS 463 Precolumbian Art II. 3 A
Arch tecture scu pture, ceram cs, text es and other art of South America bef re European contact w th focus on the Centra Andes. Meets non Western art h story requ rement Prerequ s tes· ARS 101 and 102 *or* nst uctor approva *General Stud es HU, H*

ARS 465 Native North American Art. 3 A
Nat ve Amer can art f rms of the Un ted States and Canada from pre h stor c t mes to the present Prerequ s tes ARS 101 and 102 *or* nstructor approva Meets non Western art h story requ rement *Genera Stud es HU H*

ARS 466 Native American Art of the Southwest. 3 A
Amer can nd an art n the southwestern states from ts or g ns to the present day. Meets non Western art h story requ rement. Prerequ s tes: ARS 101 and 102 *or* nstructor approva *Genera Studies· HU C H*

ARS 468 Art of the Arctic and Northwest Coast. 3 N
Art assoc ated w th ceremony shaman sm and da y fe n the Arct c and on the Northwest Coast Meets non Western art h story requ re ment Prerequ s tes ARS 101 and 102 *or* nstructor approva . *Genera Stud es HU*

ARS 469 Mexican Art. 3 A
Art of Mex c and re ated Centra Amer can cu tures from the preh s tor c to the contemp rary schoo s Meets non Western art h story requ rement Prerequ s tes ARS 101 and 102 *or* nstructor approva *General Stud es HU H*

ARS 472 Art of China. 3 A
Study of major fo ms n Ch nese art r tual bronze scu pture ceram c, ca graphy pa nt ng and arch tecture Sat sf es non Western art h s tory requ rement Prerequ s tes· ARS 101 and 102 *or* nstructor approva *Ge era Stud es HU*

ARS 473 Art of Japan. 3 A
Japanese art fr m the Joman per od to the present Sat sf es non Western art h st ry requ rement Prerequ s tes ARS 101 and 102 *or* structor app ova *Genera Stud es HU*

ARS 475 Chinese Painting. 3 A
From Ku K a ch n to Ch Pa sh h Major art sts styles, and move- ments n Ch nese pa nt ng Sat sf es non Western art h story requ re ment Prerequ s tes ARS 101 and 102 *or* nstructor approva *Genera Stud es HU*

NOTE: For the Genera Stud es requ rement courses and codes such as L1 N3 C and H see Genera St d es page 85 For graduation requ rements see Un vers ty Graduat on Requ rements " page 81 For an exp anat on of add t ona mn bus c urses offered but not sted in th s cata og see 'C ass f cat on of Courses " page 58

ARS 480 Research Methods. (3 F S
Methodo ogy and resource mater a for art h stor ca research Tech n ques of scho ar y and cr t ca wr t ng and eva uat on of b b ograph c s urces Prerequ s tes· ARS 101 and 102 *or* nstructor approva *Gen era Stud es L2*

ARS 485 Women in the Visual Arts. (3 S
H st r ca study of art by women n vari us med a related socia , po t ca educat ona ssues representat on of women n art Lecture d s cuss o Prerequ s te ARS 101 or 102 or nstructor approva *General Stud es L2*

ARS 494 ST: Special Topics. (3 F S
a H story of Photography

ARS 498 PS. Pro-Seminar. (3–6) A
Undergraduate sem nar n top cs se ected from the fo ow ng. Prob ems or cr t c sm n·
a Amer can Art
b Amer can nd an Art
c Anc ent Art
d Art H story
e Baroque Art
f Ch nese Art
g Med eva Art
h Modern Art
Ph t graph c H story
Pre C mb an Art
k Rena ssance Art
Prerequ s te nst uctor approva

ARS 501 Methodologies and Art History. (3 F
The h story of the d sc p ne and an exp orat on of various methodo o g es cr t ca theory and b b ograph es used by art h stor ans. Sem *nar*

ARS 502 Critical Studies in Egyptian Art. (3 N
Egypt an art from pre-Dy ast c to New K ngdom per ods Focus on aesthet c ph osoph ca and cultura context. Research paper and read ngs requ red

ARS 504 Critical Approaches to Greek Art. (3) A
Art and arch tecture of Aegean c v zations Cyclad c Minoan, Myce-naean and of Greece to end of He en stic per od Research paper and read ngs requ red

ARS 506 Critical Studies in Roman Art. (3) A
Art and arch tect re f Etrur a, the Roman Repub c, and the Roman E p re Research paper and/or supp ementa read ngs requ red

ARS 514 Critical Approaches to Romanesque Art. 3) N
Scu pture, pa nt ng arch tecture, and the m nor arts in western Eur pe ca. 1030–1200, cons dered with n rel g ous econom c, and soc a contexts Research paper requ red

ARS 516 Critical Approaches to Gothic Art. 3) N
Arch tecture, scu pture pa nt ng and the minor arts n western Europe ca 1150–1350 c nsidered w th n re ig o s, soc a and eco-nom c c texts Research paper requ red

ARS 517 Critical Approaches to Late Gothic Art. (3) N
Art of the ate Goth c sty e ca 1350–1525 cons dered with n re g u soc a econ m c and po t cai contexts. Research or read ng project requ red

ARS 522 Sixteenth Century Italian Art. (3 A
Cr t ca study of pa nt ng scu pture, and arch tecture n 16th century ta y n ts re g ous and h stor cal context.

ARS 528 Eighteenth Century Art in Europe. (3) A
Cr t ca study of European art from the ate Baroque to the ear y years of Neoc ass c sm

ARS 530 Art of Spain and New Spain. (3) A
Cr t ca tudy of arch tecture, paint ng, and scu pture from 1500 to 1800 Lecture conference

ARS 532 Art, Politics, and Patronage 1770–1850. (3 F
Cr t ca ana yses of po t ca events in Europe Issues of patronage art as propaganda exam ned mpact of war and revo ut on on visua arts

ARS 534 Studies in Modern European Art, 1850–1914. (3) A
Cr t ca tudy of v sua a ts us ng pr mary source mater a from m d 19th century t WW w th n ph osoph ca soc o econom c contexts Lecture tutor a Prerequ s te nstructor approva .

ARS 542 Critical Issues in American Painting I. 3 A
Exp ores themes and soc a ssues n Amer can art w th a cr t ca study of Amer can pa nt ng fr m the 18th century to 1850 Lecture discus s on. Prerequ s tes ARS 101 102

ARS 543 Critical Issues in American Painting II. (3) A
Exp ores themes and socia ssues n Amer can art w th a cr t cal study of Amer can pa nt ng fr m 1850 to 1900. Lecture ab. Prerequ s te nstructor approva

ARS 544 American Modernism and Realism, 1900–1945. (3) A
Cr t ca study of the soc a po t ca and art st'c changes n American art during the first ha f of the twent eth century Prerequ s tes ARS 101 and 102 *or* 340.

ARS 562 Art of Ancient Mesoamerica. (3 F
Cr t ca study of art and arch tecture of Mex co and Maya area before Span sh contact. Lecture conference

ARS 565 Native Art of North America. (3) A
A cr t ca exam nat on of Nat ve Amer can art w th n cu ture preh story to the present Prerequ s tes ARS 101 and 102 *or* nstructor approva

ARS 574 Studies in Japanese Art. 3 A
A cr t ca exam nat on of the nature a d h story of Japanese art ts r ch *her tage and ts ndebtedness to fore gn sources Lecture d scuss on* Prerequ s tes· ARS 101 and 102 *or* nstructor approva

ARS 575 Approaches to Chinese Painting. (3 F
A cr t cal h story of Ch nese pa nt ng from Eastern Chou to 1911 Emphasis on masters regiona deve opments and conceptua under p nn ngs Lecture d scuss on. Prerequ s tes· ARS 101 and 102 *or* nstructor approval.

ARS 591 Seminar. (3–6 A
Graduate sem nar in top cs selected from the fo ow ng Prob ems or cr tic sm n:
(a) Amer can Art
(b) Amer can nd an Art
c) Anc ent Art
d Baroque Art
(e) Ch nese Art
(f) Cr t ca Theor es n the Visua Arts
(g Medieva Art
(h) Modern Art
( ) Nat ve American Art
(j Photograph c H story
(k) Pre Co umb an Art
) Rena'ssance Art
Prerequ s te nstructor approva

STUDIO CORE CURRICULUM (ART)

ART 111 Drawing I. (3 F, S SS
Fundamental techn ca and perceptua sk s us'ng common draw ng *med a and the r app icati n to pictor a organ zat on 6 hours a week*

ART 112 Two-Dimensional Design. 3 F S, SS
Fundamenta s of p ctorial des gn 6 hours a week

ART 113 Color. 3) F S SS
Pr nc p es of color theory as re ated to the v s al arts 6 hours a week Prerequ s tes ART 111 112

ART 115 Three-Dimensiona Design. 3) F, S SS
Fundamentals of 3D f rm 6 hours a week Prerequ s tes ART 111 112.

ART 294 ST: Special Topics. 3 F S

DRAWING (ART)

ART 211 Drawing II. 3) F S SS
Cont nued deve opment f techn a and perceptua sk s Emphas s on mater a s and p ctor a co tent 6 hours a week. Prerequ s tes ART 113, 115

ART 214 Life Draw'ng I. (3 F S SS
Deve opment of sk l and express veness n draw ng the bas c form, construct on and gesture from the human f gure 6 hours a week Pre-requ s tes ART 113 115

ART 311 Drawing III. 3 F, S
Emphas s on compos t on, exp orat on of d aw ng med a 6 hours a week. Prerequ s tes ART 211 214 nstr ctor approva

ART 314 Life Drawing II. 3 F S
Draw ng from the mode w th greater reference to structura , graph c, and compos t ona concerns 6 h rs a week Prerequ s te ART 214 *or nstructor approva*

ART 315 Life Drawing III. 3 F, S
The human f gure as the subject for draw ng Emphas s on conceptua a ternat ves and management of mater a s 6 hours a week Prerequ s te· ART 314 or nstructor approva

ART 411 Advanced Drawing. 3 F S
V sua and nte ectua concepts through prob em so v ng and ndepen dent study Emphas s on the nd v dua creat ve statement 6 ho rs a week May be repeated for cred t Prerequ s tes ART 311 nstructor approva .

ART 414 Advanced Life Drawing. 3 F S
Var ous med a and techn ques on an advanced eve The human f g ure as an express ve veh c e n var ous contexts 6 hours a week May be repeated for cred t Prerequ s te· ART 315 or nstructor approva

ART 415 Art Anatomy. (4 N
Study of h man anatom ca structures as app ed to the pract ce of f g ure or ented art 3 hours lecture 5 h urs stud a week Prerequ s te ART 214

ART 494 ST: Special Topics. 3 F S
(a) Draw ng

PAINTING (ART)

ART 223 Painting I. (3) F S, SS
Fundamenta concepts and mater a s of trad t ona and exper menta pa nt ng med a Emphas s on preparat on of pa nt ng supports com pos tion and co or 6 hours a week Prerequ s tes ART 113, 115

ART 227 Watercolor I. (3) F S
Fundamental concepts mater a s and techniques of waterco or Emphas s on problem so v ng bas c sk s compos t n and co or 6 hours a week Prerequis tes ART 113, 115.

ART 323 Painting II. (3 F, S
Deve opment of competency n sk s and express on. Ass gned prob ems nvo ve ght space co or, f rm and c ntent 6 hours a week Prerequ s te ART 223 or nstructor approva

ART 324 Painting III. 3 F, S
Cont nuation of ART 323 6 hours a week Prerequ s te ART 323 or 'nstructor app ova .

ART 325 Figure Painting. 3 F, S
The human f gure c othed and nude as the subject for pa nt ng n selected med a 6 hours a week Prerequ s tes ART 314 323

ART 327 Watercolor II. (3) A
Explorat ons of persona express on in waterco or Cont nued deve p ment of waterco or k s us ng trad t ona and exper menta mater a s and techn ques 6 hours a week Prerequ s te. ART 227

ART 423 Advanced Painting. 3) F, S
Continuat on of ART 324 6 hours a week May be repeated for cred t Prerequis te ART 324.

ART 425 Advanced F gure Paint'ng. (3 F S
Cont nuat on of ART 325 6 hours a week May be repeated for cred t Prerequ s tes ART 315 324 325

ART 427 Advanced Watercolor. (3 F S
Cont nuat on of ART 327. More advanced forma conceptua and techn ca prob ems n contemporary waterco or 6 hours a week. May be repeated for cred t Prerequ s te ART 327

ART 494 ST: Special Topics. 3 F S
(a) Pa nt ng

INTERMEDIA (ART)

ART 439 Mixed Media. 3) F S
Exp or ng v sua effects by comb n ng trad t ona and nontrad t ona methods, techn ques and concepts 6 hours a week. May be repeated for cred t Stud o. Prerequ s tes. ART 113 and 115 and 6 ho rs add t onal stud o requ'rements *or* nstructor approva

ART 440 New Media Concepts. 3 F, S
Cont nued exper ments w th new med a and nterd sc pl nary concerns n art 6 hours a week May be repeated for cred t Prerequ s te ART 443 Corequ s te ART 441

ART 441 Video Art 1 F S
Ut z ng v deo and aud o equ pment essent'a to the product on of broadcast qua ty v deo art 2 hours a week May be repeated f r cred t Corequ s te ART 440

ART 442 Fo k/Outs der Art F
Exp orat n of dea att tudes and art f contemporary se f taught v s nary" and outs der' art st Research and stud o practice Lec ture st d o Prerequ s te ART 115 r n tructor approva

ART 443 ntermed a. 3 F, S
Exper menta or ceptua and terd c p nary st o art w th empha s s n ew med a and te h g es 6 hou s a week May be repeated nce for cred t P erequ s te struct r approva .

ART 444 Computer Art I 3 F S
A study f PC hardware and softwa e f r creat ng art Emphas s on computer graph cs h story h rdware ftware conf gurat ons DOS p nc p es f 2 and 3 d me ona graph cs 2 h urs ecture 2 hours stud o Prerequ s te ART 111 112 r equ va ent nstructor appr va *Gene a Stud es N3*

ART 446 Computer Art II. 3 A
Three d men a de ng and an mat on. Emphas s on concepts and f e arts app cat ons St d o Prerequ s tes ART 113 115 nstructor approva *Genera Stud es N3*

ART 448 Computer Animation I. 3 F S
Pr nc p e and app at o s of 3D an mat on for f ne arts Emphas s on an mat on techn ques for express e effects Stud o Prerequ s te ART 446 or nstructor approva

ART 449 Computer An mat'on I . 3 F S
Adv n ed pr nc p es and app cat s f 3D an mat on for f ne arts Stud Prerequ te ART 448 r struct r approva .

ART 450 Computer Animation III 3 F S
Spec a effects n f ne arts 3D a mat on Stud o. Prerequ s tes ART 449 structor approva

ART 494 ST: Special Topics. 3 F S
a ntermed a E ect ve

ART 530 Two-Dimens ona a id Three-Dimensional Computer Art. 3 A
ntegrat on of 2D and 3D computer mag ng for art Emphasis upon new d rect o s f r computer mag ng wh h accounts f r med a char-acter st s Stud o

ART 540 Advanced Computer Art. 3 A
Study of mot n for 3D mode s ght sources and surface effects Course assumes stude ts have a comprehens on of comp ex m de ng mapp ng and ght ng Stud o Prerequ s te ART 446 or nstructor appr va

PHOTOGRAPHY (ART)

ART 201 Photography I 3 F S
Deve opment of sk s and te h ques f b ack and wh te photography Emphas s on amera work and darkr m procedures 2 hours ecture, 3 h urs ab

ART 301 Photography II. 3 F S
Photography as an art med um w th add t na exp orat on nto per sona phot graph c ae thet 6 hours a week Prerequ s tes ART 113 and 115 and 201 *o* stru t r approva

ART 304 Advanced Photography. 3 F S
nterpretat o and an pu at on of ght as a too n the performance of express ve photograp y 6 h urs a week Prerequ s te ART 301 or nst ct r approva

ART 305 Co or Photography I. 3 F S
App cat n f co or transpare c es and pr nts to phot graph c art 6 h urs a week Pre equ s te ART 304 r nstructor appr va

ART 401 Nonsilver Photography. 3 F S
Re g t on f the nherent character st cs of nons ver processes and the r use n commun cat ng dea 6 h rs a week May be repeated f r cred t Prerequ s te ART 304 or nstructor approva

ART 403 Senior Photographic Projects. 3 F S
Techn ca and ph oph ca ref neme t of persona aesthet c w th vari-ous ph t graph c med a 6 h urs a week May be repeated for cred t Prerequ s te ART 3 4 or nstructo approva

ART 404 Portra'ture Photography. 3 F S
Ph tograph ng pe e C t ca d scu s ns and s de ectures n sues portra tu e 6 hours a week May be repeated for cred t Pre requ s te ART 304 or nstructor approva

NOTE: For the Genera Stud es requ rement courses and codes such as L1 N3 C and H ee Gener St d e page 85 For graduat on requ rements, see Un vers ty Graduat on Requ rements page 81. For an exp anat on f add t o a mn b ourse ffered but not sted n th s cata og, see "C ass f cation of Course , page 58

ART 405 Advanced Color Photography. (3 F S
tens ve u e of subtract ve co or pr cess n photograph c pr nt ng 6 ho r a week May be repeated f r cred t Pre equ s te ART 305 or n tru t ap ova

ART 406 Photo Techn ques. 3 F, S
Came a and darkr om te hn ques w th emphas s on creat ve contro of the b ack and wh te pr nt 6 h urs a week Prerequ s te ART 301 or nstructo approva

ART 407 V ew Camera. 3 F S
V ew camera and darkroom techn ques Stud , ab Prerequ s te· ART 3 1 r str ctor approva

ART 408 D gital Photographic Images. 3 F S
Scann ng man pu at on ref nement, and compos t ng of photograph c mage n the c mputer Lab stud o. Prerequ s te ART 201

ART 409 Photographic Exhibition. 3 A
Care f phot graph c pr nts pr nt presentat on and exh b t on Pract ca exper ence ga ery operat ons 6 hours a week May be repeated for cred t Prerequ s te ART 304 o nstruct r approva

ART 494 ST: Specia Topics. 3 F S
a 19th Cent ry Ph to Processes
b Photo

PRINTMAKING (ART)

ART 351 Intagl o I. 3 F S
ntrod ct on to nternporary and trad t ona deve opmenta tech n ques f b a k and wh te pr nts 6 hours a week Prereq s te nstructor approva

ART 352 Lithography I. 3 F S
Monochromat c and co or p anograph c pr ntmak ng ut z ng stone and a um n m p ate processes 6 hours a week. Prerequ s te ART 113 or nstruct r approva

ART 354 Screen Print'ng I. 3 F S
ntrodu t n t paper d rect and photograph c stenc techn ques 6 hours a week Prerequ s te ART 113

ART 355 Photo Process for Printmak ng I. 3 F
troduct o to photograph c pr nc p es and sk s for ph tomechan ca pr ntmak ng processes nc ud ng photos kscreen photo tho and photoetch ng 6 hour a week Prerequ s te ART 201 or equ va e t.

ART 451 Advanced Intaglio. 3 F, S
Var us contemporary and trad t a meth ds f pr nt g to ach eve co or pr nt 6 hour a week May be repeated for red t Prerequ s te nstructor appr va

ART 452 Advanced Lithography. 3 F S
Cont nuat on of ART 352 6 hours a week May be repeated f r c ed t Prerequ s te nstruct r approva

ART 454 Advanced Screen Printing. 3 A
Cont nuat n of ART 354 6 hours a week May be repeated for cred t Pre equ s te nstructor approva

ART 455 Advanced Photo Processes for Pr ntmaking. 3 A
A cont ued study of photomechan ca techn ques and app cat ons to pr'ntmak ng or ph tograph c processes Prerequ s te ART 355 or structor approva

ART 456 Fine Print ng and Bookmak ng I. 3 A
Letterpress pr t ng a d typography as f ne art Study of h story a phabets mechan s of ha d typesett ng presswork and var ous forms of pr nted matter. Prereq s te structor appr va

ART 457 Fine Printing and Bookmaking II. 3 A
Cont nuat of ART 456 B kb nd ng, book des gn and pr nt ng, advanced typography theory and presswork May be repeated for cred t Prerequ s tes ART 456 nstructor appr va

ART 458 Papermak ng. 3 F S
H tory the ry demonstrat ons heet form ng o age treatments, and 3 d mens ona appr aches 6 hours a week May be repeated for cred t Prerequ s te nstructor approva

ART 459 Monopr'nting. 3 F S
The n mu t p e pr nted mage us ng a var ety of techn ca appr a hes 6 h ur a week May be repeated for cred t Prerequ s tes ART 311 323 or any 300 eve pr ntmak ng c ass nstructo approva

ART 551 Intaglio Projects. 3 F S
The mater a s and methods of ntag o as a matr x for exp o g var ous c ntemporary ssues Spec f ca y structured to accommodate the g aduate eve draw ng w th n pr ntmak ng background Stud o.

SCULPTURE (ART)

ART 231 Sculpture I. 3 F S SS
Exp orat on of scu ptura forms through concepts re ated to bas c mater a s Focus on stud o product n, safety, aesthet c cr t c sm and h story of scu pture 6 hours a week Prerequ s tes ART 113 and 115 *or* nstructor approva

ART 274 Wood I. 3 F S
Fu damenta woodwork ng techn ques to produce creat ve f nct ona 3 d mens na objects 6 h urs a week

ART 331 Scu pture II. 3 F S
Cont nuat n f ART 231 w th an emphas s o meta fabr cat on as an express ve sculptura process Techn ques weld ng cutt ng and bend ng of meta s and the r aesthet cs 6 hours a week Prerequ s te· ART 231 or nstructor approva

ART 332 Sculpture III. 3 F S
Exp rat ns n d verse med a w th a focus on mo d mak g processes Developme t of the scu pture portfo o 6 h urs a week Prerequ s te ART 331 or nstructor approva

ART 333 Foundry Casting Methods. 3 F S
The f ne art and techn ques of meta ca t ng· m d mak ng fo ndry safety, f n sh ng techn ques, app cat on of pat nas and h st ry of cast ng 6 hours a week May be repeated for cred t Prerequ s te ART 332 or nstructor approva

ART 374 Wood II. 3 F S
nd v dua and d re ted prob ems n wood re ated to the pr duct n f un que funct ona art objects 6 h urs a week Prerequ s tes ART 113 and 115 and 274 *or* nstruct r approva

ART 431 Special Problems in Sculpture 3 F S
Deve pment of a persona app oach t scu pture emphas s on form, nd v dua prob ems and re ated co or techno ogy Profess ona prac t ces and prese tat on 6 hours a week May be repeated for cred t Prerequ s tes ART 332 nstructor approva

ART 432 Neon Sculpture. 3 F
Techn ques for creat ng neon n an art co text G ass tube bend ng and fabr cat n Construct on of artworks ut z ng ght generat ng gas ses 6 hou s a week May be epeated for cred t Prerequ s te nstr c tor approva

ART 433 Foundry Research Methods. 3 F S
Research n foundry techn ques Stud o Pre r corequ s te ART 333 or nstructor approva

ART 436 Architectural Sculpture. 3 N
Scu ptura concept as re ated to arch tecture and other man made env ronment Sca e draw ng m de s and re ef scu pture 6 h urs a week May be repeated for cred t Prerequ s te ART 332 or nstructor approva

ART 437 Film Animation. 3 F
Product on of sho t 16mm f ms that feature art cu ated scu ptura obje ts m de s do s puppets and graph cs through the use f s ng e frame f m ng techn ques 6 hours a week May be repeated for cred t Prerequ s te nstructor approva .

ART 438 Experimental Systems n Sculpture. 3 S
S mp e e e tr ca and mechan ca systems that an be ut zed n the context f stud o art and nsta at ns Act ve product'o f stud o art works requ red 6 hours a week May be repeated for cred t Prereq s te nstructor approva

ART 474 Advanced Wood 3 F S
Extended exper e ce and advanced techn ques n the use of wood to c eate funct ona works of art 6 hours a week May be repeated for cred t Prerequ s tes ART 374 nstructor approva

CERAMICS (ART)

ART 260 Ceramics for Nonmajors. 3 F, S SS
Handbu d ng meth ds wheel throw ng g aze and deco at ve pro- cesses Raku, and stoneware f r gs 6 hours a week

ART 261 Ceramic Survey. 3 F S SS
Handform ng methods throw ng on the whee , decorat ve pr cesses and g aze app cat on 6 hours a week Prerequ s tes ART 112, 115

ART 360 Ceramic Throw ng. 3 F S
Des gn ana ys s and product n of funct na pottery Emphas s on throw ng techn ques surface enr chment and g aze app cat on 6 hours a week May be repeated once for cred t Prerequ s te ART 261

ART 364 Ceramic Handbuilding I. 3) F
Search for form s ng handbu d ng techn ques. K f r ng and re ated prob ems. Prerequ s te ART 261

ART 365 Ceramic Handbuilding II. 3 S
Cont nuat on of ART 364 w th an add t ona focus n arge sca e works surface treatments and g aze decorat n w th re ated k n f r ng app cations Prerequ s te ART 364 or tructor approva

ART 460 Ceram c Clay. 3 S
Research nto var ous c ay body formu at ons oca natura mater a s s p glazes, and engobes ecture, ab stud Prerequ s tes ART 360 and 364 *or* nstructor approva .

ART 463 Ceramic Glaze. 3 F
Glaze ca culat on and formu at on us ng var ous g aze co ors and sur faces Lecture ab stud o Prerequ s te ART 460 or nstruct r approva .

ART 466 Specia Problems in Ceramics. 3 F S SS
Emphasis on persona express on w th n structure of sem nars cr t'ques, and stud o work Profess onal methods of presentat on/docu mentat on of work 6 h urs a week May be repeated for cred t Prerequ s te ART 364 or nstructor approva .

FIBERS (ART)

ART 276 Fibers I. 3 F S
Explorat on of var ous mater a s and bas c techn ques n the structura use of f bers and surface des gn on fabr c 6 hours a week Prerequ s tes· ART 113 and 115 *or* nstructor approva

ART 376 Fibers: Loom Techniques. 3 A
Invest gat on of oom techn ques and c mputer pattern des gn 6 hours a week Prerequ s te ART 113 or 115 r nstructor approva

ART 377 Surface Design. 3 F, S
Surface des gn on fabr c thr ugh the app cat on of dyes and p g ments Techn ques nc ude pa nt ng pr nt ng a rbrush ng and the cyanotype process Prerequ s te ART 276 or nstructor approval

ART 476 Fibers: Multiple Harness Weaving. 3 F S
Advanced oom techn ques and computer pattern des gn Emphasis on ind v dua des gn and oom app cat on Prerequ s te ART 113 or 115 or 376 or nstructor approva

ART 477 Pr nted Textiles. (3 A
Techn ques for screen pr nt ng on fabr c exp or ng pattern as a compo s t ona e ement Var ous stenc methods nc ud'ng photograph c pro cesses Stud o May be repeated for cred t. Prerequ s te ART 377 or nstructor approva

METALS (ART)

ART 272 Jewelry I 3 F, S
Emphas s on fabr cat on n jewe ry mak ng Bas c techn ques of cutt ng and pierc ng forg ng and so der ng and form ng 6 hours a week Pre requ s te: freshman or soph m re or jun or stand ng

ART 372 Jewelry II. 3 F S
Fabr cated approach to jewe ry mak ng Techn ques n stone sett ng and surface embe shment 6 hours a week Prerequ s tes· ART 113 and 115 and 272 *or* nstructor approva

ART 373 Metalworking I. 3 A
Compress on, d e and stretch forming as app ed to ho ow form con struct on Hot and co d f rg'ng techn ques as app ed to sm th ng 6 hours a week Prerequ s tes· ART 113 and 115 and 272 *or* nstructor approva

ART 472 Advanced Jewelry. 3 F S
Jewe ry mak ng with emphas s on deve op ng persona statements and craftsmansh p. 6 hou s a week May be repeated f r cred t Pre- requ s tes. ART 372 nstr ct r approva

ART 473 Advanced Metalworking. 3 A
Forg ng and form ng techn ques n nd v dua zed d rect ons 6 hours a week May be repeated for cred t Prerequ s tes ART 373, nstructor approva

ART 494 ST: Special Topics. 3) F S
a Meta s

SPECIAL STUDIO ART (ART)

ART 621 Stud o Problems. 3) F S SS
Advanced st dy n the fo ow'ng areas
a Ceram cs
b Draw ng
c) F ber Art
(d Jewe ry Meta work ng
e) Meta s
f Pa nt ng
(g) Photography
h) Pr ntmak ng
Scu pture
(j Stud o Art
k Wood
6 h urs a week each sect on. May be repeated for cred t Prerequ te nstructor approva

ART 680 Practicum: M.F.A. Exhibition. 1 15) F S, SS
Stud o work n preparat on for requ red M F A exh b t on Pub c exh bit to be approved by the student's superv sory comm ttee and accompa n ed by a f na oral exam nat on Photograph c documentat on and wr tten statement of prob em Prerequ s te: approva of the student s supervisory comm ttee

Department of Dance

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PROFESSORS
JONES KAPLAN, KEUTER, LESSARD
LUDWIG, MURPHEY

ASSOCIATE PROFESSORS
MATT MOONEY

ASSISTANT PROFESSORS
JACKSON PARK, VISSICARO

ACADEMIC PROFESSIONAL
MITCHELL

SENIOR LECTURER
F TZGERALD

For adv sing 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 that 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 dance major technique courses are required to take part in a place ment audition to determine their levels of technical profi ciency 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

NOTE: For the Genera Stud es requ rement courses and codes such as L1 N3 C and H see "Genera Stud es " page 85 For graduat on requ'rements see Un vers ty Graduat on Requ rements page 81 For an exp anat on of add t ona omn bus courses offered but not sted n this cata og see 'C ass f cat n f Courses " page 58

areas before enrolling in intermediate or advanced levels of course work.

BACHELOR OF FINE ARTS DEGREE

Dance

The faculty in the Department of Dance in the College of Fine Arts offer a Bachelor of Fine Arts degree at the undergraduate level with emphases in four areas of concentration: choreography, dance education, dance studies, and performance. All new Dance majors are admitted into the preprofessional program. Students audition or petition for admission into one of the Bachelor of Fine Arts dance concentrations during the sophomore year of study. Transfers may request admission into the B.F.A. degree after one semester in residence. Further details may be obtained from the Department of Dance.

Graduation Requirements. In addition to fulfilling the major requirements, students must meet all university graduation requirements and college degree requirements. At least 45 semester hours must be upper division courses. See "University Graduation Requirements," page 81, and "College Degree Requirements," page 261.

Core Curriculum. The Dance major consists of a minimum of 54 semester hours in the dance core. All courses in the major must be completed with a grade of "C" or higher. First semester students in the preprofessional program should take the following courses:

DAN 134	Technique and Theory of Modern Dance	3
DAN 135	Technique and Theory of Ballet	2
ENG 101	First Year Composition	3
Dance elective		1
General Studies courses		6
Total		15

The following courses make up the core curriculum:

Technique. Twenty-six semester hours in ballet and modern technique are required.

Performance. Two upper division courses are required.

Theory. The following dance theory courses are required:

DAH 100	Introduction to Dance *HU*	3
DAN 221	Rhythmic Theory for Dance I	2
DAN 222	Rhythmic Theory for Dance II	2
DAN 340	Dance Kinesiology	4
Total		11

Choreography. The following courses are required:

DAN 264	Improvisational Structures	3
DAN 265	Approaches to Choreography	3
Total		6

History. Choose two from the following three courses:

DAH 307	Cross Cultural Dance Perspectives *L2 HU G*	3
DAH 401	Dance History I *HU*	3
DAH 402	Dance History II *HU*	3

Production. Choose one of the following two courses:

DAN 210	Dance Production I	3
DAN 211	Dance Production II	3

Dance Concentration Curriculum. Each concentration in the dance curriculum—dance education, dance studies, and performance—is composed of 25 semester hours.

Choreography

Core Curriculum. See "Core Curriculum" under "Dance."

Specialization. The following courses are required for the choreography specialization.

DAN 226	Dance Notation I	3
DAN 321	Music Literature for Dance	3
DAN 364	Choreography and Accompaniment	3
DAN 365	Advanced Choreography	3
DAN 481	Senior Performance in Dance	2
Total		14

Production. Choose one of the following two courses:

DAN 210	Dance Production I	3
DAN 211	Dance Production II	3

Additional requirements are listed on the check sheet available from the Department of Dance.

Dance Education

Core Curriculum. See "Core Curriculum," under "Dance."

Specialization. The following courses are required for the dance education specialization.

DAN 321	Music Literature for Dance	3
DAN 359	Dance Education Theory	3
DAN 364	Choreography and Accompaniment	3
DAN 365	Advanced Choreography	3
DAN 481	Senior Performance in Dance	2
Total		14

Production. Choose one of the following two courses:

DAN 210	Dance Production I	3
DAN 211	Dance Production II	3

Dance Methods. Choose two of the following three courses:

DAN 35	Methods of Teaching Modern Dance in Secondary Education	3
DAN 351	Methods of Teaching Ballet	3
DAN 357	Children's Dance	3

Additional requirements are listed on the check sheet available from the Department of Dance.

Dance Studies

Core Curriculum. See "Core Curriculum," under "Dance."

Specialization. The following courses are required for the dance studies specialization.

DAH 495	Dance Research Sources	2
DAH 496	Senior Thesis Project	2
Total		4

Twenty additional hours approved by an advisor must be taken in no more than two related fields. Additional requirements are listed on the check sheet available from the Department of Dance

Performance

Core Curriculum. See "Core Curriculum," page 276.

Specialization The following courses are required for the performance specialization:

DAN 32	Music Literature for Dance	3
DAN 380	Performance Studies Practicum	2
DAN 480	Senior Performance in Dance	4
THP 101	Introduction to the Art of Acting	3
Total		12

Production. Choose one of the following two courses

DAN 210	Dance Production I	3
DAN 211	Dance Production II	3

Performance. Choose from the following three courses (six semester hours are required):

DAN 371	Dance Theatre Performance/Production	1-3
DAN 471	Dance Arizona Repertory Theatre	6
DAN 494 ST	Concert Dance	2

Additional requirements are listed on the check sheet available from the Department of Dance

A student pursuing the B.F.A degree in Dance Education may also choose to become certified to teach dance (K-12) in Arizona public schools. Students should apply to the College of Education in the middle of the sophomore year. To be considered for admission to the teacher certification program, students must complete an admission portfolio specified by the College of Education, which may include completion of the Pre-Professional Skills Test (PPST). Students should be advised that at least 20 additional semester hours are required to complete certification requirements. For more information, consult the dance education advisor and College of Education Office of Student Affairs.

MINOR

The department offers a minor in Dance consisting of 18 semester hours of course work, including 12 upper division hours. A minimum grade of "C" is required in all courses. Dance minor requirements include:

Performance or choreography	3
Technique	6
Theory	6
Electives	3

Interested students should contact the Department of Dance for specific requirements and admission procedures.

GRADUATE PROGRAM

A total of 60 semester hours of graduate credit is required. 30 hours of dance studio; 12 hours of dance theory; nine hours of electives, and nine hours of individual project (choreography, performance, or other approved project). In addition to the studio concentrations in choreography and performance, specialized areas of emphasis are available within the 60 semester hour program. In consultation with the graduate director, specific interests, needs, and abilities determine a program of study that directs course work in alternative directions.

DANCE HISTORY (DAH)

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*

DAH 190 Introduction to the Dance Profession. 1 F
Orientation to the dance profession introducing career options and university department resources. Designed for Dance majors.

DAH 300 Focus on Dance. 3 F, S, SS
Specialized study of cultural and theatrical aspects of dance such as social dance forms, specific genres or historical periods. May be repeated for credit. Lecture-studio. May not be taken for credit by student who has completed DAH 100. *General Studies HU*

DAH 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*

DAH 302 Cross-Cultural Dance Perspectives. 3 F S
Comparative analysis of dance in diverse cultural contexts. Internet learning environment. Independent research project. Prerequisites: completion of First Year Composition requirement or instructor approval. *General Studies. L2/HU G*

DAH 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.*

DAH 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*

DAH 495 Dance Research Sources. 2 F
The investigation of various resources and methods for conducting research in dance. Seminar. Prerequisite: instructor approval.

DAH 496 Senior Thesis Project. 2 S
Accumulating research project which integrates dance and a related field of interest. Prerequisite: DAH 495

DAH 501 Philosophy of Dance. 3) A
Analysis of traditional and contemporary theories of dance with regard to issues of expression, form and meaning.

DAH 502 Cultural Concepts of Dance. 3 A
Examines the close connection between culture, dance, and movement through writings in cultural theory, dance ethnology, and philosophy.

DANCE (DAN)

DAN 130 Dance. 2 F S SS
Introduction to styles and forms of dance: ballet, modern, jazz, tap, ballroom, ethnic. May be repeated for credit.

DAN 134 Technique and Theory of Modern Dance. 3 F S
Elementary concepts of modern dance technique. Development of movement quality and performance skills. 6 hours weekly. May be repeated for credit. Placement audition required. Prerequisite: Dance major.

DAN 135 Technique and Theory of Ballet. 2 F S
Elementary ballet technique with emphasis on alignment, control and development of the feet with proper awareness of style and phrasing. 4 hours weekly. May be repeated for credit. Placement auditions required.

DAN 164 Improvisation. 1 F S
Improvisation techniques employing the basic elements of space, time, and energy. Studio

NOTE: For the General Studies requirement courses and codes such as L1, N3, C, and H, see General Studies page 85. For graduation requirements see University Graduation Requirements, page 81. For an explanation of additional comments/bus courses offered but not listed in this catalog see 'Classification of Courses" page 58

DAN 171 Dance Production Lab: Costume. 0 F S
Part pat n n c ncert dance product on n the area of costum ng Requ'red f a Dance ma ors ab

DAN 172 Dance Production Lab: Technical Theatre. 0 F S
Part c pat on n c cert dance product on n the area f techn ca the atre Requ red of a Da e maj rs Lab

DAN 173 Dance Production Lab: Management. (0 F S
Part c pat on n concert dan e product n n the area of product on management Requ red of a Dance majors Lab

DAN 210 Dance Production I. 3 F
Theory a d pract ce of ght ng scenery sound and stage manage ment for dance pr duct on Labs cover a areas of product on Lec ture, ab

DAN 211 Dance Product on I . 3 S
Theory and pract ce f arts management and costume des gn for dance pro u t n Labs cover a areas f pr duct on Lecture, ab

DAN 221 Rhythmic Theory for Dance I. 2 F
E eme t of mus c mus st uctures and the r re at onsh p to dance. Emphas s n rhythm c ana ys s a d dance accompan ment

DAN 222 Rhythmic Theory for Dance II. 2 S
Cont nuat on of DAN 221 w th an emphas s on sma group movement pro e ts n re at on to mus ca t me and structure CD ROM work nc ded Prerequ s te DAN 221 or prof c ency exam

DAN 228 Dance Notation I. 3 F S
Survey f systems of dance notat o troduct n to effort shape ana ys s of movement Emphas s on earn ng e ementary abanota t n Lectu e stud o Prerequ s tes DAN 221 MUS 100

DAN 230 Dance. 2 F, S SS
ntermed ate eve s Cont nuat on of DAN 130 May be repeated for cred t

DAN 234 Technique and Theory of Modern Dance. 3 F S
ntermed ate concepts of modern dance techn que Deve opment of moveme t qua ty a d perf rmance sk s 6 hours week y May be repeated f r cred t P a ement aud t n requ red

DAN 235 Technique and Theory of Ba let. 2 F S
The advanced study f e ementary ba et techn que through the trad t ona exerc ses w th pr per awareness of sty e and phras ng 4 hours week y May be repeated f r cred t Placement aud t on requ red

DAN 237 Beg nn ng Pointe. 1 F, S
The study of e ementary po nte techn que through the trad t na exer c ses 2 hours week y May be repeated for cred t Prerequ s tes bas c ba et t a n ng nst uctor approva

DAN 264 Improvisational Structures. 3 F
ntrod ct on to bas c mprov sat ona and choreograph c pr nc p es w th emphas s n current med a and techn gy group structures and movement nvent on Lect re, stud o

DAN 265 Approaches to Choreography. (3 S
ntermed ate app cat on f bas c choreograph c pr nc p es with emphas s on mprov sat on form content and eva uat ve sk s Lec ture stud Prerequ s te DAN 264

DAN 321 Music Literature for Dance. 3 F, S
H st r ca survey of mus c and comp s t ona e ement re at ve to dan e Emphas s n ana ys s f ch reography from a mus ca stand- po nt CD ROM ab Lecture, ab Prerequ s tes DAN 221 and 222 o nstruct r approva . Pre or c requ s te MUS 340

DAN 328 Dance Notation II. 2 S
ntermed ate st dy of abanotat on Emphas s n score read ng Pre requ s te DAN 228 or equ va ent

DAN 330 Dance. 2 F S SS
Advanced eve s Cont nuat o of DAN 230. May be repeated for cred t

DAN 334 Techn que and Theory of Modern Dance. 3 F S
Advanced concepts of modern dance techn que. Deve opment of movement qua ty a d performance sk s 6 hours week y May be repeated for cred t P acement aud t n requ ed

DAN 335 Technique and Theory of Ba let 2 F S
ntermed ate ba et techn que w th emphas s o strength dynam cs rhythm ca mpu ses a d trans t ons w th awareness of proper sty e and phras g 4 hours week y May be repeated for cred t P acement aud t requ red

DAN 337 Intermed ate Pointe. 1 F S
Study of ntermed ate and adva ced p te te hn que through the tra- d t na exerc ses 2 ho rs week y May e repeated for red t Prereq u s te DAN 237 or st uctor approva

DAN 340 Dance K'nesiology. 4 S
K nes o og ca pr nc p e app ed to dance techn que nc g ana y s s of muscu ar patte s dan e vement and t e path e an cs of dance n ury Prerequ s te B O 201 o n t ct r appr va .

DAN 342 Ideokinesis 2 F
A study of po ture us ng t e v s a zat n of mage goa s t fa tate mproved a gnment and m vement eff c ency May be epeated fo cred t Lecture tud o

DAN 350 Methods of Teach ng Modern Dance in Secondary Education. 3 F
Ana ys s and a qu s t on of teac ng mater a s f r the techn q e mprov sat n and choreography f modern dance e ture st d Pre or coreq s te DAN 359

DAN 351 Methods of Teaching Ballet. 3 S
Ana ys s and acqu s t on of tea h g techn ques a d mater a s f r ba et jazz and mu t cu t ra dance forms Le ture stud o Pre r coreq s te DAN 359

DAN 357 Chi dren's Dance. 3 S
Theory and pract ce f teach ng creat ve dance to h dren De gned for Dance maj rs a d re ated curr cu a but open to a st de t

DAN 359 Dance Education Theory 3 F
App cat o of pr nc p es of mot vat on earn ng and eva at n to the teach ng of dance

DAN 364 Choreography and Accompaniment. 3 F
Expe ence the se of t ad t ona nd n tra t ona mus a struc t res as a bas s for cho eograph c pro e ts Lecture stud Prereq s te DAN 321

DAN 365 Advanced Choreography. 3 S
nvest gat on and pract ce of c ntemporary sty es f choreography Stud o Prerequ tes DAN 264 and 65 o equ va e ts

DAN 371 Dance Theatre Performance/Production. 1 3 F S
Performance or techn ca theatre w rk n de g ated dance duc t ons 3 ho rs a week pe se ester o r May be repeated for red t Prerequ s te nstr ct r approva .

DAN 380 Performance Studies Practicum 2 F S
Projects nc ude da es rec structed from abanotat n and facu ty guest art st r student created performance eve ts St d ab

DAN 423 Dance, Computers and Multimedia. 3 F
ntroduct on to desktop mu t med a as t re ates to dance creat on ed cat on p oduct n and esearch ectu e, ab. *Genera Stud es N3*

DAN 434 Technique and Theory of Modern Dance. 3 F S
Preparat on in the performance and comprehe s on of pr fess o a eve modern dance techn que 6 hours week y May be epeated for cred t P acement aud t requ re

DAN 435 Technique and Theory of Bal et. 2 F S
The study of pr fes na advanced ba et tech que w t emp as s on preparat on for perf rma e 4 ho rs week y May be repeated f r cred t P acement aud t req red.

DAN 471 Dance Arizona Repertory Theatre. 3 F S
Profess ona modern dance company exper ence and commu ty out reach Opp rtun ty to work w th facu ty gue t performers nd cho e ographe s Lecture stud o May be repeated for c ed t

DAN 480 Sen or Performance 'n Dance. 2 F
O g na cho e graphy f r g oup performa ce w th ana ys a d cr t que of prob ems enc untered n prod ct Must be repeated for a tota of 4 cred ts Prerequ s te DAN 364 365

DAN 494 ST: Specia Topics. 2 A
a Concert Dan e

DAN 510 Dance Stagecraft and Production. 1 3 F S
The ry of co tum ng ght ng make p, scenery and ound s re ated t dance performance May be epeated n e f r cred t Le ture stu d Prereq s te DAN 211 r equ va ent

DAN 521 Sound Lab I 1 F
tr duct on to tape record g s u d x ng a d o tape ed t ng for dance ch reographers Lecture ab Prereq s te nstr ctor approva

NOTE: For the Ge era Stud es requ rement courses and codes (such as L1 N3 C and H see Genera St d e page 85 For graduat on requ rements, see Un vers ty Graduat on Requ rements page 81 For an exp anat on of add t ona om u c rses offered but not sted n th s cata og, see C assif cat on of Co rses page 58

DAN 522 Sound Lab II. 1 S
Cont nuat on of DAN 521 Emphas s on deve pment of aud o compo s t ons for choreograph c pro ects Lecture ab Prerequ s te DAN 521

DAN 523 Dance, Computers, and Multimedia. 3 F S
Introduct on to desktop mult med a as t re ates to dance creat on pro duction educat on and research Lecture, ab.

DAN 534 Technique and Theory of Modern Dance. 3 F S
Preparation n the perf rmance and c mprehens on of profess onal eve modern dance for f rst year graduate students 6 h urs week y May be repeated for cred t P acement aud t on requ red

DAN 535 Technique and Theory of Ba let. 2 F, S
Graduate study of ba et techn que May be repeated for cred t P acement aud t on requ red Stud o

DAN 542 Ideokinesis. 2 F
A theoretical exam at on of deok net c methods of fac tat ng postura change and movement eff c ency.

DAN 550 Graduate Dance Pedagogy: Modern. 3) S
Overv ew of the role of modern dance techn que and theory 'n the un' vers ty curricu um nc ud ng curre t pedagog ca theory d vers ty, gen der May fo ow or precede nternsh p n pract ca teach ng

DAN 551 Graduate Dance Pedagogy: Ballet. (3) F
Advanced ana ys s of teach ng techn ques fo ba et Prerequ s te: nstructor approva .

DAN 561 Choreographer/Composer Workshop. 1 3) N
Ana ys s of, exper mentat on w th, and pract ce n work ng w th com posers of mus c for ch reography Open to exper enced choreogra phers and composers Lecture stud o Prerequ s te: nstructo approva

DAN 564 Solo and Group Choreography I. (3 F
Orig na choreography created for so o and group performance Stu dio Prerequ s tes DAN 364 and 365 *or* equ va ent.

DAN 565 Solo and Group Choreography II. (3 S
Cont nuation of DAN 564 Studio. Prerequ s te DAN 564

DAN 571 Dance Theatre. 1 3 F S
Performance n spec a y choreographed dance product ons May be repeated for cred t Prerequ s te nstructor approva .

DAN 580 Performance Studies Practicum. 1 3) F, S
Projects nc ude dances reconstructed from abanotat on and from, student , fac ty or guest art st created performance events Stud o, ab.

DAN 591 Seminar. 1 3) F S
Sem nar focus ng on enr chment top cs, product on aspects of thes s projects teach ng concerns, spec a ectures f ms or cr t ques

DAN 634 Technique and Theory of Modern Dance. 3) F S
Preparation the perf rmance and c mprehens on of profess ona eve modern dance for second year graduate students 6 hours week y May be repeated for cred t P acement aud t on requ red

DAN 640 Advanced Prob ems in Analysis of Dance Technique. 3) S
Theories and pr nc p es of human anatomy, k nes'o ogy, and the psy cho ogy of earn ng app ed to ana ys s of dance movement Prerequ s tes DAN 340 and 342 *or* nstructor approva

DAN 664 Choreography Workshop. 1 3 F
Choreographic study n a sem nar context w th facu ty and guest art ists Stud o May be repeated for cred t Prerequ s tes DAN 564 565

DAN 671 Dance Arizona Repertory Theatre. (3 F, S
Profess ona m dern dance c mpany exper ence and commun ty out reach Opportun ty to work w th choreographers faculty, and guest performers. Lecture stud o

DAN 693 M.F.A. Project. 1 9 F S SS
Preparat n for requ red M F.A project approved by the student s superv sory comm ttee Work s fo owed by a final ora exam nat on and documentat on appropr ate to the project Prerequ s te comm ttee approva

School of Music

Toni-Marie Montgomery
Director
(MUSIC 185) 480/965-3371
www.asu.edu/cfa/music

REGENTS' PROFESSORS
H CKMAN PAGANO

PROFESSORS
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ASSISTANT PROFESSORS
BRYAN, BUSH, LYMAN, MCLIN, RIO

LECTURER
SHELLANS

ACADEMIC PROFESSIONAL
CAMPBELL

The School of Music is a member of the National Associ ation of Schools of Music, and the requirements for entrance and graduation set forth in this cata og are in accordance with the published regulations of the associa tion. 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 musi cian must to some extent be a performer, a listener, a histo rian, a composer, a theorist, and a teacher For this reason, certain subject matter areas and learning processes are com mon 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 under graduate 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 (interpreta tion), composer (creation , scholar (research), and teacher.

3. A repertory for study that embraces all cultures and historical periods

All students registering in a School of Music major program enroll through the College of Fine Arts

Audition/Admission Requirements. *All students who enroll in an undergraduate music degree program are required to pass an entrance audition in their primary performing medium (instrument or voice) before being admitted to the School of Music.* Audition forms and specific audition requirements for each instrument or voice may be obtained upon request by contacting the School of Music. Official dates for these auditions are set for each academic year

Admission to the composition concentration is subject to the approval of the composition faculty based upon an evaluation of the student's compositions and or interview

Diagnostic Examinations. Entering students, including *all* transfer students, must take a diagnostic examination in piano during orientation week of their first semester on campus, regardless of previous piano course work completed All students are required to reach a minimum level of piano proficiency.

Continuation in the composition program is subject to review in the sophomore or junior year.

All Music Education majors, including transfer and post baccalaureate students, must perform an additional audition before being admitted to the teacher education program Normally, this audition occurs during the sophomore year

All students majoring in Music Therapy must pass MUE 211 Music in Recreation and a music therapy faculty review and screening interview before being passed into upper division study

BACHELOR OF ARTS DEGREE

The Bachelor of Arts degree requires a minimum of 120 hours for graduation.

MAJOR REQUIREMENTS

The Music major consists of 50 semester hours and includes the requirements listed below for each area of concentration.

GRADUATION REQUIREMENTS

In addition to fulfilling the major requirements, students must meet all university graduation requirements and college degree requirements See "University Graduation Requirements," page 81, and "College Degree Requirements," page 261

Music Theory. The following music theory courses are required:

MTC 125	Basic Music Theory	3
MTC 221	Music Theory, 18th Century	3
MTC 222	Music Theory 19th Century	3
MTC 223	Music Theory: 20th Century	3
MTC 320	Modal Counterpoint	2
	or MTC 321 Tonal Counterpoint	2
MTC 327	Form and Analysis I	3
MTC 422	Musical Acoustics	3
Total		20

Music History. Three semester hours of MHL 341 Music History and three semester hours of MHL 342 Music History are required. Nine elective upper division hours in music history and/or theory are required

Major Performing Medium. Eight semester hours of MUP 111 Studio Instruction or 311 Studio Instruction are required At least four of these hours must be at ASU

Recital Attendance. Six semesters of MUP 100 Concert Attendance are required.

Diagnostic Examination. Four semesters of class piano (MUP 131, 132, 231, 232 , unless waived by a diagnostic examination at the time of entrance, are required.

The remaining semester hours in music are selected by the student in consultation with an advisor Areas of study may include ethnomusicology, music education, music history, music theory, and performance At least 23 semester hours, 12 in the field of specialization, must be in the upper division. Students must select sufficient elective courses to complete the 120 hours required for graduation.

BACHELOR OF MUSIC DEGREE

All Bachelor of Music degree programs require 120 semester hours for graduation excluding Music Education (125 semester hours and Music Therapy 129 semester hours The B M curriculum offers majors in Performance, Theory and Composition, Music Education, and Music Therapy.

MAJOR REQUIREMENTS

The curricula for the Music Education and Music Therapy degrees require more than 120 semester hours. A student wishing to complete these programs in four years is required to take more than 15 semester hours per semester or to attend summer sessions.

The music curriculum for the remaining B M degrees listed consists of 79 semester hours The requirements for each major are listed below. In addition, the Music Education major provides certification to students interested in teaching in the public schools

GRADUATION REQUIREMENTS

In addition to fulfilling the major requirements, students must meet all university graduation requirements and college degree requirements. See "University Graduation Requirements," page 81, and "College Degree Requirements," page 261.

Music Education Major, Choral-General Concentration

This degree program may include a teaching minor in instrumental music

Music Theory. The following music theory courses are required.

MTC 125	Basic Music Theory	3
MTC 221	Music Theory 18th Century	3
MTC 222	Music Theory 19th Century	3
MTC 223	Music Theory 20th Century	3
MTC 327	Form and Analysis I	3
Total		15

Music History. The following music history courses are required:

MHL 341	Music History	3
MHL 342	Music History	3
Total		6

Conducting. The following conducting courses are required:

MUP 209	Beginning Choral Conducting	1
MUP 339	Choral Conducting	2
Total		3

Music Education. The following music education courses are required:

MUE 110	Introduction to Music Education	1
MUE 313	Elementary Music Methods	3
MUE 315	General Music in the Secondary Schools	2
MUE 480	Choral Methods	3
Total		9

Major Performing Medium. Eight semester hours of MUP 111 Studio Instruction and eight semester hours of MUP 311 Studio Instruction are required to obtain a proficiency level necessary to meet the graduation recital requirement. MUP 495 Solo Performance 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) is required. Students wishing to extend their proficiency beyond this level may continue to study in MUP 321 Studio Instruction

Ensemble. Eight different semesters of participation, including at least six semesters of MUP 352 Concert Choir and/or MUP 353 University Choir, four of which must be at ASU, are required.

Recital Attendance. Six semesters of MUP 100 Concert Attendance are required.

Music Education Major, Instrumental Concentration

It is strongly recommended that this degree program include courses in choral music or courses in jazz education.

Music Theory. The following music theory courses are required:

MTC 125	Basic Music Theory	3
MTC 221	Music Theory 18th Century	3
MTC 222	Music Theory 19th Century	3
MTC 223	Music Theory 20th Century	3
MTC 327	Form and Analysis I	3
Total		15

Music History. The following music history courses are required:

MHL 341	Music History	3
MHL 342	Music History	3
Total		6

Conducting. The following conducting courses are required:

MUP 210	Beginning Instrumental Conducting	1
MUP 340	Instrumental Conducting	2
Total		3

Music Education. The following music education courses are required:

MUE 110	Introduction to Music Education	1
MUE 315	General Music in the Secondary Schools	2
MUE 317	Educational Methods for Violin and Viola	1
MUE 318	Educational Methods for Cello and String Bass	1
MUE 327	Educational Methods for Trumpet and Horn	1
MUE 328	Educational Methods for Trombone, Euphonium, and Tuba	1
MUE 336	Educational Methods for Percussion	1
MUE 337	Educational Methods for Flute, Clarinet, and Saxophone	1
MUE 338	Educational Methods for Double Reed Instruments	1
MUE 481	Instrumental Practicum/Methods	5
MUE 482	Instrumental Practicum/Methods	5
Total		20

Major Performing Medium. Eight semester hours of MUP 111 Studio Instruction and eight semester hours of MUP 311 Studio Instruction are required to obtain a proficiency level necessary to meet the graduation recital requirement. MUP 495 Solo Performance completes the requirement.

Ensemble. Eight different semesters of participation in an ensemble are required, 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 Symphony Orchestra. Wind and percussion players must have a minimum of six semesters of MUP 361 Marching and Concert Bands.

Recital Attendance. Six semesters of MUP 100 Concert Attendance are required.

Diagnostic Examination. Four semesters of class piano (MUP 131, 132, 231, 232), unless waived by a diagnostic examination at the time of entrance, are required.

Music Education Major, String Concentration

Music Theory. The following music theory courses are required:

MTC 125	Basic Music Theory	3
MTC 221	Music Theory 18th Century	3
MTC 222	Music Theory 19th Century	3
MTC 223	Music Theory 20th Century	3
MTC 327	Form and Analysis I	3
Total		15

Music History. Three semester hours of MHL 341 Music History and three semester hours of MHL 342 Music History are required.

NOTE: For the General Studies requirements, courses and codes (such as L1, N3, C, and H), see General Studies, page 85. For graduation requirements see "University Graduation Requirements," page 81. For an explanation of additional nonbusiness courses offered but not listed in this catalog see "Classification of Courses," page 58.

Conducting. The following conducting courses are required:

MUP 210	Beginning Instrumental Conducting	1
MUP 340	Instrumental Conducting	2
Total		3

Music Education. The following music education courses are required:

MUE 110	Introduction to Music Education	1
MUE 315	General Music in the Secondary Schools	2
MUE 317	Educational Methods for Violin and Viola or MUE 318 Educational Methods for Cello and String Bass	1
MUE 335	Educational Methods for Guitar	1
MUE 336	Educational Methods for Percussion	1
MUE 487	Instrumental Practicum/Methods	5
MUE 485	String Practicum/Methods	2
Total		13

Also required are MUP 121 Studio Instruction for three semester hours in a stringed instrument in an area other than the major instrument, MUP 121 for one semester hour in a third stringed instrument, and MUP 121 for one semester hour in a fourth stringed instrument.

Major Performing Medium. Eight semester hours of MUP 111 Studio Instruction and eight semester hours of MUP 311 Studio Instruction are required to obtain a proficiency level necessary to meet the graduation recital requirement MUP 495 Solo Performance completes the requirement.

Ensemble. Eight different semesters of participation in an ensemble are required, four of which must be at ASU. Six semesters of MUP 345 Symphony Orchestra or equivalent are required.

Recital Attendance. Six semesters of MUP 100 Concert Attendance are required.

Recommended Elective. MUE 313 Elementary Music Methods

Diagnostic Examination. Four semesters of class piano (MUP 131, 132, 231, 232), unless waived by a diagnostic examination at the time of entrance, are required.

Performance Major, Guitar Concentration

Music Theory. The following music theory courses are required

MTC 125	Basic Music Theory	3
MTC 221	Music Theory 18th Century	3
MTC 222	Music Theory 19th Century	3
MTC 223	Music Theory 20th Century	3
MTC 320	Modal Counterpoint or MTC 321 Tonal Counterpoint	2
MTC 327	Form and Analysis I	3
Total		17

Music History. Three semester hours of MHL 341 Music History and three semester hours of MHL 342 Music History are required

Repertoire and Pedagogy. Two semester hours of MUP 451 Repertoire and two semester hours of MUP 481 Performance Pedagogy and Materials are required

Conducting. MUP 210 Beginning Instrumental Conducting is required.

Major Performing Medium. Sixteen semester hours of MUP 127 Studio Instruction and 16 semester hours of MUP 327 Studio Instruction are required to attain a proficiency level necessary to meet the graduation recital requirements. A half recital (MUP 495 Solo Performance) and a full recital (MUP 496 Solo Performance) are also required.

Ensemble. Eight semester hours of ensemble are required within a minimum of six different semesters. Four of the eight semester hours must be MUP 379 Chamber Music Ensemble: Guitar

Recital Attendance. Six semesters of MUP 100 Concert Attendance are required.

Diagnostic Examination. Four semesters of class piano (MUP 131, 132, 231 232), unless waived by a diagnostic examination at the time of entrance, are required.

Additional Requirements. MHL 447 Music Since 1900 may be used to satisfy the General Studies L2 requirement.

Performance Major, Jazz Concentration

Music Theory. The following music theory courses are required.

MTC 125	Basic Music Theory	3
MTC 221	Music Theory 18th Century	3
MTC 222	Music Theory 19th Century	3
MTC 223	Music Theory: 20th Century	3
MTC 315	Modern Arranging	2
MTC 316	Modern Arranging	2
MTC 320	Modal Counterpoint or MTC 321 Tonal Counterpoint	2
MTC 327	Form and Analysis I	3
MTC 440	Jazz Theory and Ear Training	2
MTC 441	Jazz Composition	2
Total		25

Music History. The following music history courses are required

MHL 341	Music History	3
MHL 342	Music History	3
MHL 352	The Evolution of Jazz *H*	3
Total		9

Conducting. MUP 210 Beginning Instrumental Conducting is required.

Major Performing Medium. Eight semester hours of MUP 111 Studio Instruction and eight semester hours of MUP 311 Studio Instruction are required to obtain a proficiency level necessary to meet the graduation recital requirements. Two half recitals MUP 495 Solo Performance) are required, with one in the jazz idiom

Improvisation. The following courses are required.

MUP 14	Jazz Fundamentals	1
MUP 142	Jazz Fundamentals	1
MUP 217	Improvisation Workshop	2
MUP 218	Improvisation Workshop	2
MUP 417	Advanced Improvisation	2

MUP 4 8 Advanced Improv sation	2
Total	10

Workshops. The following courses are required:

MUP 319 Recording Studio Techn ques	2
MUP 320 MIDI Workshop	2
Total	4

Ensemble. Eight semesters of ensemble are required, including six semesters of MUP 379 Chamber Music Ensembles and two semesters of MUP 386 Stage Band.

Recital Attendance. Six semesters of MUP 100 Concert Attendance are required

Diagnostic Examination. Four semesters of class piano (MUP 131, 132, 231, 232), unless waived by a diagnostic examination at the time of entrance, are required.

Performance Major, Keyboard Concentration

Music Theory. The following music theory courses are required:

MTC 125 Basic Music Theory	3
MTC 221 Music Theory 18th Century	3
MTC 222 Music Theory 19th Century	3
MTC 223 Music Theory 20th Century	3
MTC 320 Modal Counterpoint	2
or MTC 321 Tonal Counterpoint (2)	
MTC 327 Form and Ana ys s I	3
MTC 495 Studies in 20th Century Theory	3
or MTC 428 Form and Ana ysis II 3)	
Total	20

Music History. The following music history courses are required:

MHL 341 Music History	3
MHL 342 Music History	3
Total	6

Repertoire and Pedagogy. The following courses are required:

MUP 451 Repertoire	2
MUP 48 Performance Pedagogy and Materials	2
or MUP 482 Piano Pedagogy II 2	
Total	4

Conducting. One of the following two courses is required:

MUP 209 Be nning Choral Conducting	1
MUP 210 Beginning Instrumental Conducting	1

Harpsichord. One semester hour of harpsichord is required

Major Performing Medium. Sixteen semester hours of MUP 127 Studio Instruction and 16 semester hours of MUP 327 Studio Instruction are required to attain a proficiency level necessary to meet the graduation recital requirements A half recital MUP 495 So o Performance) and a full recital (MUP 496 Solo Performance) are required.

Ensemble. Eight semester hours of ensemb e within a mini mum of six different semesters are required, including two semesters of accompanying and two semesters of chamber music.

Recital Attendance. Six semesters of MUP 100 Concert Attendance are required

Additional Requirements. MHL 447 Music Since 1900 may be used to satisfy the General Studies L2 requirement.

Performance Major, Music Theatre Concentration

Music Theory. The following music theory courses are required:

MTC 125 Basic Music Theory	3
MTC 221 Mus c Theory 18th Century	3
MTC 222 Mus c Theory 19th Century	3
MTC 223 Mus c Theory 2 th Century	3
MTC 327 Form and Analysis I	3
Total	15

Music History. The following music history courses are required:

MHL 341 Music History	3
MHL 342 Music History	3
Total	6

Major Performing Medium. Eight semester hours of MUP 111 Studio Instruction and eight semester hours of MUP 311 Studio Instruction are required to attain a proficiency level necessary to meet the graduation requirement of a public performance of two roles, both of which must be of major proportion.

Music Theatre. Five semesters of MUP 370 Music Theatre: Techniques; four semesters of MUP 371 Music Theatre: Workshops, eight semesters of MUP 373 M isic Theatre: Performance, two semesters of MUP 374 Music Theatre Production, and one semester of MUP 451 Repertoire: Broadway Musicals are required

Recital Attendance. Six semesters of MUP 100 Concert Attendance are required.

Additional Requirements. Nine semester hours in theatre and 11 semester hours in dance are required. MHL 447 Music Since 1900 should be used to satisfy the General Studies L2 requirement.

Diagnostic Examination. Four semesters of class piano (MUP 131, 132, 231, 232 , unless waived by a diagnostic examination at the time of entrance, are required.

Opera Option. For those students whose goal is opera per formance, the following substitutions to the course of study may be made: MUP 451 Repertoire: Opera instead of MUP 451 Repertoire: Broadway Musicals, and two semesters of MUP 371 Aria Preparation and three semesters of MUP 250 Diction for Singers instead of five semester hours of dance.

NOTE: For the General Stud es requ rement courses and codes (such as L1 N3 C and H see Genera Stud es page 85 For graduat n requ rements see Un vers ty Graduat on Requ rements page 81. For an exp anat o of add t na omn bus c urses offered but not l sted in th s cata og see 'C ass f cat on of Courses ' page 58

Performance Major, Orchestral Instrument Concentration

Music Theory. The following music theory courses are required

MTC 125	Basic Music Theory	3
MTC 221	Music Theory: 18th Century	3
MTC 222	Music Theory: 19th Century	3
MTC 223	Music Theory: 20th Century	3
MTC 320	Modal Counterpoint or MTC 321 Tonal Counterpoint 2	2
MTC 327	Form and Analysis I	3
MTC 425	Studies in 20th Century Theory	3
Total		20

Music History. The following courses are required.

MHL 341	Music History	3
MHL 342	Music History	3
Total		6

Repertoire and Pedagogy. One of the following two courses is required.

MUP 451	Repertoire	2
MUP 481	Performance Pedagogy and Materials	2

Conducting. The following courses are required.

MUP 210	Beginning Instrumental Conducting	1
MUP 341	Instrumental Conducting	2
Total		3

Major Performing Medium. Sixteen semester hours of MUP 127 Studio Instruction and 16 semester hours of MUP 327 Studio Instruction are required to attain a proficiency level necessary to meet the graduation recital requirements. A half recital (MUP 495 Solo Performance) and a full recital (MUP 496 Solo Performance) are required.

Ensemble. Eight semester hours of large ensembles within a minimum of six different semesters are required plus four semester hours of small ensembles within a minimum of four different semesters.

Recital Attendance. Six semesters of MUP 100 Concert Attendance are required.

Diagnostic Examination. Four semesters of class piano (MUP 131, 132, 231, 232), unless waived by a diagnostic examination at the time of entrance, are required.

Additional Requirements. MHL 447 Music Since 1900 may be used to satisfy the General Studies L2 requirement.

Performance Major, Piano Accompanying Concentration

Music Theory. The following music theory courses are required:

MTC 125	Basic Music Theory	3
MTC 221	Music Theory: 18th Century	3
MTC 222	Music Theory: 19th Century	3
MTC 223	Music Theory: 20th Century	3
MTC 320	Modal Counterpoint or MTC 321 Tonal Counterpoint 2	2
MTC 327	Form and Analysis I	3
MTC 428	Form and Analysis II	3
Total		20

Music History. The following courses are required

MHL 341	Music History	3
MHL 342	Music History	3
Total		6

Diction and Repertoire. The following courses are required:

MUP 250	Diction for Singers	1
MUP 451	Repertoire	2
MUP 453	Song Literature	2
MUP 454	Song Literature	2
Total		7

Conducting. One of the following two courses is required:

MUP 209	Beginning Choral Conducting	1
MUP 210	Beginning Instrumental Conducting	1

Major Performing Medium. The following courses are required

MUP 127	Studio Instruction	4
MUP 311	Studio Instruction	8
MUP 337	Studio Instruction: Piano Accompanying	8
Total		20

In addition, each student accompanies two half recitals (MUP 495 Solo Performance), 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 Solo Performance), one vocal and one instrumental.

Ensemble. Two semesters of MUP 379 Chamber Music Ensembles, one semester of MUP 379 Chamber Music Ensembles (piano), one semester of MUP 487 Piano Accompanying, four semesters of MUP 388 Piano Accompanying, and two semesters of ensemble elective (minimum of six different semesters) are required.

Recital Attendance. Six semesters of MUP 100 Concert Attendance are required

Language. Eight semester hours of one foreign language (French, Italian, or German) are required.

Additional Requirements. MHL 447 Music Since 1900 should be used to satisfy the General Studies L2 requirement

Performance Major, Voice Concentration

Music Theory. The following music theory courses are required.

MTC 125	Basic Music Theory	3
MTC 221	Music Theory: 18th Century	3
MTC 222	Music Theory: 19th Century	3
MTC 223	Music Theory: 20th Century	3
MTC 320	Modal Counterpoint or MTC 321 Tonal Counterpoint 2	2
MTC 327	Form and Analysis I	3

MTC 425 Studies in 20th Century Theory	3
Total	2

Music History. The following music history courses are required:

MHL 341 Music History	3
MHL 342 Music History	3
Total	6

Repertoire and Pedagogy. Two semester hours of MUP 451 Repertoire and two semester hours of MUP 481 Performance Pedagogy and Materials are required.

Also required are two semester hours selected from MUP 453 Song Literature or 454 Song Literature or a repeated enrollment of MUP 451 Repertoire.

Diction. Three semester hours of MUP 250 Diction for Singers is required in Italian, German, and French.

Conducting. MUP 209 Beginning Choral Conducting is required.

Major Performing Medium. Sixteen semester hours of MUP 127 Studio Instruction and 16 semester hours of MUP 327 Studio Instruction are required to attain a proficiency level necessary to meet the graduation recital requirements. A half recital (MUP 495 Solo Performance) and a full recital (MUP 496 Solo Performance) are required.

Ensemble. Four different semesters of large vocal ensembles are required 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 Concert Attendance are required.

Language. Sixteen semester hours are required in more than one foreign language, chosen from French, German, and Italian. A student may select one year of one language and either one or two semesters of the other(s), chosen in conference with the advisor.

Additional Requirements. MHL 447 Music Since 1900 should be used to satisfy the General Studies L2 requirement.

Diagnostic Examination. Four semesters of class piano (MUP 131, 132, 231, 232), unless waived by a diagnostic examination at the time of entrance, are required.

Music Therapy Major

Students are eligible to apply for the Certification Exam offered by the Certification Board for Music Therapists upon completion of the requirements for graduation.

Music Theory. The following music theory courses are required:

MTC 125 Basic Music Theory	3
MTC 221 Music Theory 18th Century	3
MTC 222 Music Theory 19th Century	3
MTC 223 Music Theory 20th Century	3
MTC 327 Form and Analysis I	3
MTC 422 Musical Acoustics	3
Total	18

Music History. The following music history courses are required:

MHL 341 Music History	3
MHL 342 Music History	3
Total	6

Conducting. One of the following two courses is required:

MUP 209 Beginning Choral Conducting	
MUP 210 Beginning Instrumental Conducting	

Music Education. The following music education courses are required:

MUE 2 Music in Recreation	2
MUE 313 Elementary Music Methods	3
MUE 335 Educational Methods for Guitar	1
MUE 336 Educational Methods for Percussion	1
MUE 389 Repertoire for Music Therapy	3
Total	10

Music Therapy. The following music therapy courses are required:

MUE 161 Introduction to Music Therapy	2
MUE 261 Music Therapy as a Behavioral Science	2
MUE 361 Music Therapy Theory and Practice in Psychopathology	3
MUE 362 Music Therapy Techniques	3
MUE 381 Music Therapy Research *L2*	3
MUE 384 Therapy Preclinical I	1
MUE 385 Therapy Preclinical II	1
MUE 386 Therapy Preclinical III	1
MUE 387 Therapy Preclinical IV	1
MUE 388 Therapy Preclinical V elective	1
MUE 441 Psychology of Music	3
MUE 475 Group Process and Music Therapy	1
MUE 476 Internship in Music Therapy	1
Total	23

Major Performing Medium. Six to eight semesters are required in the major performing medium, which must include at least two semester hours of MUP 311 Studio Instruction.

Voice. Two semesters of study in voice are required.

Ensembles. Six semesters of ensemble participation are required with at least four semesters in large groups.

Recital Attendance. Six semesters of MUP 100 Concert Attendance are required.

Additional Requirements.

Four semesters of dance DAN Jy	4
BIO 2 1 Human Anatomy and Physiology I S2	4
PGS 0 Introduction to Psychology *SB*	3
PGS 466 Abnormal Psychology *SB*	3
PSY 230 Introduction to Statistics *N2*	3
or STP 226 Elements of Statistics *N2*	3

NOTE: For the General Studies requirement courses and codes (such as L1, N3, C, and H), see General Studies page 85. For graduation requirements, see University Graduation Requirements page 81. For an explanation of additional nonbusiness courses offered but not listed in this catalog see "Classification of Courses" page 58.

SOC 101 Introductory Sociology *SB*	3
Total	29

Diagnostic Examination. Four semesters of class piano (MUP 131, 132, 231, 232), unless waived by a diagnostic examination at the time of entrance, are required.

Theory and Composition Major, Theory Concentration

Music Theory. The following music theory courses are required:

MTC 125 Basic Music Theory	3
MTC 221 Music Theory 18th Century	3
MTC 222 Music Theory 19th Century	3
MTC 223 Music Theory 20th Century	3
MTC 320 Modal Counterpoint	2
MTC 321 Tonal Counterpoint	2
MTC 323 Composition	2-3
MTC 327 Form and Analysis I	3
MTC 422 Musical Acoustics	3
MTC 425 Studies in 20th Century Theory	3
MTC 428 Form and Analysis II	3
MTC 496 Theory Project	3
Total	33-34

Also required are 10 semester hours of electives in MTC courses at the 300 level or above, to be chosen in consultation with advisor.

Music History. Three semester hours of MHL 341 Music History and three semester hours of MHL 342 Music History are required.

Also required are three upper division elective semester hours in music history, not to include MHL 447 Music Since 1900.

Conducting. Choose between the two combinations of courses: MUP 209 Beginning Choral Conducting and MUP 339 Choral Conducting or MUP 210 Beginning Instrumental Conducting and MUP 340 Instrumental Conducting.

Applied Music. Twelve semester hours of study in applied music are required, eight of which must be in MUP 111 Studio Instruction.

Ensemble. Eight semesters of participation in an ensemble are required.

Final Project. MTC 496 Theory Project is required.

Recital Attendance. Six semesters of MUP 100 Concert Attendance are required.

Language. The equivalent of 16 semester hours in one foreign language is required. The choice of language is subject to approval of advisor.

Diagnostic Examination. Four semesters of class piano (MUP 131, 132, 231, 232), unless waived by a diagnostic examination at the time of entrance, are required.

Additional Requirements. MHL 447 Music Since 1900 should be used to satisfy the General Studies L2 requirement.

Theory and Composition Major, Composition Concentration

Music Theory. The following music theory courses are required:

MTC 125 Basic Music Theory	3
MTC 221 Music Theory 18th Century	3
MTC 222 Music Theory 19th Century	3
MTC 223 Music Theory 20th Century	3
MTC 320 Modal Counterpoint	2
MTC 321 Tonal Counterpoint	2
MTC 327 Form and Analysis I	3
MTC 422 Musical Acoustics	3
MTC 425 Studies in 20th Century Theory	3
MTC 428 Form and Analysis II	3
MTC 433 Canon and Fugue	2
MTC 430 18th Century Counterpoint	2
MTC 431 Instrumentation	2
MTC 433 Orchestration	2
Total	36

Four semesters of MTC 323 Composition are also required, of which at least three must be taken at ASU.

Music History. Three semester hours of MHL 341 Music History and three semester hours of MHL 342 Music History are required.

Also required are three upper division elective semester hours in music history, not to include MHL 447 Music Since 1900.

Conducting. Choose between the two combinations of courses: MUP 209 Beginning Choral Conducting and MUP 339 Choral Conducting or MUP 210 Beginning Instrumental Conducting and MUP 340 Instrumental Conducting.

Applied Music. Twelve semester hours of study in applied music are required, eight of which must be in MUP 111 Studio Instruction.

Ensemble. Eight semesters of participation in an ensemble are required.

Final Project. MTC 495 Final Project is required.

Recital Attendance. Six semesters of MUP 100 Concert Attendance are required.

Diagnostic Examination. Four semesters of class piano (MUP 131, 132, 231, 232), unless waived by a diagnostic examination at the time of entrance, are required.

Additional Requirements. MHL 447 Music Since 1900 should be used to satisfy the General Studies L2 requirement.

MUSIC MINOR

The School of Music offers a minor consisting of 20 semester hours of course work. A minimum grade of "C" is required in all courses.

MHL 341 Music History	3
MHL 342 Music History	3
MTC 125 Basic Music Theory	3
MTC 221 Music Theory 18th Century	3
Electives	8
Total	20

Interested students shou d contact the Sch(ol of Music for specif c requiren ents and adn ission p r cedures.

GRADUATE PROGRAMS

The facu ty in the Schoc l of Music offer graduate pr) grams leading to the follow ng degrees: Master of Arts, Master of Mus c, and Doctor c f Musical Arts Refer t(the "Col ege ot Fine Arts Graduate Degrees nd Ma ors" table, page 262, for a list of maj)rs and c oncentrations A docu ment on graduate degree programs in mus c may be obtained by contacting the School of Mus c Consult the *Graduate Catal)g* for nform at)n on all graduate degrees

MUSIC HISTORY/LITERATURE (MHL)

MHL 142 Music L stening. 1 N
Aura percept of a var ety of mus c trad t n genres, forms a d techn q es Prerequ s te Mus c ma or

MHL 201 MacLiteracy for Musicians 3 F S SS
nstruct on n bas c Mac ntosh computer tera y nc ud ng ge e c app cat ons and mus c spec f c programs w th hands on exper ence Lecture ab *Genera Stud es N3*

MHL 341 Music History. 3 F S
Western m s c from the Greeks to the present day Need n t be taken n sequence w th MH 342 Prerequ te MTC 221

MHL 342 Music H story. 3 F S
See MHL 341 Prerequ s te· MTC 221

MHL 344 Mus c in Wor d Cultures 3 S
Exam nat on of the re ations among mus c dan e theat e e g on and s c a status n As a Afr ca Ocean a, Eu ope and the Un ted States *Genera Stud es HU, G*

MHL 352 The Evo ution of Jazz. 3 F 2000
Or g n, deve opme t and ty es of jazz mus c and ts exponents. Pre requ s te MTC 223 *Genera Stud e H*

MHL 438 Music n the Class c Era. 3 F 2 00
Deve opment of the c ass sty e of the 18th century majo works of Haydn, Mozart and Beethoven Prerequ s tes MH 341 342 MTC 327 *Genera Stud es H*

MHL 439 Mus c in the 19th Century. 3 S
European art mus c afte Beethoven Prerequ s tes MHL 341 342 MTC 327 *Genera Stud es L2 H*

MHL 441 Music of the Baroque Era 3 F 1999
Wo ks of major omposers and sty st c tendenc es of the pe od P e requ s tes. MHL 341 342 MTC 327 *Genera Stud es L2*

MHL 447 Music Since 1900. 3 F S
Survey of the works by majo composers and sty st c trends re eq u s tes MHL 341 342 MTC 327 *Genera St d es L2*

MHL 456 H'story of Opera. 3 S 2 1
The deve opment of pera fr m ts c eat on 160 t present Emphas s p aced on ma or sty st c deve op ents an representat ve works Prerequ s tes MHL 34 342 MTC 222

MHL 466 North American Indian Mus c. 3 S 2 1
Var ous sty es of nd an mus c n the n ted States Canada and Mex co Open to Mus c ma ors and nonma ors *Genera Stud es L2 HU C*

MHL 532 Music B b iography. 3 F
Ma o h t ca a d a ayt ca wr t ngs systemat c a d h t a co ect ons of m s c Read ng know edge f a fore gn anguage re om mended

MHL 535 Medieva Music. 3 S 2001
Mus c of Europe n the M dd e Ages Greg r an chant re g ou and ecu ar monophony a d po yphony to 1400

MHL 536 Music of the Rena'ssance 3 S 2000
Mus c n Europe w th empha s n sty t c c ncepts a d changes c 1400–1580

MHL 544 World Music I. 3 F 1999
Mus c f trad t ona a d fo k cu t res of Afr ca Europe and the Ame cas

MHL 545 World Music II. 3 F 2000
Trad t ona fo k a d art mus c of the Pac f c Near Ea t and As a

MHL 547 Topics in American Mus c. 3 N
Se ected top cs n the h story of mu c C mposers work ng n t e Amer cas w th emphas s upon mu nce 19

MHL 557 Top cs in Symphonic Literature. 3 S 2000
An exam nat n f the evo ut on of the symph y and symph n c poem f om t e ear y c ass c era through the 19th entury w th empha s s on the ana ys s of se ected work

MHL 564 History of Music Instruments. 3 F 2 0
Survey of the h story and deve pment of mus nst ments n trad t ona fo k and art cu tures

MHL 566 Area Studies n Ethnomusicology. 3 2000
Study of the mus c f a part cu ar cu t re ountry or a ea e g mus c f Mex co at n Amer ca Ch na Afr ca May be epeat d for cred t

MHL 568 Introduction to Ethnomusicology. 3 F 1999
ntr duct on to the theory and meth d ogy of the d sc p ne nc u ng b b graphy, f e dwork transc pt on ana ys s and ga o ogy

MHL 575 History of Choral Music 3 F
Ma r ch ra w rks

MHL 644 Notation of Polyphonic Mus c. 3 S 2 00
Mus c notat on fr m the 15th through 17th centur es n ud ng pr b ems of transcr pt n nto m der n tat on

MUSIC THEORY AND COMPOSITION (MTC)

MTC 125 Basic Music Theory. 3 F, S
For mus c ma ors Des gned t deve p aura and notat na k Meets da y

MTC 221 Music Theory· 18th Century 3 F S
Mus c from the 18th century w th a v ew toward deve p ng stude t' ab t es t ana yze the r ze erf m and create examp es w th n the sty e Deve opment f re ated aura v a and keyboa d sk Pre req s te MTC 125

MTC 222 Music Theory: 19th Century. 3 F S
M s ca c mpos t ons ch sen f om the ate 18th and 19th centur es Harmon c progress ns me od c constr ct n and rhythm deve op ments deve opment of e ated a ra v sua a d keyboard sk s Pre requ s te MTC 221

MTC 223 Mus c Theory: 20th Century. 3 F S
Representat ve 20th century compos t o s w th part u a emphas s on th se e ements of me od c harmon c and rhythm treatment wh ch break w th past c vent ons Deve opment of re ated au a v sua and keyboard sk s Prerequ s te MTC 222

MTC 315 Modern Arranging 2 F
Techn ques n arrang ng f r the c ntemporary azz rad te ev s and stud o orchestra Prerequ s te MTC 223

MTC 316 Modern Arranging. 2 S
C nt n at o of MTC 315 Prerequ s te MTC 315

MTC 320 Modal Counterpo'nt. 2 F
C unterpo nt based o 6th century v a p y hon c sty e Prerequ s te MTC 221

MTC 321 Tonal Counterpoint. 2 S
Counterp nt based on 18t century p yphon sty e Pre equ s te MTC 221

MTC 323 Composition. 2 3 F S
Wr t ng mus c compos t ons w th emphas s on ba c techn ques and sma er structures May be repeated f r cred t Prerequ s te nstruct approva

MTC 327 Form and Analysis I. 3 F S
Organ z ng e ements n the ost portant ontrapunta and h mo phon c mus a forms from the Rena ssance thro gh the 19t century Pre equ s te MTC 222

MTC 422 Musical Acoustics. 3 F
Propert es of sound and tone. Harmon c er es nstrun ents the ea , aud tor um acoust cs and the repr duct n f s und. A t o ough know edge of mus ca notat terva s sca e and h rmony or 2 yea s of mus c theory s assumed

NOTE: For the Genera Stud es requ rement courses and c des such as L1 N3 C and H see Genera Stud es page 85 F r graduat on requ rements see ' n vers ty Graduat n Requ rements page 81 F r an exp anat on of a d t ona omn bus ou es ff red but n t ted n th s ata og see C a s f cat on of Cou ses page 58

MTC 425 Studies in 20th-Century Theory. (3 F
C nt nued deve opment of ana yt ca techn ques and aural sk with an exam nat on of theoret ca systems app cab e to 20th century mus c Prerequ site MTC 223

MTC 428 Form and Analysis II. (3 S
Organ z ng pr nc p es of the arge forms f mus ca compos t on n the 19th and 20th centur es Prerequ s te· MTC 327

MTC 429 Canon and Fugue. (2 F 1999
Writ ng of canons a d fugues n tonal sty e Prerequ s te MTC 321

MTC 430 20th-Century Counterpoint. 2 S 2000
Counterpo nt stud es ut z ng 20th century d oms Prerequ s te MTC 223

MTC 432 Instrumentation. (2 F 2000
Study of the character st cs and performance techn ques of nd vidua orchestra nstruments. Prerequ s te MTC 223.

MTC 433 Orchestration. 2 S 2001
Theoret ca and pract cal study of scor ng mus c for orchestra Prereq u s te· MTC 432

MTC 436 Electronic Studio Techniques I. 2 F
Pr nc p es of analog electron c mus c systems and the r app cat on n the compos t on of e ectron c music A thorough know edge of mus c notat on and nterva s s assumed

MTC 437 Electronic Studio Techniques II. (2) S
Pr nc p es of d g ta e ectr n c mus c systems and the r app cat ons n the compos t on of electron c mus c. Prerequ s te. MTC 436

MTC 440 Jazz Theory and Ear Training. (2 F
Advanced study f jazz harmon c systems Da y ora dr s Prerequ s te MTC 223

MTC 441 Jazz Composition. 2 F
Creat ve wr t ng n the smal er forms and n the d om of jazz Prerequ s te MTC 321.

MTC 495 Final Project. (0 F S
A ha f rec ta of comp s t ons or approval of a arge sca e c mpos t on or a research paper

MTC 496 Theory Project. 3 F S
Superv sed nd v dua writ ng project deal ng w th mus c the ry

MTC 516 Baroque Music (3 S 2000
Deta ed ana ys s of se ected examp es of mus c fro the Ba oque per od

MTC 517 Classic Music. 3 S 2001
Deta ed ana ys s of se ected examples of mus c from the C ass c per d

MTC 518 Romantic Music. 3) F 2000
Deta ed ana ys s of se ected examp es of mus c from the Romant c per od

MTC 519 Late 19th-/Early 20th-Century Music. 3 F 1999
Deta ed ana ys s of se ected examp es of mus c from the ate 19th and ear y 20th centur es

MTC 520 Analytical Techniques. 3 S SS
Ana yt cal techn ques systemat ca ly app 'ed to mus c Concentrat on on structura and comp s t ona procedures

MTC 523 Advanced Composition. 2 3 F S
Advanced mus c compos t on nc ud ng comp ex techn ques and arger structure May be repeated for cred t Prerequ s te nstructor approval

MTC 525 Pedagogy of Theory. (3) F 2000
Pract ces and pr nc p es of teach ng music theory Emphas zes most des rab e and practica offer ngs poss b e Comparat ve stud es of ex st ng pract ces

MTC 527 History of Music Theory. 3 F 1999
Theory from Pythag ras to the 16th century Need not be taken n sequence w th MTC 528

MTC 528 History of Music Theory. 3) S 2000
Theory from the 17th century to the present Need n t be taken n sequence w th MTC 527

MTC 555 Computer Music Notation. 2 N
nstruct on n prepar ng score and part of mus c compos t ons us ng var ous mus c notat on software packages Cred t cannot be app ed toward the graduate theory requ rement Lecture ab Prerequ s te nstructor approval

MTC 647 D'rect ons in New Mus'c. 3 N
Stud es n contemp rary d om and aesthet cs d awn from recent works of v s t ng c mp sers nvo ves a a yt ca d scour e cr t ca wr t ng and app ed concepts n c mp s t on Lecture d scuss on exer c se Prerequ s te nstructo approva .

MTC 723 Advanced Composit on. 3 F S
Spec a prob ems n wr t ng n comp ex f rms and textures May be repeated f r cred t Stud o

MTC 755 Music Composition Technology 3 N
Advanced study n d g ta samp ng synthes s sequenc ng computer generated s d and computer performe nterfaces. May be repeated for cred t Lecture ab P erequ s tes MTC 436 and 437 *or* equ va ents

MUSIC EDUCATION (MUE)

MUE 110 Introduction to Music Education. 1 S
Overv ew of mus ed cat on Or entat on t student character st cs teacher ro es and f undat ons f ph sophy a d h t ry Scho observat ons requ red

MUE 161 Introduction to Music Therapy. 2 F
Overv ew of the pr fe s n f mus c therapy and ts app cat ons n menta hea th rehab tat on and spe a educat n

MUE 211 Mus c in Recreation. 2 F
Mater a s met ods and organ zat ona structures appropr ate for rec reat ona mus c

MUE 261 Music Therapy as a Behaviora Science. 2 F
Or entat on to prec n ca exper ence w th an emphas s on observat on sk s assessment goa sett ng and profes ona eth cs Requ red off campu observat ons Prerequ s te MUE 161

MUE 310 Music in Early Chi dhood Educat on 3 S
dent fy ng and understa d ng mus ca needs f y ung ch dre Meth ods and mater a s for pr gram deve pment for ass o m teachers

MUE 311 Music for the Classroom Teacher. 3 F S
Deve pment of the c assroom m s c program n the e ementary scho . No prev ous m s c exper ence or urse w rk requ red Pre-requ s te n n Mus c ma or or n nor

MUE 313 Elementary Music Methods. 3 F
Methods of struct on, p ann ng and pre entat o f appropr ate con tents 'n mus c For mus c educators and mus c therap sts Prerequ s te Mus c major

MUE 315 General Music in the Secondary Schools. 2 F S
Curr cu um student cha acte t cs and teach ng strateg es for gen era mus c. Prerequ s te Mus major

MUE 317 Educational Methods for Viol n and Viola. 1 F S
Teach ng and p ay ng sk s for m s c teachers 3 hou s per week

MUE 318 Educational Methods for Cello and String Bass. (1 F S
Teach ng and p ay ng k fo m s c teacher 3 hours per week

MUE 327 Educational Methods for Trumpet and Horn. 1 F S
Teach ng and p ay ng sk s fo m s c teachers 3 hours per week

MUE 328 Educat onal Methods for Trombone Euphonium, and Tuba. 1 F, S
Teach ng and p ay ng sk s for mus c te chers 3 ho rs per week

MUE 335 Educat ona Methods for Guitar. 1 F S
Teach ng and p ay g sk s f r mus c teache s 3 hours per week

MUE 336 Educational Methods for Percussion. 1 F S
Teach ng and p ay ng sk s for mus c teachers 3 hours per week

MUE 337 Educational Methods for Flute, Clar net, and Saxophone. 1 F S
Teaching and p ay ng sk s for mu c teachers 3 hours per week

MUE 338 Educational Methods for Double Reed Instruments. 1 F, S
Teach ng and p ay ng sk s f r mus c tea hers 3 hours per week

MUE 361 Mus c Therapy Theory and Practice in Psychopathology. 3 F
Inf ence of m c on behav o pr nc p e a d pra t ces of m s c ther apy and psych atr c ents Prerequ s tes M E 211 261 Mus Ther-apy ma or

MUE 362 Mus c Therapy Techn ques. 3
Organ zat on adm n strat n and use of m c n hab tat o w th var ous c ent popu at ons Prereq s tes MUE 361 Mus c Therapy ma or

MUE 381 Music Therapy Research. 3 S
Stat st cs and esea ch des gn approp ate for nvest gat ons n m s c the apy *Gene a Stud es L2*

MUE 384 Therapy Preclinical I 1 F S
Pa red stude ts w p v de mus the apy for sma groups at a commun ty agency f r menta y etarded ger atr c or phys ca y d sab ed c ents for a m n m m of 10 c ck h urs Prerequ s tes MUE 211 261

MUE 385 Therapy Prec nical II. 1 F S
nd v dua p acement n ASU Mus c Therapy C n c

MUE 386 Therapy Preclinical II. 1 F S
See MUE 385

MUE 387 Therapy Prec nica V 1 F S
nd v dua c ca work n a comm n ty n enta hea th fac ty

MUE 388 Therapy Preclin cal V. 1 F S
See MUE 387

MUE 389 Repertoire for Music Therapy S
Mu c sk s repert re fo m s c therapy nc ud ng un ts on brass str gs w w nds e ectron c strument computer mus c and mprov sat techn ques Lab Prerequ s te MUE 211 Mus c Ther apy ma r

MUE 441 Psycho ogy of Music 3 S
Psycho og ca and phys og a aspects of mus c empha z ng mu a behav or fu ct per ept on a d earn ng Prerequ s tes jun or stand ng Mus Therapy major or n truct r approva

MUE 475 Group Process and Music Therapy. 1 F
Pr nc p es of group process verba counse ng profess na wr t ng, as re ated to mus c the apy pract ce Prerequ s tes MUE 362 Mus c Therapy ma or

MUE 476 Internship n Music Therapy. 1 F S
A fu t me 6 month off campus re dency n an approved c n ca nst tut on

MUE 480 Choral Methods. 3 S
Meth ds of st t on rga zat and presentat on of appropr ate content n cho a mus c asses P erequ s te Secondary Educat on major.

MUE 481 Instrumental Practicum/Methods. 5 F
nstrumenta mus c a a means of deve op ng mus c sk s unde stand ngs and att t des n e ementary and seconda y sch o stu dent Prerequ s te Secondary Edu at n maj r.

MUE 482 nstrumenta Practicum/Methods. 5 S
See MUE 481 Prerequ s tes MUE 481 or 485 Secondary Educa t on major

MUE 485 String Practicum/Methods. 2 F
F r students prepar ng t adm n ster a str ng program and teach str ngs at the e e entary eve Lecture ab

MUE 548 Introduction to Research n Music Education. (3) F SS
Survey f research meth ds and terature n mus c educat n Focus on terpretat a d eva uat on

MUE 549 Foundat ons of Music Education. 3 A
A treatment f h stor ca perspect ves ph sophy aesthet cs dent f ed w th mus c educat n and earn ng theor es app ed to mus c tea h ng earn ng Ba c esearch and w t ng sk s appropr ate to graduate stud es n mus edu at on

MUE 550 Studies in Music Curricula. 3 A
Sc pe and sequence of mus ca exper ences Deve opment of cr te a fo the e a uat f mus c cur cu a.

MUE 551 Advanced Studies n Elementary School Music. 3 A
For exper enced teachers organ zat on nd o tent of t e general mus c c asses n k nde garten and the f rst 6 grades of e ementary scho Emphas s n teach ng mus c read ng and ear tra n ng t young ch dren

MUE 552 Genera Music, Mus c Theory, and Music History Classes in the Jun'or and Sen or High Schoo . 3) A
Organ zat on and ntent of schoo mus c asses wh ch are not per forma ce o ented

MUE 553 Contemporary Elementary Music 3 N
dent f cat on a d deve pment of mater a s and techn ques for teach ng spec a n ts f m s study to e ementary K 8 ch dren

MUE 560 Jazz Pedagogy 3 S 2 1
Study of pedag gy repe t re, a d te h que f nst u t n jazz sty es e semb e techn q es and performance pract ce fo scho e emb es Lecture ab d scuss n observat Prerequ s te M M Mus c Edu at on ma or

MUE 562 Jazz Ensemble Rehearsal Techniques 1 F S
C nduct ng and rehearsa te h ques f r sch azz ensemb es Lab Prerequ s te M M M s Educat on maj r

MUE 564 Instrumental Mus'c, Advanced Rehearsal Techniques. 3 A
An depth a a ys s of stru enta techn ques p eparat on for a thor h d scu s on of ba d tun ng pr b ems and so ut ns D sc s s n f p du t ve conduct g and rehearsa tech ques for schoo mus c tea hers

MUE 566 Instrumental Literature for Schoo s. 3 A
Comprehen ve study a d ana ys s of a types of nstrumenta mus c

MUE 568 Choral Music, Advanced Rehearsal Techn ques 3 A
Mu a and v ca te hn ques necessary for p esentat of hora t eratu e Ana y and exper mentat r w th psyc og a acoust ca and ther p ems of rehearsa and perfo ma ce

MUE 570 Chora Literature for Schools. 3 A
Comprehens ve study and a ys s f hora n us c for the h gh s hoo w th spe a e p as s on o tavo terature

MUE 579 Psychology of Music. 3 A
The natu e of us a ty and ts eva uat on A rev ew of recent resea h

MUE 585 Vocal Acoust cs and Production. 3 A
An n depth approa h to the p y ho og ca phy o og a w rk gs of the v ca me ha m

MUE 733 Contemporary Issues and Research n Music Education. 3 A
Empha s up n recent resear h e at ng t mus c stru t on at a lev e s, cu rent a d h st r a ssues n chora genera and nstrumental mu c

MUE 744 H gher Education Instruction. 3 A
Ph osoph ca and psych og ca p nc p es of c ege un vers ty teach ng Patterns f mus c teacher educat n a d a pro ect on f course ut nes

MUE 755 Philosophy and Aesthetics in Music Educat'on. 3 SS
Ph sophy a d aesthet cs as they nf uence c r u um content and teach g p cedures

MUSIC PERFORMANCE (MUP)

MUP 100 Concert Attendance. 0 F S
Requ red of a mus c ma o s for 6 semester n each degree program w th a m n mum f 4 conv cat ons atte ded each semester

MUP 111 Studio Instruction. F, S
F r majors n M s c deg ee program Bass on ce o c ar net contra ba s cornet euph n m f ute gu tar harp harp chord, horn oboe, rga per us p ano sax ph ne tr mbone trumpet tuba v o a v vo ce M n mum co ta t of 1 h ur p s stud c ass week y May be epeated fo cred t May not be taken for aud t Prerequ s tes p a ement exam nat n and a t

MUP 121 Studio Instruction. 1 F S SS
For secondary r m nor nstrument nst uct on a d onma ors n the un ve s ty Basso e o c ar et ntrabass cornet euphonium f ute gu ta harp h ps cho d h b e rga percu s on p ano saxophone, t bone trumpet t ba v o a v o n v ce M n mum c ta t of 1 2 h r per week May be repeated for cred t May not be taken fo aud t P ereq s tes p a ement exam nat n and aud t on

MUP 127 Studio Instruction. 4 F, S
F r Performance ma ors n Bache o f a d Master of Mus c degree pr grams on y B ss o ce o ar net, c ntrabass cornet eupho n m f ute g ta ha p harps chord horn b e rgan percuss on p ano saxoph ne t ombone tr mpet, tuba v a v o vo ce M n mum contact f 1 hour p us stud o c ass week y May be repeated for cred t May not be taken fo a d t Prerequ s tes p acement exam na t on and aud t on

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NOTE: For the Genera Stud es requ rement cou ses and codes (such as L1 N3 C and H see Genera Stud es page 85 For graduat on requ rements see Un vers ty Graduat on Requ rements page 81 For an exp anat on of add t ona omn bus courses ffered but not sted n th s cata og see C ass f cat o of Courses page 58

MUP 130 Beginning Group Piano. 1) F S
Prov des a bas c ntroduct on to p ay ng p ano through mus c read ng chords rhythm c and wr tten act v t es Prerequ s te non-Mus c major

MUP 131 Class Piano. 1 F S
A four semester sequence w th MUP 132 231 and 232 des gned for those w th tt e or no p ano exper ence Emphas s on keyboard tech- n que s ght read ng s mp e accompan ments and mprov sat on 2 hours per week May not be taken for aud t Prerequ s te· Mus c ma or

MUP 132 Class Piano. 1 S
See MUP 131

MUP 133 Class Voice 1 F S
A four semester sequence MUP 134 233 and 234 open to a stu dents. 2 hours per week May not be taken for aud t.

MUP 134 Class Voice. (1 F S
See MUP 133 Pre equ s te MUP 133 or nstructor approva .

MUP 141 Jazz Fundamentals. 1 F
Pr nc p es, methods and theory of azz perf rma ce espec a y des gned for the sma jazz ensemb e 2 hours per week

MUP 142 Jazz Fundamentals. 1 S
Cont nuat on of MUP 141 2 hours per week

MUP 209 Beginning Choral Conducting. 1 F, S
Essent a s of choral conduct g techn ques. 2 hours per week

MUP 210 Beginning Instrumenta Conducting. 1 S
Essent a s of nstrumenta conduct ng te hn ques 2 hours per week

MUP 217 Improvisation Workshop. 2 F S
Emphas s on bas c jazz terature chord symbo read ng me od c pat terns, ear tra n ng me odic concepts and analys s of mprov sed so os Must be taken n sequence w th MUP 218 May not be taken for aud t Prerequ s tes MTC 125 MUP 111 1 semester

MUP 218 Improvisation Workshop. 2 F S
Cont nuat on of M P 217 Prerequ s te MUP 217

MUP 231 Class Piano. 1 F
See MUP 131

MUP 232 Class Piano. (1) S
See MUP 131

MUP 233 Class Voice. 1 F, S
See MUP 133 Prerequ s te MUP 134 or nstructor approva

MUP 234 Class Vo ce. 1 F S
See MUP 133 Prerequ s te MUP 233 or nstructor approva

MUP 235 Jazz Piano. 1 F
A 2 semester sequence w th MUP 236 des gned f r jazz keyboard exper ence Emphas s s n chord symbo read ng s mp e mprov sa t on and vo c ng. 2 hours per week Prerequisite MUP 132

MUP 236 Jazz Piano. 1 S
See MUP 235 Prerequ s te MUP 132

MUP 250 Diction for Singers. 1 F S
Use of phonet cs n the study of song and opera terature Language emphas s d ffers each semester. May be repeated for cred't

MUP 301 Advanced Class Piano. 1 F
Required for the chora genera concentrat on of the Mus c Educat on major Open to other mus c ma rs who have comp eted MUP 232 Emphas s on accompan ments ensemb e p ay g score read ng advanced harmon zat ns reperto re techn que and mpr v sat on 2 hours per week. May not be taken for aud t Prerequ s tes MUP 232 or prof c ency p acement exam nat on

MUP 302 Advanced Class Piano. 1 S
Requ red for the chora genera concentrat on of the Mus c Educat on major. Open to other mus c majors wh have comp eted MUP 301 A sequentia cont nuat on of MUP 301 sk s that nc ude both group and stud o nstruct on 2 hours per week May not be taken for aud t. Pre requ s tes MUP 301 or prof c ency p acement exam nat on.

MUP 311 Studio Instruction. 2 F S
See MUP 111

MUP 319 Recording Studio Techniques. 2 S
Study of both ana og and d g ta record ng methods Lab t me on record ng console and tape mach nes s nc uded Lab

MUP 320 MIDI Workshop. 2 F
Presentat on of hardware a d software app cat ons for sequenc ng and mus c pr nt ng Lab

MUP 321 Studio Instruction. 1 F S SS
See MUP 121

MUP 327 Studio Instruction. 4 F S
See MUP 127

MUP 337 Studio Instruction: Piano Accompanying. (2) S
Lessons for Performance ma ors w th a concentrat on n p ano accom- pany ng on y. Reperto re to be se ected from voca and nstrumental terature 1 hour esson per week May be repeated for cred t Prereq u s te· p acement exam nat on

MUP 339 Choral Conducting. 2 F, S
E ements of chora conduct ng techn que and nterpretat on 3 hours per week Prerequ s te MUP 209

MUP 340 Instrumental Conducting. 2 F
Fundamenta s of score read ng and nterpretat on of nstrumenta mus c. 3 hours per week Prerequ s te MUP 210

MUP 344 Chamber Orchestra. 1 F S
mportant masterp eces from a pe ods of mus c are performed throughout the year Membersh p by aud t on May be repeated for cred t

MUP 345 Symphony Orchestra. 1 F, S
Open to a students who can qua fy n the basis of aud t ons w th the d rector Over a 4 year per od the student is ntroduced to the master p eces of symphony rchestra terature 3 t mes per week May be repeated f cred t

MUP 346 Sinfonietta. 1 F S
Symphon c orchestra that presents approx mate y s x concerts annu a y, perform g masterp eces of the c ass ca reperto re 3 t mes per week May be repeated for cred t Prerequ s te· aud t on w th d rector

MUP 350 Choral Union. 1 F S
Open to a students n the un vers ty and t nterested s ngers n the commun ty by aud t on Preparat n and performance of the arger chora works 2 hours per week May be repeated for cred t

MUP 352 Concert Choir. 1 F S
4 hours per week May be repeated for cre t Prerequ s te nstructor approva

MUP 353 University Cho r. 1 F S
4 hours per week May be repeated for cred t Prerequ s te. nstructor approva

MUP 355 Men's Chorus. 1) F, S
Open to a ma e students n the un vers ty who can qua fy on the bas s of audit ons Rehearsa and performance of mus c for male vo ces 3 hours per week May be repeated for cred t Prerequ s te nstructor approva

MUP 357 Women's Chorus. 1 F S
2 hours per week May be repeated f r cred t Prerequ s te: nstructor approva

MUP 361 Marching and Concert Bands. 1 F S
Open to a students who can qua fy on the bas s of aud t ons with the d rector Stag ng of format ons and dr s for footba games and other events fa masterp eces of symphon c band terature spr ng) Meets da y May be repeated for cred t

MUP 370 Music Theatre· Techniques. 1 F S
Exerc ses and mprov sat ons for the s nger actor emphas z ng body awareness, bas c mus c theater performance sk s and freedom of the voca and breath mechan sms Sect on 1 (Movement for S ngers); Sect on 2 Express on Sect on 3 nterpretat on , Sect on 4 Advanced Express on) Sect o 5 Advanced nterpretation) Sect ons 2 through 5 must be taken n sequence Each sect'on 3 hours per week May be repeated for cred t

MUP 371 Music Theatre: Workshops. 1 F, S
Deve opment f spec f c sk s for mus ca dramat c nterpretat on Sec t on 1 Ar a Preparat on Sect on 2 Broadway I Sect on 3 (Broadway Each sect on 1 hour ecture demonstrat on 1 ab per week May be repeated for cred t

MUP 372 Music Theatre: Orchestras. 1) F S
Open to a students who can qua fy on the bas s of aud t ons w th the nstructor Part c pat on n Lyr c Opera Theatre pr duct ons Section 1 (Orchestra Sect on 2 Chamber Orchestra Sect on 3 (Chamber Ensemb e May be repeated for cred t Prerequ s te· nstructor approva

MUP 373 Music Theatre: Performance. 1 F, S
Open to a students who can qua fy on the bas s of aud t ons w th the nstructor Part c pat on n Lyr c Opera Theatre product ons Sect on 1 Pr nc pal Ro es Sect on 2 Chorus May be repeated for cred t Pre requ site nstructor approva

MUP 374 Music Theatre: Production. 1 F S
Part c pat on n Lyr c Opera Theatre product ons Sect on 1 Voca Per formance); Sect'on 2 Techn ca Mus c Theatre Sect on 3 Problems n Product on to be taken c current y w th MUP 373 Sect on 2 May be repeated for cred t

MUP 376 New Mus'c Ensemble. 1) F S
Rehearsal and performance of mus c wr tten n the ast 20 years May be repeated for cred t Prerequ s te nstructor approva

MUP 377 Brass Choir. 1) F S
Spec a z'ng n pub c performance of mus c wr tten for brass nstru ments 2 hours per week May be repeated for cred t Prerequis te: nstructor appr va

MUP 379 Chamber Music Ensembles. 1 F S
Brass, gu tar keyboard m xed percuss on str ng voca and wood winds ensemb es 2 hours per week May be repeated for cred t. Pre requisite nstructor approva

MUP 382 Collegium Musicum. 1 N
Singers and nstrumenta sts spec a z ng 'n the performance of ear y and unusual mus c 2 hours per week May be repeated for cred t Pre requ s te nstructor approva

MUP 385 Percussion Ensemble. (1 F S
Rehearsa and performance of standard and r g na reperto re for the percuss on ensemb e and re ated nstrume ts 2 hours per week May be repeated for cred t Prerequ s te. nstructor approva

MUP 386 Stage Band. 1 F S
Rehearsal and performance of terature f r the stage band 4 hours per week May be repeated for cred t Prerequ s te nstructor approval

MUP 387 Ethnomusicology Ensembles. 1) F, S
Performance learn ng exper ence for the mus c of var'ous cu tures of the world. May be repeated f r cred t Prerequ s te know edge of instrument or nstructor approva

MUP 388 Piano Accompanying. 1 F S
Accompany ng majors others at the d scret'on of instructor P ano accompan ments found n voca and nstrume ta terature, d scuss on of sty es and performance pract ces exper ence n pub ic perfor mance 2 hours per week May be repeated for cred t

MUP 417 Advanced Improvisation. 2 F S
Emphas s on ana ys s and performance f advanced jazz terature compos t on 'n contemp rary sty es Must be taken n sequence w th MUP 418 May not be taken for aud t Prerequ s te MUP 218

MUP 418 Advanced Improvisation. 2) F S
Cont nuat on of MUP 417 Prerequ s te MUP 417

MUP 440 Keyboard Harmony. 1 F
Performance or ented class emphas z ng chord progress ns harmo n zat on, f gured bass rea zat on sty st c mprov sat on transpos t on open score read'ng and s ght read ng Prerequ s te Performance major w th a concentrat on n keyboard or nstructor approva

MUP 451 Repertoire. 2 F S
Literature ava able for performance n a perform ng med a May be repeated for cred t Prerequ s te: jun or stand ng n major performance f e d

MUP 453 Song Literature. (2 A
Ear y ta ian Eng sh German and Fre ch art song

MUP 454 Song Literature. 2 A
Amer can Russ an, Span sh Scand navian and c ntemporary song

MUP 481 Performance Pedagogy and Materials. 2 N
Pr nc p es and meth ds f performance techn ques f r each perfor mance f e d May be repeated for cred t Prerequ s te sen or stand ng or nstructor approva

MUP 482 Piano Pedagogy II. 2 N
Cont nuat on of MUP 481 P ano Pr b ems and techn ques of teach ng ntermed ate to advanced p ano students Prerequ s tes· jun or stand ng as p ano major nstructor approva

MUP 487 Piano Accompanying. 1 F S
Keyboard majors P ano accompan me ts found n voca and nstru menta terature, d s uss on of sty es and performance pract ces, exper ence n pub c performance 2 hours per week May be repeated for cred t May not be taken for aud t

MUP 495 So o Performance. 0 F S
For cand dates of a Bache or of Mus c degree n Performance n wh ch 1 2 re ta s a graduat n requ rement

MUP 496 Solo Performance. 0 F S
F r cand dates of a Bache or of Mus c degree n Performance n wh ch a fu rec ta s a graduat on req rement Prerequ s te MUP 495

MUP 507 Group P ano Pract cum. 2 F
Curr cu a mater a s and teach ng techn ques for group teach ng at the un vers ty and commun ty c ege eve s Observat on superv sed teach ng n group p ano

MUP 508 Studio Observation. 1 F S
Week y observat on of stud o teach ng by var ous p ano facu ty Paper as f na requ rement Prerequ s'te M M performance pedagogy p ano student

MUP 509 Jazz Keyboard Harmony. 1 F
Emphas s on jazz ch rds and chord progress ons harmon zat on vo c ng and ana ys s f transcr pt ons Lab. Prerequ s te M M Mus c Educat on student

MUP 510 Jazz Keyboard Harmony. (1 S
Cont nuat on of MUP 509 Lab Prerequ site. MUP 509

MUP 511 Stud o Instruction. 2 F S
For majors n Mus c degree program Bassoon ce o c ar net contra-bass cornet euphon um f ute, gu tar harp, harps chord, horn oboe, organ percuss n, p ano saxophone trombone trumpet, tuba v o a v o n vo ce M n mum contact of 1 hour p us stud o c ass week y May be repeated for red t May not be taken for aud t Prerequ s tes: p acement examinat on and aud t on

MUP 517 Advanced Improvisation. 1 F
mprov sat n techn ques w th n the context of advanced jazz tera ture Must be taken n equence w th MUP 518 Lab. Prerequ s tes p acement exam nat on and aud t on

MUP 518 Advanced Improvisation. 1 S
Cont nuat n f MUP 517 Lab P erequ s te. MUP 517

MUP 521 Stud'o Instruction. 1 F, S SS
For secondary or m nor nstrument nstruct on and n nmajors n the un vers ty Bas oon, ce c ar net, contrabass c rnet euphon um f ute gu tar harp harps chord horn oboe organ percuss on p ano, saxophone trombone t umpet tuba, v a v o n vo ce M n mum c ntact of 1 2 hour per week. May be repeated for cred t May not be taken for aud t Prerequ s tes p acement exam nat'on and aud t on

MUP 527 Studio Instruction. 2 r 4) F S
For Performance majors n Master of Mus c degree program on y. Bas soon ce o c ar net contrabass, cornet euphon um, f ute gu tar harp harps chord horn boe organ, percuss on p ano saxophone tr mbone trumpet tuba v o a, v oi n, v e M nimum contact of 1 2 h ur per week May be repeated for credit May not be taken for aud t Prerequ s tes p acement exam nat on and aud t on

MUP 540 Advanced Conducting. 3 F
Score preparat on and conduct ng techn ques for nstrumenta mus c Concentrat on on study f h stor ca sty es Requ red of D M A. stu de ts n nstrumenta Mus c

MUP 541 The Art Song. 3 N
Sem nar on so o song fr m ts beg nn ng to the present day

MUP 544 Chamber Orchestra. 1 F S
Important masterp eces from a periods of mus c w l be performed throughout the year May be repeated for cred t Prereq s te nstruc tor approva

MUP 545 Symphony Orchestra. 1 F S
Open on the bas s of aud t on w th the d rector Masterp eces of sym ph ny orchestra terature Three t mes per week May be repeated for cred t

MUP 546 Sinfonietta. 1 F S
Symphon c orchestra that presents approx mate y s x concerts annu- a y perform ng masterp eces of the c ass ca reperto re 3 t mes per week May be repeated for credit Prerequ s te aud t on w th d rector.

MUP 550 Choral Union. 1 F, S
Open to a students n the un vers ty and to nterested s ngers n the comm n ty by aud t on Preparat on and performance of the arger chora works 2 hours per week May be repeated for cred t

NOTE: For the General Stud es requ rement courses, and codes (such as L1, N3 C, and H see Genera St d es page 85 For graduat on requ rements see Un vers ty Grad at on Requ rements page 81 For an exp anat on of add t ona omn bus courses offered but not sted in th s cata og see C ass f cat o of Courses " page 58

MUP 551 Repertoire. (2) N
Literature avai ab e for performance n al performing med a May be repeated for cred t.

MUP 552 Concert Choir. 1) F S
4 hours per week May be repeated for cred t Prerequ s te nstructor approval.

MUP 553 University Choir. 1) F, S
4 hours per week May be repeated for credit Prerequ s te. nstructor approva

MUP 555 Men s Chorus. 1) F S
Open to al male students n the un vers ty who can qua fy on the bas s of aud t ons Rehearsa and performance of mus c for ma e vo ces. 3 hours per week May be repeated for cred t Prerequ s te nstructor approva

MUP 557 Women's Chorus. 1) F, S
2 hours per week May be repeated for cred t Prerequis te nstructor approva

MUP 561 Marching and Concert Bands. (1) F S
Open by aud tion on y Stag ng of format ons and dr s for footba games and other events (fa) masterp eces of symphon c band l tera ture (spr ng Meets da y. May be repeated for cred t

MUP 570 Music Theatre: Techniques. (1) F S
Exerc ses and mprov sat ons for the s ng ng actor emphas zing body awareness so at ons and freedom of the voca and breath mecha n sms. Sect on 1 (nterpretat on Sect on 2 (Express on)· Sect on 3 (Movement for Singers) Each Sect on. 3 hours per week. May be repeated for cred t

MUP 571 Music Theatre: Workshops. 1) F, S
Deve opment of spec f c sk s for the mus ca -dramat c nterpretat on Section 1 (Ro e Preparat on Sect on 2 Sty es Sect on 3 (Opera Scenes), Sect on 4 (Mus ca Comedy) Sect on 5 (Revue Ensemb es Each sect on 1 hour ecture demonstrat on, 1 ab per week. May be repeated for cred t

MUP 572 Music Theatre: Orchestras. (1) F S
Open to al students who can qualify on the bas s of aud t ons with the nstructor Part c pat on n Lyr c Opera Theatre product ons Section 1 (Orchestra); Section 2 (Chamber Orchestra Sect on 3 (Chamber Ensemb e) May be repeated for cred t Prerequ s te nstructor approval

MUP 573 Music Theatre: Performance. 1) F, S
Open to a students who can qua fy on the bas s of auditions w th the instructor Part c pat on n Lyr c Opera Theatre productions. Section 1 (Principa Ro es) Sect on 2 (Chorus). May be repeated for cred t Pre requ's te instructor approval

MUP 574 Music Theatre: Production. (1) F S
Part c pation n Lyr c Opera Theatre productions Sect on 1 (Voca Performance), Section 2 (Techn ca Music Theatre) Sect n 3 Prob ems n Product on to be taken concurrent y w th MUP 373, Sect on 2 May be repeated for cred t

MUP 576 New Music Ensemble. (1) F S
Rehearsa and performance of mus c wr tten n the ast 20 years May be repeated for cred t Prerequ s te nstructor approva

MUP 577 Brass Choir. (1) F S
Pub c performance of mus c wr tten for brass nstruments 2 hours per week May be repeated for cred t Prerequisite: nstructor approva

MUP 579 Chamber Music Ensembles. (1 F S
String brass woodw nd, percuss on keyboard, voca and m xed ensemb es 2 hours per week. May be repeated for cred t Prerequ s te instructor approval

MUP 581 Performance Pedagogy and Materials. (2) N
Princ p es and methods of performance techniques for each perfor mance f e d. May be repeated for credit

MUP 582 Collegium Musicum. (1) F S
S ngers and instrumenta sts spec aliz ng n the performance of early and unusua mus c 2 hours per week May be repeated for cred t Pre requisite: nstructor approva

MUP 585 Percussion Ensemble. 1 F S
Rehearsa and performance of standard and or g na reperto re for the percuss on ensemb e and re ated instruments 2 hours per week May be repeated for cred t. Prerequ s te nstructor approva .

MUP 586 Stage Band. 1 F, S
Rehearsa and performance of terature for the stage band 4 hours per week May be repeated for cred t. Prerequ s te· nstructor approval.

MUP 587 Ethnomusicology Ensembles. (1) F S
Performance earning exper ence for the mus c of var ous cu tures of the wor d May be repeated for cred t Prerequ site knowledge of instrument or instructor approva

MUP 588 Piano Accompanying. 1) F S
Performance majors with a concentrat on n p ano accompanying (oth ers at the d scret on of the nstructor). P ano accompan ments found in voca and nstrumenta terature d scuss on of sty es and perfor mance pract'ces exper ence n pub c performance. 2 hours per week May be repeated for credit

MUP 596 Solo Performance. 1) F S
For Master of Mus c cand dates 'n app ed music only May be fu rec tal, major operat c ro e so o performance w th orchestra ensem ble or ecture recita

MUP 597 Solo Performance. 1 F, S
See MUP 596

MUP 671 Choral Repertoire. (3) N
Exam nat on of arge chora orchestral works to determ ne the r mus ca and textua characterist cs from a conductor's po nt of v ew

MUP 727 Studio Instruction. 2 or 4 F, S
For D M A cand dates on y M n mum contact of 1 hour per week May be repeated for cred t

MUP 796 Solo Performance. (1 15 F, S
For D M A cand dates on y May be repeated for credit

MUSIC (MUS)

MUS 100 Fundamentals of Music Notation. (3) F, S
Prov des non Mus c majors w th suff c ent symbol iteracy to beg n work n the f e d of mus ca earning Credit not app cab e toward any Mus c degree

MUS 340 Survey of Music History. (3) F S SS
Major composers, composit ons and periods n the h story of music Credit not applicab e toward any Music degree. *General Stud es. HU, H.*

MUS 347 Jazz in America. 3) F S SS
Current practices emp oyed by contemporary jazz musicians; the h s- torica deve opment of jazz tech ques Credit not appl cab e toward any Mus c degree *Genera Stud es. HU*

MUS 353 Survey of Afro-American Music. 3) N
Afro-American mus c traced from ts or g ns in Afr ca to the present w th emphas s on sp r tua b ues, jazz gospe and class ca styles Cred t not app cable toward any Mus c degree *General Stud es· HU*

MUS 354 Popular Music. 3) F, S SS
Emphas s on histor ca cu tura and performance patterns n a var ety of popu ar d oms such as, but not im ted to rock folk jazz, and Afro- Amer can mus c May be repeated for cred t Cred t not app cab e toward any Mus c degree *General Studies HU*

MUS 355 Survey of American Music. (3) F S SS
Growth and deve opment of American mus c Cred t not app cable toward any Mus c degree *General Stud es HU, H.*

MUS 356 Survey of the Musical Theatre. (3) A
Mus c s place n the theatre v ewed in terms of h stor ca mportance and re at ve funct on. Cred t not app cab e toward any Mus c degree *Genera Stud es HU*

MUS 363 Survey of Russian Music. (3) F 1999
Examines mus c and musica fe n Russia and the Soviet Un on from the Middle Ages to the present Lecture d scuss on Cred t not app cab e toward any Mus c degree.

Department of Theatre

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PROFESSORS
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FINE ARTS SPECIALIST
TAYLOR

SENIOR LECTURER
H LL

LECTURERS
RV NE SM TH-DAWSON

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 advising purposes, all students registering in a Theatre degree program enroll through the College of Fine Arts. Special advising check sheets, providing complete information regarding require ments and suggested electives, are available in the Depart ment of Theatre office for each degree program and area of concentration.

PRE-BACHELOR OF ARTS THEATRE PROGRAM

Freshman and sophomores who meet university and departmental standards are admitted to the Pre Bachelor of Arts Theatre program Students are required to submit a letter of intent stating area of interest before being admitted to the Pre B.A. Theater program.

Students must receive a grade of "C" or higher in all major courses and a 2.50 cumulative GPA during their first semester to continue in the pre B.A. Theater program. Stu dents failing to meet these requirements will have one semester of departmental probation to receive a "C" or higher in major courses and raise their cumulative GPA to 2.50. Students failing to meet the above requirements by the end of the first year (two semesters) will be asked to seek advisement regarding other majors.

MAJOR REQUIREMENTS

The major in Theatre consists of 54 semester hours Spe cific requirements are listed below for each area of concen tration. The following core of courses is required of all B.A. degree candidates·

THE	220 Principles of Dramatic Analysis *LI*	3
THE	320 History of the Theatre I *HU H*	3
THE	321 History of the Theatre II *HU, H*	3
THE	322 History of the Theatre III *HU, H*	3
THP	102 Beginning Acting	3
THP	200 Theatre Workshop	2
THP	213 Introduction to Technical Theatre	3
THP	301 Theatre Production*	2
THP	315 Fundamentals of Directing	3
Total		25

[1] One semester hour in two different workshop options per Theatre advisor.

* One semester hour in two different production options

Two of the following three courses (six semester hours) are required:

THP	330 Introduction to Costuming	3
THP	340 Scene Design	3
THP	345 Lighting Design	3

Within the major (including related area studies consid ered part of the major), only courses with a grade of "C" or higher may be applied toward graduation.

Before the junior year, students are evaluated on an audition, portfolio review, or written critical/historical essay, depending on the area of interest. Based on this evaluation, students may enter a concentration area or remain in the general B.A. degree program.

Students may be accepted in a concentration chosen from the following: acting, design/technical theatre, directing/ stage management, and history/theory and criticism.

Additional elective courses in General Studies and theatre are selected with an advisor to meet the total 120 semester hours required for the degree.

B.A. DEGREE

Students who wish to be considered for a concentration are required to interview, submit a portfolio, or audition in order to be admitted The interview or audition is conducted during the semester that students reach 55 semester hours and upon completion of the required core of lower division theatre courses. See the section on each concentration for a list of specific courses.

Students who transfer 55 semester hours or more are required to audition or interview before or during their first semester to be admitted to the B.A. degree in Theatre pro gram in one of the concentrations Students may be admit ted on a provisional basis to a concentration for one semester, at which time they must audition or interview again. Admission and retention in all theatre concentrations require a 2.50 GPA in theatre courses and a 2 00 cumulative GPA.

Electives. After satisfying all other requirements, remaining electives to total a minimum of 54 semester hours may be chosen with advisor approval from the list of approved Gen eral Studies courses or any courses in the College of Fine

NOTE: For the Genera Stud es requ rement, courses and codes (such as L1 N3, C, and H) see "Genera Stud es " page 85 For graduat on requ rements see Un vers ty Graduat on Requ rements," page 81 For an exp anat on of add t ona omn bus courses offered but not sted n th s catalog see "C ass f cat on of Courses " page 58

Arts Lower division courses in a foreign language may also be used as electives. See "College Degree Requirements," page 261, for approved areas of study and the distribution of semester hours as required by the College of Fine Arts.

Concentrations. The requirements for each concentration follow.

Acting

Admission is by audition at the end of the sophomore year and with the completion of the following required theatre performance courses in addition to the core:

THP	272	Introduction to Stage Movement	3
THP	277	Introduction to Stage Speech	3
THP	285	Acting: Beginning Scene Study or THP 207 Introduction to Acting: The Creative Imagination (3	3
THP	370	Intermediate Voice and Movement for the Stage	2
THP	377	Stage Speech	2
THP	385	Acting: Intermediate Scene Study	2
THP	472	Advanced Movement for the Stage	3
THP	477	Advanced Voice for the Stage	3
THP	485	Acting: Advanced Classical Scene Study	3
Total			24

In addition, students intending to audition for the acting concentration are strongly encouraged to take THP 113 Techniques of Theatrical Makeup (three semester hours).

Students admitted to the acting concentration are required to audition for designated subscription series productions.

Design/Technical Theatre

Students are admitted to the design/technical theatre concentration after the submission of a portfolio at the end of the sophomore year and with the completion of the following required theatre core courses.

THE	220	Principles of Dramatic Analysis *LI*	3
THP	101	Introduction to the Art of Acting or THP 102 Beginning Acting (3	3
THP	200	Theatre Workshop*	1
THP	213	Introduction to Technical Theatre	3
Total			10

* Selection of Theatre Workshop must be made by theatre advisor.

One of the following courses, which must be the course not selected as part of the core, is required:

THP	330	Introduction to Costuming	3
THP	340	Scene Design	3
THP	345	Lighting Design	3

Three additional semester hours of THP 301 Theatre Production (one hour each in carpentry, stitching, and electric) are required as well as THP 401 Theatre Practicum (two semester hours) and THP 442 Drawing.

Also required are 14 semester hours selected from the following courses:

THE	430	History of Costume: Western Tradition	3
THP	317	Stage Management	3
THP	331	Costume Construction	3
THP	350	Sound Design	3
THP	401	Theatre Practicum	1–3
THP	406	Scenography	3
THP	430	Costume Design	3
THP	431	Advanced Costume Construction	3
THP	435	Advanced Technical Theatre	3
THP	440	Advanced Scene Design	3
THP	441	Scene Painting	3
THP	444	Drafting for the Stage	3
THP	445	Advanced Lighting Design	3
THP	494	ST Special Topics	1–4
THP	498	PS Pro Seminar	1–6

Assignments on ASU Theatre productions in various technical and design support areas provide practical training. Students who demonstrate consistent interest and ability are typically awarded a final design or technical direction project of a fully mounted Lyceum production.

Directing/Stage Management

Students are admitted to the directing and stage management concentration after having an interview, receiving a grade of "B" or higher in THP 315 Fundamentals of Directing (or its equivalent), and completing the following required lower division theatre core courses:

THE	220	Principles of Dramatic Analysis *LI*	3
THP	102	Beginning Acting	3
THP	200	Theatre Workshop*	1
THP	213	Introduction to Technical Theatre	3
Total			10

* Selection of Theatre Workshop must be made by Theatre advisor.

The following courses are also required:

THP	285	Acting: Beginning Scene Study	3
THP	317	Stage Management	3
THP	419	Preproduction Workshop: Director/Designer Collaboration	3
Total			9

Also required is the introductory design course not selected as part of the theatre core: THP 330 Introduction to Costuming, or THP 340 Scene Design, or THP 345 Lighting Design.

In addition, 12 semester hours selected with advisor approval from the following courses are required.

THE	424	Trends in Theatre for Youth	3
THP	272	Introduction to Stage Movement	3
THP	277	Introduction to Stage Speech	3
THP	301	Theatre Production	1–4
THP	385	Acting: Intermediate Scene Study	2
THP	401	Theatre Practicum	1–3
THP	414	Directing: The Production Concept	2
THP	415	Directing the Actor	3
THP	450	Theatre Organization and Management	3
THP	484	Internship	1–4
THP	498	PS Pro Seminar: Directing, Stage Management, Theatre in Education, Theatre for Youth Tour	1–6

Exceptional students may be admitted to the directing and stage management concentration on a provisional basis if they have not taken THP 315 Fundamentals of Directing (or its equivalent). Special application to the department is required.

In addition to the above concentration area courses, advisor approval is required for General Studies and elective

courses. Students are encouraged to apply for directing/stage management assignments in the scholarship series.

History/Theory and Criticism

Students are admitted to the history/theory and criticism concentration after having an interview, submitting a written critical or historical essay at the end of the sophomore year, and completing the following required lower division theatre core courses

THE	220 Principles of Dramatic Analysis *L1*	3
THP	102 Beginning Acting	3
THP	200 Theatre Workshop*	1
THP	213 Introduction to Technical Theatre	3
Total		10

* Selection of Theatre Workshop must be made by Theatre advisor

Two of the following three courses are required:

THE	420 History of the American Theatre *HU H*	3
THE	421 History of the English Theatre *L2 HU*	3
THE	425 History of Asian Theatre *L2 HU*	3

Also required are six semester hours of upper division dramatic literature in theatre, English, or a foreign language and three semester hours of playwriting (THP 294 Special Topics or 460 Playwrights Workshop Six semester hours selected from the following courses are required:

ENG	361 Silent Film *HU*	4
ENG	362 Sound Film Genres *HU*	4
THE	401 Focus on Multiethnic Film *HU, C*	3
THP	414 Directing The Production Concept	2
THP	415 Directing the Actor	3
THP	419 Preproduction Workshop Director Designer Collaboration	3

THP 498 PS: Senior Project is also required.

GRADUATION REQUIREMENTS

In addition to fulfilling the major requirements, students must meet all university graduation requirements. See "University Graduation Requirements," page 81.

BACHELOR OF FINE ARTS DEGREE

Theatre Education

For students seeking secondary school certification by the State of Arizona, the B.F.A degree offers a teacher certification track. This track certifies a teacher for the instruction of theatre to students in grades 7 12 (and an endorsement for K 12 "dramatic arts") 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 Professional Teacher Preparation Program (PTPP)

A minor teaching field of 24 to 30 semester hours in such areas as English or communication is not required for the degree 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 semester hours required for major areas, approved areas, and endorsements in certification.

The following theatre courses are required

THE	220 Principles of Dramatic Analysis *L1*	3
THE	320 History of the Theatre I *HU H*	3
THE	321 History of the Theatre II *HU H*	3
THP	102 Beginning Acting	3
THP	200 Theatre Workshop*	1
THP	213 Introduction to Technical Theatre	3
THP	272 Introduction to Stage Movement	3
THP	277 Introduction to Stage Speech	3
THP	285 Acting Beginning Scene Study	3
THP	301 Theatre Production	1–4
THP	315 Fundamentals of Directing	3
THP	330 Introduction to Costuming	3
THP	345 Lighting Design	3
THP	414 Directing The Production Concept	2
Total		37–40

* Selection of Theatre Workshop must be made by Theatre advisor

The following theatre education courses are required for the theatre education concentration

THE	325 Play Reading	1
THE	480 Methods of Teaching Theatre	4
THP	3 Improvisation with Youth	3
THP	4 Methods of Teaching Drama	3
THP	48 Secondary School Play Production	3
Total		14

Students are strongly encouraged to voluntarily enroll in additional course work in the practice in the art of theatre Recommended courses include.

THE	322 History of Theatre III *HU, H*	3
THP	113 Techniques of Theatrical Makeup	3
THP	340 Scene Design	3
THP	415 Directing the Actor	3

The PTPP, in cooperation with the theatre education coordinator, establishes professional education course work.

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 three 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 semes

NOTE: For the General Studies requirement courses, and codes such as L1 N3, C and H see General Studies page 85. For graduation requirements, see University Graduation Requirements page 81 For an explanation of additional common business courses offered but not listed in this catalog, see Classification of Courses" page 58.

ter of full-time study. Strict deadlines are set for application to the PTPP. Students who express an interest in the theatre education concentration are advised to apply no later than the beginning of the sophomore year. The student is also required to meet admission standards mandated by the PTPP and the Arizona Department of Education for teacher certification (see "College of Education," page 177).

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, thus removing a student from the B.F.A. degree program. 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 PTPP must also be maintained for students in the teacher certification track.

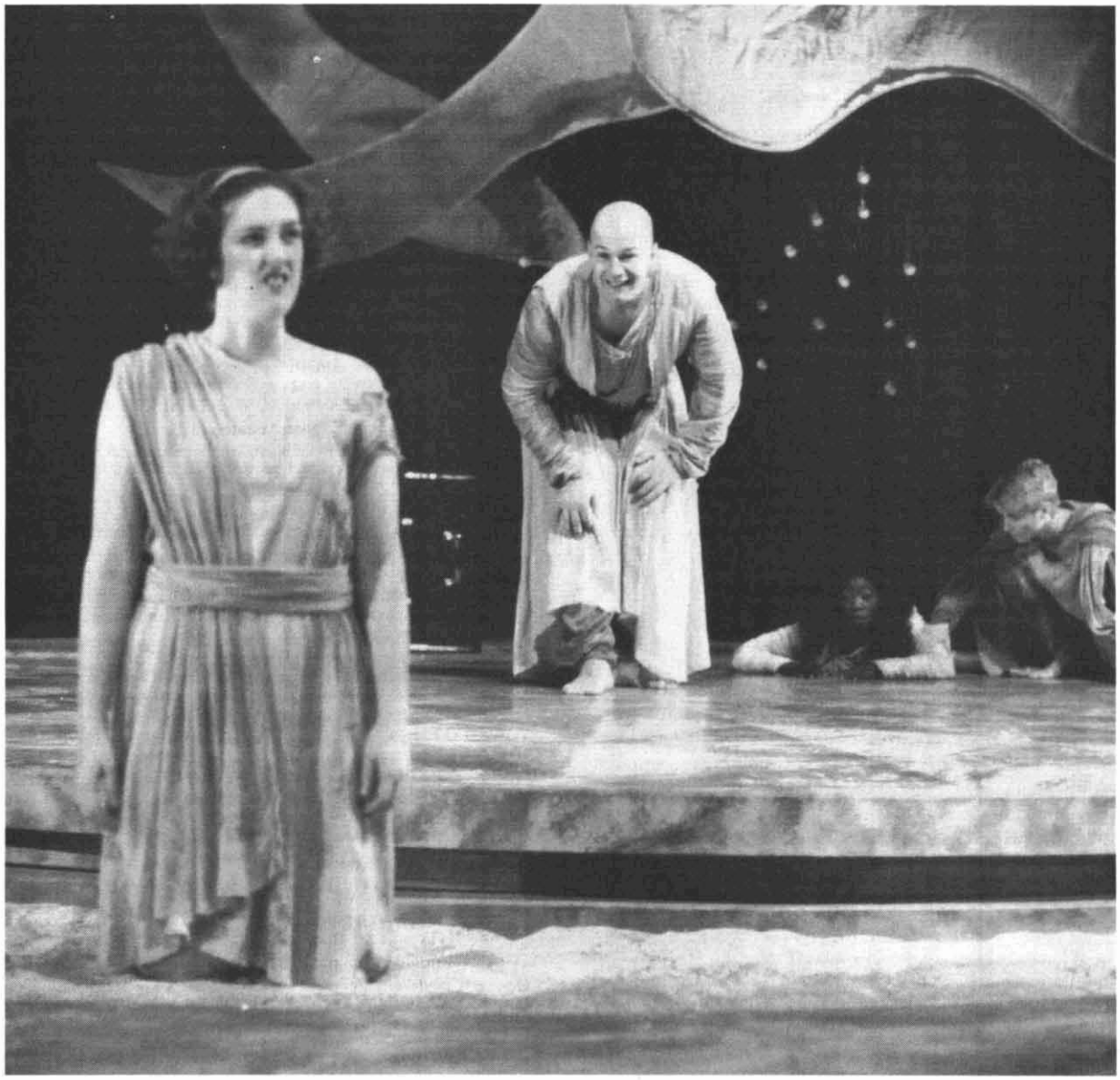
DEPARTMENTAL MINOR

The department offers a minor in Theatre consisting of 22 semester hours of course work. The following courses are required:

THE	100 Introduction to Theatre *HU*	3
THP	101 Introduction to the Art of Acting	3
THP	213 Introduction to Technical Theatre	3
THP	301 Theatre Production	1–4
Total		10–13

Two of the following three courses are also required:

THE	320 History of the Theatre I *HU, H*	3
THE	321 History of the Theatre II *HU, H*	3
THE	322 History of the Theatre III *HU, H*	3



From the 1998 fall production of *As You Like It*

Lyle Bellman photo

Also required are two three hour courses in the same area of concentration. Contact the departn ent for area options and course requirements

Courses ordinarily limited to majors only are available to minors on a second priority basis that is, minors may not preregister for these courses, but are allowed to register after all majors' needs have been met Al prerequisites for the minor courses must be n et (see cc urse listings).

Departmental Academic Specialization

Elementary Education. Students pursuing the Bachelor of Arts in Education degree n Elen entary Education may select theatre as an academic specia ization, cons sting of 18 semester hours fron the follow ing courses·

THE	100	Introduct on to Theat HU 3
THE	424	Trends i Theatre for Youth. 3
THP	101	Introducti to the Art of Act n 3
THP	213	Introducti r to Tecl nical Theatre 3
THP	311	Improvisat on w th Youth 3
THP	312	Puppetry with Ch ldren 3
THP	315	F nda ientals of D recting 3
THP	330	Introduction to Cc stumin 3

THP 411 Methods of Teaching Drama 3) is required

Secondary Education. Students pursuing the B.A. in Edu cation degree in Secondary Education may select theatre as a second teaching field The second teaching field consists of 30 semester hours including the follow ing courses:

THE	220	Principle of Dramatic Analysis L . 3
THE	325	Play Read ng. . . . 1
THE	480	Methods of Teaching Theatre 4
THP	101	Introduct on to the Art of Act ng . . . 3
THP	213	Introduction to Technical Theatre . 3
THP	301	Theatre Production . . 1–4
THP	311	Improvisation with Youth . . . 3
THP	315	Fundamentals of Direct ng . . 3
THP	481	Secondary School Play Production . 3
Total		24–27

Two of the follow ing three courses are also required:

THP	330	Introduct on to Costun ng 3
THP	345	L ght ng Design 3
THP	41	Methods of Teach n Drama 3

GRADUATE PROGRAMS

The faculty n the Department of Theatre offer programs leading to the M.A degree in Theatre; the Master of Fine Arts degree in Theatre with con centrations in performance, scenography, and theatre for youth, the Ph.D. degree in Theatre with a concentration in theatre for youth· and, in con junction with the Department of English, an interdisciplinary Master of Fine Arts degree in Creative Writing (play writing opti n . Consu t the *Graduate Catalog* for details.

THEATRE (THE)

THE 100 Introduction to Theatre. 3 F S SS
E ements and p c p es of the theatre Le ture d scuss on P erequ s te nonmajor *Gen ra Stud es H*

THE 220 Principles of Dramatic Analysis. 3 F S
Ana ys s eva uat on and nterpretat'on of dramat c terature for theat r ca product'on Se ected read ngs of class c contemporary and modern p ays Prerequ s tes ENG 101 or 105 , Theatre major *Gen era Stud es L1*

THE 225 Orientation to Theatre. 1 F
Or entat on to un vers ty and department resources and procedures. Career p ann ng and gu dance Attendance and wr tten responses to theatre product ons Required for B A Theatre majors Prerequ s te. Theatre ma or

THE 300 Film: The Creative Process. 3) F S SS
Elements of the theatr ca f m c nematography sound ed t ng, d rect ng act ng, scr ptwr t ng, produc ng, and cr t c sm 3 hours ecture 2 hours ab *Genera Stud es HU*

THE 320 History of the Theatre I. (3) F
Traces major deve opments n theatre product on and dramat c tera ture from their beg nn ngs to the m d 17th century Lecture student presentations *General Stud es. HU, H*

THE 321 History of the Theatre II. 3 S
Traces ma or deve opments n theatre product on and dramat c tera ture from the m d 17th century to the end of the 19th century Lecture, student p esentat ons *General Studies: HU H*

THE 322 History of the Theatre III. (3 F
Traces major deve opments n theatre product on and dramat c tera ture in the 20th century Cooperative earn ng *Genera Studies HU H.*

THE 325 Play Reading. (1 F S
Ass gned ndependent read ngs n plays f r h gh schoo production Prerequ s te theatre educat on concentrat on or wr tten nstructor approva

THE 400 Focus on Film. (3) F S SS
Spec a zed study of prom nent f m art'sts techn'ques and genres Emphas s s on the creat ve process. May be repeated for cred t. Pre requ site ENG 101 or 105

THE 401 Focus on Multiethnic Film. (3) N
Spec a ized study of major ethn c f ims and prom nent f m art sts Emphas s s on the creat ve process. Lecture, f m v ew ng papers Prerequ s te· ENG 101 *Genera Stud es· HU C*

THE 420 History of the American Theatre. (3) F
H story of the p ays art sts, and events n the deve opment of Amer can theatre from co on a to modern t mes *General Studies· HU H.*

THE 421 History of the English Theatre. 3 S
H story of the art sts events and p ays n the deve opment of Eng sh theatre from med eva times to the present Lecture, group and nde pendent w rk *Genera Studies L2/HU*

THE 424 Trends in Theatre for Youth. (3 N
A survey of the h story iterature and contemporary pract ces n the atre for youth

THE 425 History of Asian Theatre. (3 N
H story and product on techn ques of theatre forms n nd a Ch na, and Japan Prerequ s te 6 hours of theatre h story or wr tten nstructor approva . *Genera Stud'es. L2/HU.*

THE 430 History of Costume: Western Tradition. 3 N
Study of major costume sty es throughout h story of Western c v iza t on and how these fash ons ref ected society. Exp orat on of how sty es can be used by theatr ca costumers

THE 431 History of Costume: Non-Western Tradition. (3) N
Study of major costume sty es of ndia As a Eastern Eur pe and the M dd e East and how these fash ons reflected soc ety Explorat on of how sty es can be used by theatr cal costumers.

THE 480 Methods of Teaching Theatre. (4) F
App cat on of mater a s, techniques and theor es for theatre w th n nth through twe fth-grade students. Emphas s on curr cu um devel opment and prax s Prerequisite theatre educat on concentrat on or wr tten nst uctor approva

THE 500 Research Methods. 1 3) F
ntroduct on to graduate study n theatre.

THE 504 Studies in Dramatic Theory and Criticism. (3 F
Dramat c theory, c t c sm and aesthet cs from the c assical per od to the 19th century Re ated read ngs n dramatic terature Prerequis te Theatre ma or

NOTE: For the Genera Stud es requ rement courses a d codes such as L1 N3 C and H see 'Genera Stud es " page 85. For graduat on requ rements see Un vers ty Grad at on Requ rements ' page 81 For an exp anat on of add t na omn bus courses ffered but not sted n this cata o see C as f cat on of Courses " page 58

THE 505 Studies in Dramatic Theory and Criticism. 3 S
ramat c theory cr t sm and aesthet cs fr m the 19th century to the present Re ated read gs dramat c teratu e Prerequ s te Theatre ma or

THE 510 Studies in Literature. 1 F S
As gned nd v d a read g p grams n standa d sources and mas terp eces n theatre terat re Top s may be se ected f om the fo ow g
a Act ng D rect g
b Cr t c sm
c Des gn Te hn ca
d H story
May be repeated for red t n d ffe e t sect ons

THE 520 Theatre H story and Literature I. 3 F
A urvey of st r ograph ca ssues h sto ca per od and theatre t e atu e through the 17th cent ry

THE 521 Theatre H story and Literature II. 3 S
A survey f h st r graph ca ssues h stor ca per ods and theatre t erature fr m the 17th century to present

THE 524 Advanced Studies in Theatre for Youth. 3 F
A n depth tudy of the h story terature and contemporary pract ce f theat e f y th Prerequ s te wr tten nstructor approva

THE 591 Seminar. 3 A
Se e ted t cs n ch d d ama commun ty theatre and theatre h story Prerequ s te w tten nstructor app ova

THE 700 Advanced Research Methods. 3 F
Cr t ca rev ew f esearch deve pment and des gn of research n theatre and theatre for youth

THE 791 Sem nar. 3 N
Se ected t p s ffered on a revo v ng as s May be repeated f r cred t when t p c changes

THEATRE PERFORMANCE AND PRODUCTION (THP)

THP 101 Introduction to the Art of Act ng. 3 F S, SS
mprov sat ons term no gy exerc ses and pro ects n act ng Prereq u s te nonmaj r

THP 102 Beginning Acting. 3 F S
Actor aware ess persona and group nterna act ng techn ques scene study w th part ers mono ogue preparat on Stud Prerequ s te Theat e ma or

THP 113 Techn ques of Theatr ca Makeup. 3 F S
Techn que of theatr ca makeup age c rrect ve masks and spec a effects 1 hour ect re 2 h urs ab Lab fee requ red

THP 194 ST: Special Topics. 1–4 A
T p c may be se ected f m the fo ow g
a Stage Management

THP 200 Theatre Workshop. 1 F S
Atte dance and or part c pat n at a var ety of demonstrat ons guest ect res perf r ances and wo kshops May be repeated for cred t Prereq s te Theatre ma or

THP 207 Introduction to Acting: The Creative Imagination. 3 F
Deve op ent f the act ' a an art st ntroduc ng the use of the cre at ve mag nat on th ugh se ory exper ence as ed by Stan s avsk Stu o Prereq s te wr tte nstructor approva Prerequ s tes w th a grade f C o h gher THE 220 THP 102

THP 208 Introduct on to Acting. Doing the Action. 3 S
Cont nuat on f the nne pro ess app y ng the techn ques of Me sner t d scover the creat v ty n the sp ntaneo s exper ence Stud o P e requ te wr tte nstru tor approva Prerequ s te w th a g ade of 'B o h gher THP 207

THP 213 Introduct on to Technical Theatre. 3 F S
Procedure of tec n ca theatre product on and demonstrat on Top cs n ude de gn and nst uct on of sce ery ght ng and propert es 2 hours ectu e 3 h urs ab

THP 272 Introduction to Stage Movement. 3 F S
Moveme t v abi a y a d p y ca tra n g n e axat on a gnn ent cond t n ng rhythm and po se Prerequ s te THP 101 or 102 or con current reg strat on n THP 1 2 *or* wr tten nstru tor approva .

THP 277 Introduct on to Stage Speech. 3 F S
Exerc ses and tec n q es to free the vo ce a d mprove project on Prerequ s tes THP 1 1 o 102 and 272 *or* wr tten nstructor approva Prerequ s te w t a grade f C r h gher THE 220

THP 285 Acting: Beginning Scene Study. 3 F S
Character a a y s s ehearsa a d perf rmance of modern p ays w th empha on rea st c act ng sty es Spec a sect ons for maj rs Pre equ s te w th a grad f C or h gher THE 220 and THP 102 *or* wr t ten nstructo approva

THP 294 ST: Special Top cs 1–4 A
a t oduct on to P ayw t ng
b Stage Management

THP 301 Theatre Production. 1–4 F S SS
Part c pat on n n ver ty theatre pr duct ns May be repeated for cred t. P ereq s te wr tten nstructor appr va

THP 307 Acting: The Inner Process. 3 F
An advanced ass f r nd v dua zed w rk on concentrat on pers na zat n se f awareness v sua zat on subst tut on creat ng n er and ute haracte s Exerc ses mono ogues and s enes Prereq s te act ng c ncentrat n or wr tten nstruct r approva

THP 308 Mu t'ethnic Workshop. 3 F S
Project r ented wo k h p prov des the eth c student and thers the opportun ty t deve op and present works r g nat ng from Amer ca s ethn c cu tures ect re ab

THP 311 Improv sation w'th Youth. 3 F S
Bas c mater a techn ques and the r s f r fac tat ng mprov sa t ona drama w th ch dren and youth Not open to freshmen.

THP 312 Puppetry w th Chi dren. 3 F S
C nst uct on and man p at on of puppets, pract ce n performance sk s Emphas s on educat na and recreat ona uses of puppetry by and w th ch dren Lab fee requ ed P ereq s te un or tand ng r ab ve requ ed

THP 315 Fundamentals of Directing 3 F S
Bas c to s of th d ector c st ng f oor p a s b o k ng rehears ng D rector s appr ach t text and art cu at on of deas emphas zed Pre req s tes THP 101 or 102 and 213 *or* wr tten nstructor approva Prerequ s te w th a grade f C r h ghe THE 220.

THP 317 Stage Management. 3 F
Read ngs n stage management and part c pat on as a stage manager n a un vers ty theat e product on Prerequ s te wr tten nstructor approva Prerequ s te w th a grade of C' or h gher THE 220

THP 330 Introduct on to Costuming. 3 F S
Co tume construct n survey of costume h story, and bas c pr nc p es f costume des gn ostume des gn pro ect and aboratory exper ence n con truct on of c tumes 3 hou s ecture 2 hou s ab Prerequ s te w th a grade of or gher THE 220.

THP 331 Costume Construction. 3 N
Uses of mater a s and techn ques f r tage costumes w th act a con struct on of per od appare P e equ s te THP 33 or wr tten nstructor approva

THP 340 Scene Design. 3 F S
tud pr jects n des g g rea st c scenery for the contemporary prosce um stage Prerequ te THP 213 or wr tten nstructor approva Prerequ s te w th a g ade of C or h ghe THE 2 0

THP 345 Lighting Des gn. 3 F S
Pr nc p es and theory of stage ght ng des gn nc ud ng des gn pro cess and execut on equ pment and ght p ots Lecture ab Prerequ te THP 213 wr tte nstructo appr va Prereq s te w th a grade f C r h gher THE 220

THP 350 Sound Des'gn. 3 F
ntr duct on to the equ pment proce s, a d rec d ng tech ques used n sound des gn f r the theatre Lecture stud o Prerequ s te w th a grade of C r h ghe THE 220

THP 370 ntermed'ate Voice and Movement for the Stage. 2 F
Conce trat on on deve p ng str ng and expre s ve voca and phys ca n truments f r the stage Pre equ s tes THP 272 and 277 and act ng concentrat on *or* wr tten nstruct r approva Prerequ s te w th a grade of C r h gher THE 220

THP 377 Stage Speech. 2 S
tr duct on of ph et c a phabet and standard speech nd d ct on 2 h rs per wee P e eq s tes THP 37 a d act ng c entrat on *or* w tten st uctor app ova

THP 385 Acting Intermediate Scene Study. 2 S
Sc pt a a y s s a d performa ce of modern c ass cs Prerequ s tes THP 37 and a t ng con entrat on *or* wr tten nst uctor approva Corequ te THP 377

THP 394 ST: Special Topics 1–4 A
a Beg nn ng Screenwr t ng
b nterme d ate P aywr t ng
May be repeated fo cred t
c Stage Management

THP 401 Theatre Practicum. 1 3 F S SS
Performance and pr d ct on ass gnments f r advanced students f act ng techn ca product on, stage a d bus ness management a d des gn May be repeated for cred t P erequ s te wr tten n tructor approva

THP 406 Scenography. 3 N
The pr cess of product on co aborat on Taught conjun t on w th THP 419 Prerequ s tes THP 330 and 340 and 345 *or* wr tten nstruc tor appr va

THP 411 Methods of Teaching Drama. 3 F
App cat on of mater a s techn ques and theor es w th grades K 8 youth Regu ar part c pat on w th ch dren Prerequ s te THP 311 or wr tten nstructor approva

THP 414 Directing: The Production Concept. 2 A
P ay ana ys s deve opment and mp ementat n of the d rect r s con cept Stud o Prerequ s tes THP 315 w tten nst uctor approva

THP 415 Directing the Actor. 3 A
Pract a app cat ons of d rect ng for the stage Rehearsa and prese tat on of scenes and short p ays Prerequ s tes THP 414, wr tten nstructor appr va

THP 419 Preproduct on Workshop: Director/Designer Col abora tion. 3 A
Study and pract ce f the co aborat ve process ecessary for deve op ng a pr duct o c ncept Var ou sty es rea sm n ea sm, theatre for youth Taught n c njunct n w th THP 406 506 ca ot be enro ed concurrent y w th THP 406 r 506 Pre equ s te THP 415 r wr tten nstructor approva

THP 430 Costume Design. 3 N
Pr nc p es of costume des gn w th pro ects n both modern and per od sty es Prerequ s te THP 330

THP 431 Advanced Costume Construction 3 A
Spec a zed tra g n costume construct n prob ems and rafts w th pro ects n ta or ng m e y and pe d accessor es Prerequ s tes THP 330 and 331 *or* wr tten nstructor appr va

THP 435 Advanced Technical Theatre. 3 A
Se ect on of mater a s draft ng f work ng draw ngs, t o perat on and construct on techn que 2 hours e ture 2 hours ab Prerequ s tes THP 34 and 345 *or* wr tten nstruct r approva .

THP 440 Advanced Scene Design 3 A
Advanced stud o proje ts des gn g s enery f r a var ety of stage for s Prerequ s te THP 340 or wr tten nstructor approva

THP 441 Scene Painting. 3 N
Stud o projects n pa nt ng stage sce ery. P erequ s te THP 340 or wr tten nstructor approva

THP 442 Draw ng. 3 N
Techn ques n draw ng and rende g f s en c c stume and ght g des gn P erequ s te wr tten nst uct r approva

THP 444 Drafting for the Stage. 3 N
Fundamenta s of and pract ce n graph c techn ques f r the stage ntrod ct on to computer a ded des gn f r the stage. 2 hours ecture 3 h urs stud o Pre equ s tes THP 213 wr tte nst uctor approva

THP 445 Advanced Lighting Design. 3 N
Spec a zed tech ques stage ght ng Advanced app cat o of des gn process graph c techn q es of des gn presentat on and use of qua t es of ght Lecture c a s w rksh ps Prerequ s te THP 345 or wr tten st uctor approva

THP 450 Theatre Organization and Management. 3 N
Box off ce h use management pr edures pr duct on budget ng and pub c ty Prerequ s te w th a grade of C or h gher THE 220

THP 460 P aywrights Workshop. 3 F S
Pract ce a d st dy of creat ng haracters, d a ogue scenes p ays and m no ogues for the stage May be repeated for cred t Stud o ec ture Prerequ s te wr tten nstr ctor appr va

THP 461 Scr pts n Progress. 3 F S
Stud o w rk w th the nstruct r centered on rev s ons of or g nal p ays P epar ng the scr pt for pr duct ns and rewr t ng wh e n pr duct on May be repeated fo cred t Stud o Prerequ s te THP 460 or wr tten stru tor appr va

THP 472 Advanced Movement for the Stage. 3 F
Movement tech ques f r the c ass ca and nonrea st c theatre stage combat a d spec a sk s Prerequ s tes. THP 385 a d act ng concen trat on wr tten structor appr va

THP 477 Advanced Voice for the Stage. 3 F
Exer ses to deve p voca f ex b ty and power mastery of e evated Amer can d ct on and anguage sk s app ed to c ass ca and nonrea t d a a stage d a ects Prerequ s tes· THP 385 and act ng c ncen trat on o wr tten structor approva

THP 481 Secondary Schoo Play Production. 3 F
Methods f d rect ng des gn ng and co rd nat ng p ay product on exper ences at the secondary s hoo eve Off campus pract cum Prerequ s tes THP 315 and theatre educat on concentrat on *or* wr tten nstructor approva

THP 484 Internship. 1–4 A

THP 485 Acting· Advanced C assical Scene Study. 3 S
Rehearsa and performance of per d ass ca and non ea st c p ays Emphas s on de very f poet c anguage Prerequ s tes THP 385 and act ng c ncentrat n *or* wr tten nstructor approva

THP 486 The Me sner Approach to Acting. 3 A
mprov sat ons and exerc ses deve ped by Sanford Me sner app ed to scene work f m se ected texts Stud o Prerequ s te ntroductory act ng c asses

THP 487 Acting for TV and F lm. 3 A
Profess ona te ev s on and f m act ng te hn ques te m no ogy and on camera exper ence. Prereq s tes THP 101 r 102 285 jun or stand ng

THP 488 Audition Techniques. 3 A
Techn ques and preparat on for stage mmerc a and TV f m aud t ns ut z ng m no ogues c d read ngs, and persona sty e Stud o. Prerequ s te ntroductory act ng c asses

THP 489 Actor Career Development. 3 A
Fam ar zat on w th the bus ness of act ng se f-promot ona to s and techn ques market ng strateg es f nances nterv ew sk s and act r un ons Stud o Prerequ s te ntroductory act ng c asses

THP 494 ST: Specia Topics. 1–4 A
Top cs may be se ected fr m the fo w ng·
a Advanced Act ng Techn ques
b Advanced Scene Pa nt g
c Adva ced Sc eenw t ng
d Advanced Stage Management
e Performa e and Techn ogy
f Prob ems n D rect ng
g Propert es and Dress ngs De gn and Construct on
h So o and Co abo at ve Performance
So Performance
Stage D a ects
k Standards n the Sch K 12
Storyte ng
m Techn ca Theatre
n Theatre of the Oppressed
o The ry and Pract ce of Performance
p V de and ndustr a Scene Des gn

THP 498 PS· Pro-Sem nar. 1 6 A
Top cs may be se ected fr m the fo ow ng
a D rect ng
b Pro ects
C stume Des gn
L ght ng Des gn
Propert es Des gn
Sce ery Des gn
Te hn a D rect n
c Stage Manag m nt
d Theatre f r Youth Tour
e Theatre n Educat on
Prerequ s te wr tten nst uct r approva

NOTE: Fo the Genera Stud es requ rement c urses and codes such as L1 N3 C and H see Genera Stud es " page 85 For graduat on requ rements see Un ver ty Graduat on Requ reme ts page 81 For an exp anat on of add t na omn bus c urses offered but not sted n th s cata g see C ass f cat on of C urses ' page 58

THP 501 Performance: Solo Performance. 8 A
Student beg n to def ne the r m ss on n art Emphas s n the actor as a so o storyte er speak ng a herse f or h mse f Stud o Prerequ s te nstructor appr va

THP 502 Performance: Aesthetics of Theatre Art. 8 A
Under tand ng and ana yz ng scr pts and performance n order to be an effect ve actor storyte er who speaks as a character P ojects focus on so o duet perf rmances Studio Prerequ s te n t u tor app ova

THP 503 Performance: The Ensemble. 8 A
The e semb e, wo k ng w th a p aywr ght creates a p ay that addresses soc a ssues through mprov sat on and commun ty nput Stud o Prerequ s te nstructor approva

THP 504 Acting: Transformation I. 8 S
Fundamenta s nc ud ng combat scans on, p et c anguage act ng sty e Scene study ensemb e perf rmance projects focused on Shakespeare, new scr pts Stud o Pre equ s te. THP 5 3 or wr tten nstructor appr va

THP 506 Scenography. 3 N
The process of product on co aborat on Taught n conjunct n w th THP 419 Prerequ s te theatre g ad ate stand ng or wr tten nstructor approva

THP 508 Multiethnic Workshop. (3 F S
Advanced workshop for deve opment and presentat on of works or g nat ng o t of Amer an ethn c cu tures Lecture ab

THP 509 Singing for Actors. 1 F S
ntroduct on f the bas cs of s ng ng techn que Breath contr reso nance art cu at n exp orat on and expans on of s ng ng ange May be repeated f r cred t Stud o Prerequ s te adm ss on to M F.A Act ng program or wr tten n tructor approva

THP 511 Improv sation with Youth Workshop. 3 S
Theor es and techn ques of drama w th var ous p pu at ons of youth Emphas s on how resea h nfo ms pract ce. Pract cum nc uded Pre requ s tes THP 411 *or* graduate sta d ng and wr tten nstructor approva

THP 512 Puppetry Workshop. 3 F S
Survey of puppetry n educat on puppetry as an art form n des gn and performance Lab fee requ red Prerequ s te graduate stand ng or wr tten nstructor approva

THP 515 Problems n Directing. 3 S
Ana ys s of comm n d rect ng prob ems Top cs nc ude creat ng the ensemb e conceptua un ty metaphor non tera strateg es and orga n zat ona respons b t es of the d rector Prerequ s te wr tten nstruc tor approva

THP 517 Stage Management Practicum. 3 F
Read ngs and research n stage management and part c pat on as a stage manager n a Un vers ty Theatre product on Prerequ s te. writ- ten nstructor approva

THP 519 Directing: Works in Progress. 3 F
Advanced projects n d rect ng concentrat ng n a co aborat ve pro cess between d rector p aywr ght actors and des gne s Focus s pri- mar y on new scr pts or adaptat ns of terature May be repeated for cred t Stud o on s te pract cum Prerequ s tes graduate stand ng wr tten nstruct app ova

THP 530 Advanced Costume Design. 3 N
Advanced stud o pr jects costume des gn for a var ety of product on forms Prerequ s te wr tten n truct r approva

THP 540 Scene Des gn Applications 3 N
Conceptua a d pract ca app cat n of the de gn process nc ud ng graph c and scu ptura pr jects Pract ca d s gn prob ems nvest gated n aboratory Lab fee Prerequ s te wr tten nstructor approva

THP 545 Light ng Design Applications. 3 N
Advanced stud projects n stag ght ng des g Prerequ s te wr tten nstruct r approva

THP 560 P aywright's Workshop. 3 F S
Pract ce and tudy of creat g characters d a gue scenes, p ays and mono ogues for the stage May be repeated f r c ed t Stud o Pre requ s te wr tten nstructo app ova

THP 561 Scripts in Progress. 3 F, S
Stud o work w th the nstructor centered on rev s ons of orig nal p ays Prepar ng the scr pt f r product ons and rewr t ng wh e n product on May be repeated f r cred t Stud o. Prerequ s te THP 560 or wr tten nstructor approva

THP 562 Literary Management Workshop. 3 F
Advanced terary management for the contemporary theater nc ud- ng trends n new p ay development fest va s and product ons through out the Un ted States Part c pat on n Ar zona P aywr't ng Compet t n Prerequ s te THP 560 or wr tten nstructor approva

THP 584 Internship. 1 3 A
F e d research and on s te tra n ng n theatre for youth commun ty the- atre and product on techn ques Pre equ s te wr tten nstructor approva

THP 593 Applied Projects. 1 12) A
Prerequ s te wr tten nstructor approva

THP 594 Conference and Workshop in Child Drama. (3 A
Prerequ s te wr tten nstructor approva

THP 598 ST: Specia Topics. 1–4 A
Top cs may be se ected from the fo ow ng
a Act ng
b Advanced Screenwr t ng
c Co lege Teach ng:
Act ng
Dramat c Ana ys s
mprov sat on w th Youth
Movement
Puppetry
Vo ce
d D rect ng
e Performance and Techno ogy
(f) So o and Co aborat ve Performance
(g So o Performance
h Stage D a ects
Stage Management
(j Theatre of the Oppressed
k W rks n P ogress
Act r
P aywr ght
Lecture stud o

THP 611 Improvisation with Youth Seminar. 3 A
Exam nat on of current research, theory and pract ces n drama w th youth Deve opment and execut on of research projects Prerequ s te wr tten nstructor approva

THP 618 Directing Practicum. 3 A
Pract ca exper ence n d rect ng and produc ng an ent re p ay or mus - ca for young aud ences Prerequ s te wr tten nstructor approva

THP 649 Design Studio. 3 F S
Projects nc ude des gn of scenery costume, ght g or sound for ab- o atory or ma nstage product ons May be epeated for cred t. Prereq u s te. wr tten nstructor approva

THP 684 Internship 3–6 F S, SS
F e d research n act ng, mprov sat on w th youth theatre for youth puppetry and scenography Prerequ s te wr tten nstructor approva

THP 691 Seminar. Scenography. (3 N
Exam nat on of and research nto modern concepts and pract ces of scenography Prerequ s te wr tten structor approva

THP 693 Applied Project. 1 12) F S SS
F na p o ects for M F A Theatre cand dates n act ng scenography and theatre for youth Prerequ s te wr tten nstructor approva

THP 783 Field Work. 1 12) A
a Theatre Educat on

Graduate College

Bianca L. Bernstein, Ph.D.
Dean

Through the faculty, the ASU Graduate College offers programs to meet the educational needs of those who already hold bachelor's degrees. While many students prepare for careers in research, the professions, and the arts, others work for personal enrichment. Both part time and full time students are enrolled in 92 master's and 47 doctoral majors encompassing hundreds of concentrations and specialties. Other students explore new areas of interest or prepare for career advancements quite apart from formal degree programs.

The size, strength, and diversity of the graduate community reflect the university's commitment to high quality education. As a major center for graduate education, ASU supports cultural and intellectual activity as well as research in a broad range of arts and sciences and professional disciplines; in addition, the university conducts research addressing Arizona's social, cultural, and economic growth and development.

One distinctive project that magnifies the Graduate College's dedication to graduate students is the Preparing Future Faculty program, funded by the Pew Charitable Trusts and ASU. The program is designed to educate students about faculty roles and prepare doctoral students specifically for faculty positions in colleges and universities across the nation.

The university's funded programs, together with more than 30 ASU research centers and institutes, provide assistantships and training for many graduate students, further, the centers coordinate conferences, colloquia, and special seminars to heighten the learning experience. The Office of the Vice Provost for Research provides seed money to enable faculty and students to work at the frontiers of knowledge. Such activities continually encourage the creative embrace of change and experimentation.

ASU provides numerous choices in student life, for personal enrichment as well as cultural interaction. Many internationally known speakers present lectures here, bringing together faculty, graduate students, and the community to engage in stimulating dialogue.

Intellectual Environment. About 11,000 students from all 50 states and more than 100 nations are enrolled in graduate study at the university. The size and diversity contribute to a cosmopolitan setting that is ideal for intellectual discourse and stimulation. As a balance to this large grouping of students, individual graduate programs conduct small colloquia and seminars where students and faculty discuss their work in an intimate intellectual environment supportive of student development. The result is a spirited, lively atmosphere in which students and faculty members get to know each other through collaborative research and intellectual exchange.

GRADUATE DEGREES AND MAJORS

The Graduate College enrolls students in programs leading to both professional and research oriented advanced degrees. The Master of Arts (M.A.), Master of Science (M.S.), and Doctor of Philosophy (Ph.D.) degrees are awarded to students completing programs that culminate in research or creative work. The Ph.D. 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 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), although some M.A. and M.S. degree programs have professional tracks. The professional doctoral degree is the highest university award conferred to candidates completing academic preparation for professional practice. Professional degrees offered through the Graduate College are as follows:

Master of Accountancy
Master of Architecture
Master of Business Administration
Master of Computer Science
Master of Counseling
Master of Education
Master of Engineering
Master of Environmental Planning
Master of Fine Arts
Master of Health Services Administration
Master of Mass Communication
Master of Music
Master of Natural Science
Master of Physical Education
Master of Public Administration
Master of Science in Design
Master of Science in Engineering
Master of Science in Technology
Master of Social Work
Master of Taxation
Master of Teaching English as a Second Language
Master of Technology
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 program.

Interdisciplinary Graduate Degrees and Majors Overseen by the Graduate College

Major	Degree	Administered by
Creative Writing	M.F.A.	Creative Writing Committee
Curriculum and Instruction Concentrations: curriculum studies, early childhood education, educational media and computers, elementary education, English education, exercise and wellness education, music education, physical education, reading education, science education, special education	Ph.D.	Interdisciplinary Committee on Curriculum and Instruction
Exercise Science Concentrations: biomechanics, motor behavior sport psychology, physiology of exercise	Ph.D.	Committee on Exercise Science
Justice Studies Concentrations: criminal and juvenile justice; dispute resolution, law, justice, and minority populations; law, policy, and evaluation, women, law, and justice	Ph.D.	Committee on Law and Social Sciences
Public Administration	D.P.A.	Committee on Public Administration
Science and Engineering of Materials Concentrations: high resolution nanostructure analysis, solid state device materials design	Ph.D.	Committee on Science and Engineering of Materials
Speech and Hearing Science Concentrations: developmental neurolinguistic disorders, neuroauditory processes, neurogerontologic communication disorders	Ph.D.	Committee on Speech and Hearing Science
Statistics	M.S.	Committee on Statistics

For the lists of graduate degrees offered at ASU Main and ASU East, see "ASU Graduate Degrees" table, page 311. For ASU West graduate degree programs, see the *ASU West Catalog*. For baccalaureate degrees offered at ASU, see "ASU Baccalaureate Degrees," page 9.

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:

Creative Writing (M.F.A.)
Curriculum and Instruction (Ph.D. jointly administered with the College of Education)
Exercise Science (Ph.D.)
Gerontology (Certificate)
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.)
Transportation Systems (Certificate)

Other interdisciplinary degree programs include History and Theory of Art (jointly offered with the University of Arizona; administered by the School of Art), Communication, Ph.D. (administered by the College of Public Programs), and Humanities, M.A., and Molecular and Cellular Biology, M.S., Ph.D. (both administered by the College of Liberal Arts and Sciences).

Each of these programs uses resources and faculty from more than one discipline. The programs promote cooperative research and instruction among faculty who share common interests but are housed in different academic units. The programs 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.

Creative Writing (M.F.A.)

The interdisciplinary Master of Fine Arts degree in Creative Writing (options include fiction, nonfiction, playwriting, poetry, and screenwriting) is administered by the Creative Writing Committee. 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 more information, see the *Graduate Catalog*.

Curriculum and Instruction (Ph.D.)

The interdiscip inary Ph D degree in Curriculum and Instruction is administered by the Interdisciplinary Committee on Curriculum and Instruction and overseen jointly by the Graduate College and the College c f Education Areas of concentration are available in curriculum studies, early childhood education, educational media and computers, ele mentary education, English education, exercise and well ness education, music education, physical education, reading education, science education, and special education For more information, see the *Gr iduate Catalog*

Exercise Science (Ph.D.)

The interdisciplinary Ph D degree in Exercise Science is administered by the Committee on Exercise Science. This individualized interdiscip inary degree integrates graduate courses from a variety of academic units to provide a sound foundation for research leading to a dissertation with con centrations in biomechanics, motor behavior/sport psychol ogy, or physiology of exercise. For more information, see the *Graduate Catalog*.

Gerontology

An interdisciplinary, 24 semester hour Certificate in Ger ontology, administered by the Committee on 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 con cerns 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 Gerontol ogy 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 more infor mation, see the *Graduate Catalog*.

For information on the undergraduate minor in Gerontol ogy, see "Gerontology," page 111.

GERONTOLOGY (GRN)

GRN 494 ST: Undergraduate Special Topics. 3) F, S
GRN 498 PS: Undergraduate Pro-Seminar. 3 S
GRN 499 Undergraduate Independent Study. (3 F S SS
GRN 580 Graduate Practicum. 3 F S
GRN 590 Graduate Read'ng and Conference. 3 F S SS
GRN 591 Graduate Seminar. 3 F S

Justice Studies (Ph.D.)

The interdisciplinary Doctor of Philosophy degree pro gram with a major in Justice Studies is administered by the Committee on Law and Social Sciences. The degree program integrates historical, legal, and philosophical approaches with social science training. Areas of concentra tion include criminal and juvenile justice, dispute resolu tion; law, justice, and minority populations; law, policy, and evaluation, and women, law, and justice For more informa tion, 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 pub ic administrators for positions in the public sector and for university teaching Ethics, modes of decision making, policy ana ysis, problem solving skills in budgeting, program evaluation, public personnel manage ment, theoretical assumptic ns, and value assessments are some of the areas of study available. For more information, see the *Graduate Catalog*.

Science and Engineering of Materials (Ph.D.)

The interdisciplinary Ph.D. degree in Science and Engi neering of Materials is administered by the Committee on Science and Engineering of Materials. Areas of concentra tion are available in solid state device n aterials design and high-resolution nanostructure analysis. Emphasis is placed on the applications of chemical thermodynamics, the mechanics of solids, quantum mechanics and transport the ory for investigation of the relationships between micro structure and properties of solids, and the dependence of microstructures on processing. For more information, see the *Graduate Catalog*.

SCIENCE AND ENGINEERING OF MATERIALS (SEM)

See the *Graduate Catalog* for the SEM courses

Speech and Hearing Science (Ph.D.)

The interdisciplinary Doctor of Philosophy degree pro gram with a major in Speech and Hearing Science is admin istered by the Committee on Speech and Hearing Science. Areas of concentration are available in developmental neurolinguistic disorders, neuroauditory processes, and neurogerontologic communication disorders. The purpose of the program is to prepare scholars for careers of basic and applied research in academia or in health care delivery envi ronments. The unifying theme of the program is the influ ence of aging and changes in neurologic condition on human communication and its disorders. For more informa tion, see the *Graduate Catalog*

Statistics (M.S.)

The interdisciplinary M.S. degree in Statistics is adminis tered by the Committee on Statistics. The program involves faculty and resources from the School of Accountancy and Information Management and the Department of Mathemat ics. Areas of emphasis include applied statistics, mathemati cal statistics, statistical computing, statistical modeling, and statistical sampling and survey research. For more informa tion, see the *Graduate Catalog*.

Transportation Systems

The interdisciplinary Certificate in Transportation Sys tems program is administered by the Committee on Trans portation Systems. The objective of this program is to enable existing ASU graduate students and transportation professionals with advanced degrees to examine transporta tion related issues from a variety of perspectives and in the context of different travel modes. For more information, see the *Graduate Catalog*

Certificate Programs

A number of certificate programs are offered by various academic units or programs on campus see the"Certificates" table, page 111).

Research Programs

ASU continues to advance as a major research institution. The Office of the Vice Provost for Research provides leadership in obtaining external funding and in coordinating and

administering sponsored projects Many graduate students receive financial support and gain first-hand experience as they participate with faculty members in carrying out these research projects.

Much of this work is associated with campus research centers that help to develop proposals, coordinate activities, and bring together in colloquia and conferences students and faculty with common intellectual interests. Such centers include the Center for Solid State Science, the Manufactur ing Institute, the Institute of Human Origins, the Hispanic Research Center, and the Preventive Intervention Research Center. For further information on centers and institutes, see "Research Centers, Institutes, and Laboratories," page 32.

Research Facilities

The university lends support to research in diverse ways, including extensive facilities for research and instructional programs Recently built facilities include an architecture building, a fine arts complex, the Goldwater Center for Science and Engineering, an addition to the Life Sciences Cen ter, and the Computing Commons. The Engineering Research Center, built as part of the Engineering Excellence Program, houses advanced facilities such as the Molecular Beam Epitaxy laboratory and a clean room for microelectronic device fabrication Other facilities supporting research on campus are the Institute for Studies in the Arts, in the College of Fine Arts; the Facility for High Resolution Electron Microscopy, in the College of Liberal Arts and Sciences; and the Southwest Archaeological Collection in the Department of Anthropology.

Graduate Student Support Services

Providing academic and professional development support to graduate students is an important part of the Gradu ate College mission Services include advising, individual mentoring for disadvantaged students, and financial support, as well as orientation sessions, workshops, career seminars, and research conferences.

The Graduate College Student Programs Services maintains a variety of programs specifically for graduate and nondegree students.

Graduate College Financial Assistance Office. The Grad uate College Financial Assistance Office meets the needs of graduate and professional students. Students may receive financial services at Wilson Hall, without having to visit other offices on campus Students are offered general infor mation about graduate financial assistance at ASU, may turn in documents, or receive status information on their student loans. Students can also apply for emergency short term loans or pick up forms to report special circumstances. Staff members are available to help students with financial assis tance concerns. Refer to "Financial Aid," page 51, for a full description of graduate financial support and services or visit the Web site at www.asu.edu/graduate.

Advising and Career/Professional Development. Many graduate students have questions and concerns about which degree to pursue, how to combine their student roles with parenting, partnering and worker roles, and what to do with their degrees upon graduation. The Graduate College pro vides the following resources.

Advising. The Graduate College's Academic Advising Office supplies general information about policies, proce dures, requirements, and support services. Appointments are available throughout the year.

Students with regular admission status should contact their academic unit for degree program advisement and program of study planning.

Career/Professional Development Seminars. The Graduate College, in conjunction with Counseling & Consultation, offers seminars to groups of graduate students interested in exploring career related subject matters Examples of semi nar topics are dual career issues, the impact of values on career decision making, and transferable skills.

Career Planning Services for Graduate Students. In conjunction with Career Services and Counseling & Consulta tion, the Graduate College provides a brochure listing numerous career planning services for graduate student needs. This publication is also available at www.asu edu/career.

Diversity Programs. The Graduate College's Diversity Programs are designed to increase the number of graduate students from groups underrepresented in their chosen field of study. Students interested in these programs must first go to their respective departments for nomination.

Diversity Assistantship Program (DAP). The purpose of this merit based program is to support research and creative activities related to a student's field of study. Nominations are made by departments and recipients are supervised by a faculty member.

Academic Support Program (ASP). The purpose of ASP is two-fold financial assistance and peer mentoring ASP is available primarily to first year students, however, depart ments are asked to provide a student's subsequent funding The program is based on financial need and the nominations of students by departments Financial support is provided in the form of federal work study to support field related research that is supervised by a faculty member. For addi tional academic support, a student meets weekly with an assigned peer mentor who is two or more years advanced in the academic program.

The Social and Academic Mentor Program. The Graduate College Social and Academic Mentor (SAM) program is designed to recruit top graduate students from domestic, international, and underrepresented populations. Academic units submit applications to the Graduate College to nomi nate a first year student (mentee) and peer mentor match. The mentor, two or more years advanced in the program, promotes the mentee's social and academic integration into graduate school using a structured format. The mentor meets weekly with the mentee and schedules regular monthly meetings with the faculty advisor to discuss the mentee's concerns, progress, accomplishments, or depart ment related matters.

Orientations. Each semester, the Graduate College hosts orientations for new graduate students and teaching assis tants (TAs).

In addition to the General Orientation, teaching assistants have the opportunity to enrich and enhance their teaching through seminars offered each semester. At least two semi nars are mandatory for first time TAs. Among other topics, TAs can attend sessions on teaching lab sciences, human diversity, critical thinking, classroom management, ethical issues, and multimedia applications in the classroom.

Workshops for Undergraduate Students Considering Graduate Education. The Graduate College holds work shops to address the issues that students contemplating graduate study should consider. The purpose of graduate study, the choices among research and professional degrees, the selection of schools to apply to, and the types and sources of financial support are among the topics discussed

Student Organizations. The Graduate Student Council is part of the Associated Students of Arizona State University (ASASU), the student government for the university. The Graduate Research Support Office represents graduate stu dent interests within ASASU and the Office of Student Life. It assists the Graduate College in planning orientations and other student related activities and funds with the Graduate College small research grants to support graduate students' thesis and dissertation projects. In addition to the Council, many other special interest organizations are open to gradu ate students.

Format Office. The thesis, dissertation, or equivalent is the culmination of an important stage of graduate studies. By researching and writing this final work, graduate students are able to show that they have acquired skills essential to a discipline. The Graduate College publishes a Format Manual as a guide in preparing the master's or doctoral docu ment.

Publications Program. The Graduate College publishes a number of brochures, fliers, and other items during the year.

Graduate Council

The Graduate Council establishes general policies for graduate programs and serves as an advisory board to the dean. As part of its duties, the counc l reviews proposals for new degree programs and concentrations, regularly con ducts reviews of established academic programs, and sets policies and general standards for graduate admissions. Six teen faculty and one student serve on the council, represent ing a wide variety of degree programs, with at least one member representing each college in the university. An Aca demic Senate representative is also elected to serve. Council members are appointed by the president of the university

Offices of the Graduate College

The general offices of the college, including those of the dean, admissions, advising, financial assistance, and opera tions are located on the first floor of Wilson Hall in the cen ter of campus. Graduate College offices are open from 8:00 A.M. to 6:00 P.M , Monday through Thursday; and 8:00 A.M. to 5:00 P.M., on Friday. The Graduate College may also be contacted by e mail at asugrad@asu.edu or telephone 480/965 3521. The Web address is www.asu.edu/ graduate.

ADMISSION TO THE GRADUATE COLLEGE

Eligibility

Anyone who holds a bachelor's (or equivalent) or gradu ate degree from a college or university of recognized stand ing is eligible to apply for admission to the Graduate College Remedies for 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 (scale is 4.00 = A), 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 stud ies, that are similar to those required for the baccalaureate degree at ASU.

Requirements of the Academic Unit

Academic units, departments or colleges, may have admission requirements in addition to those of the Graduate College. Many graduate programs require scores from a national admissions test such as the Graduate Record Exam ination GRE), Graduate Management Admission Test (GMAT), or the Miller Analogies Test (MAT). Some pro grams require a portfolio, letters of recommendation, or a statement of goals. Applicants should contact the academic unit regarding spec fic requirements.

Submission of an Application

For admission information and procedures, access the Web site at www.asu.edu/graduate admission or refer to the *Application for Graduate Admission* booklet Students may apply electronically.

Application Fee

Each application for entry to ASU graduate programs must be accompanied by a nonrefundable application fee The fee is $45 to apply for admission to a degree program and $15 to app y for nondegree studies. For admission information and procedures, access the Web site at www asu.edu/graduate admission, or refer to the *Applica tion for Graduate Admission* booklet.

International Applicants

Applicants who will attend the university while holding F 1 or J 1 visas must meet the regulations of the Immigra tion and Naturalization Services in addition to the require ments of the Graduate College and the academic units to which they apply

International applicants must meet the requirements of the Graduate College as well as those of the degree pro grams to which they apply. Applicants from outside the United States are also required to submit additional materi als and should follow the procedures described in the *Appli cation for Graduate Admission* booklet, or access the Web site at www.asu.edu/graduate/admission. International applicants should read this information carefully to become familiar with all the requirements they must meet and should consult it often for the instructions they must follow in submitting materials. The *Graduate Catalog* provides essential information about ASU and its graduate programs, but applicants can also consult ASU's 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 sub mit 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 certi fies their skill in speaking English—either the Test of Spo

ken English TSE), which may be taken in the student's home country, or SPEAK (an interview test , which is administered at ASU. Some degree programs also require TSE or SPEAK scores of applicants whose native language is not English. For specific information about TSE require ments, 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 Financial Guarantee form is available in the *Application for Graduate Admissic n* book let. It can also be accessed through the Graduate College Web site at www asu.edu/graduate/admission. International applicants must see that the form with a verification from a bank or sponsoring organization is completed and submitted to Graduate Admissions. The I 20 or 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, a certificate program, or the postbaccalaureate teacher education program 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 $45 (in U.S funds) must accompany the formal application, which otherwise is not processed.

All F 1 or J 1 visa students must have insurance coverage against illness and accident before being permitted to regis ter. 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 advi sor in the International Student Office.

Additional Information

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.

Academic units, which must indicate their willingness to admit applicants frequently set higher standards than those established by the Graduate College. Many qualified applicants are denied because only a limited number of students are admitted each year.

Notice of Admission Decisions

Only the dean of the Graduate College can make formal offers of admission. The Graduate College notifies all appli cants in writing of the admission decision

All documents received by the university in connection with an application for admission become the property of ASU 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 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.

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 required to complete courses to remedy deficiencies. The letter of admission specifies the deficiencies that must be completed before the student is awarded a graduate degree. Deficiency courses may not be applied toward the minimum hours required for the degree program.

Provisional Admission. A student who does not meet mini mum academic standards but has counterbalancing evidence to suggest the potential for success may be admitted on a provisional basis. Provisional admission provides an aca demic unit with more evidence on which to base its deci sion. 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 require ments, they should check with their advisors to make sure that the change of status has been recommended A provi sional 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 pro gram may enroll as a nondegree student. The application process is streamlined, and does not require submission of transcripts or test scores. For nondegree admission informa tion and procedures, access the Web site at www.asu edu graduate admission or refer to the *Application for Graduate Admission* booklet. Students may apply electronically. A maximum of nine hours taken at ASU while in this category may be applied toward a master's degree if appropriate for the student's program of study

The six-year maximum time limit applies to nondegree semester hours appearing on a master's program of study In addition, because of limited class size and resources, certain academic units may limit the enrollment of nondegree stu dents

Recognition of a Degree

Recognition of a degree is acknowledgment that the pro gram 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 ASU is expected to have undergraduate educational experiences, including general education studies, that are appropriate for the program.

Definition of a Unit of Credit

The Arizona Board of Regents has defined May 26, 1979) a unit of credit for the institutions under its jurisdic tion. A minimum of 45 hours of work by each student is required for each unit of credit. An hour of work is the equivalent of 50 minutes of class time often ca led a "con

tact hour") or 60 minutes of independent study work. For lecture discussion courses, this requirement equates to at least 15 contact hours and a minimum of 30 hours of work outside of the classroom for each unit of credit. Even though the values of 15 and 30 may vary for different modes of instruction, the minimum total of 45 hours of work for each unit of credit is a constant. Since the unit of credit as defined by the Arizona Board of Regents is the cornerstone of academic degree programs at ASU, degrees granted by other institutions that are recognized by ASU should be based on a similar unit of credit.

GRADUATE COLLEGE PROCEDURES

Change in Graduate Degree Program

A change from one graduate degree program to another requires a new application to the Graduate College. The usual admission procedures are followed. For details on matters relating to the application fee, see "Fees, Deposits, and Other Charges," page 47.

Readmission to the Graduate College

Any graduate student who has not been in attendance at the university for one or more semesters must submit an application for readmission to the Graduate College. 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 readmission and other matters relating to the application fee, access the Web site at www.asu.edu/graduate/admission or refer to the *Application for Graduate Admission* booklet.

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.

A student graduates under the curriculum, course requirements, and regulations for graduation in effect at the time of admission to a graduate degree program at ASU. A student may also choose to graduate under any subsequent catalog issued. In determining graduation requirements, a student may use only one catalog.

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 "Registration," page 72.

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

For general guidelines to enrollment verification, see the "Enrollment Verification Guidelines" table, page 74. These guidelines 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.

The *Schedule of Classes* lists the procedures for withdrawal. Failure to withdraw officially from a course results in a grade of "E," which is used in the computation of the GPA.

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 teaching and research assistants and associates must enroll for a minimum of six semester hours during each fall and spring semester of their appointment. The six hours cannot include audit enrollment. Enrollment in continuing registration (595, 695, or 795) does not fulfill the six-hour requirement. A half-time (50 percent) teaching and research 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 percent) assistant or associate for more than 13 hours, and a quarter time (25 percent) assistant or associate for more than 15 hours.

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 continuing registration (595, 695, or 795).

For an explanation of summer session semester hour load, see "Registration," page 72.

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 and research 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. Refer to the *Graduate Assistant Handbook*.

GRADUATE COLLEGE DEGREE REQUIREMENTS

Graduate Advising

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 Advising office serves 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 480 965-3521 for an appointment or stop by the lobby of Wilson Hall.

Grading

The "Grades" table defines grades and gives their values.

Grades

Grade	Definition	Value
A	Excellent	4.00
B	Good	3.00
C	Passing	2.00
D	No graduate credit	1.00
E	Failure	0.00
W[1]	Withdrawal	
I	Incomplete	
X	Audit	
Y	Satisfactory	
Z[2]	Course in progress	

[1] This grade is given whenever a student officially withdraws from a class.

[2] This grade is usually given pending completion of courses.

A grade of "P" (pass) in a 400 level course may not appear on a program of study. Grades on transfer work or ASU law credit are not included in computing GPAs.

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.

Graduate course work (500, 600, or 700 level courses) 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 in 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 higher. 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.

The designations of honors *summa cum laude*, *magna cum laude*, and *cum laude* are reserved for undergraduates. The Graduate College does not use these academic distinctions.

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 cannot be certified as such for purposes of employment or transferring to other institutions.

Reserving of Course Credit by Undergraduates. See "Registration" on page 72.

Transfer Credit. Transfer of credit is the acceptance of credit from another institution or campus 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 percent 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:

- Credits awarded by postsecondary institutions in the United States that lack candidate status or accreditation by a regionally accredited association.

2. credits awarded by postsecondary institutions for life experience;
3. credits awarded by postsecondary institutions for courses taken at nonco legiate institutions (e g , govern ment agencies, corporations, and industrial firms);
4. credits awarded by postsecondary institutions for non credit 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 pre scribed by the Arizona Board of Regents are subject to con version 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.

Independent Learning and Extension Courses. Indepen dent learning 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 recommen dation 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 commit tee 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 cochairs or members or extra members of thesis and dissertation com mittees upon approval by the Graduate College. Individuals who are recommended by an academic unit as eligible to serve as a cochair must meet the criteria established by the academic unit and be approved by the Graduate College.

Upon the recommendation of the committee chair and head of the academic unit, ASU West tenured (or tenure track) faculty may serve as committee members for master's and doctoral committees at ASU Main. ASU West tenured (or tenure track) faculty may serve as cochairs for theses and dissertations at ASU Main upon the recommendation of the head of the academic unit and approval of the dean of the Graduate College. Cochairs must meet the academic unit's criteria for chairing theses and dissertations.

Qualified individuals outside the university, upon the rec ommendation 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 cochairs unless they have affiliated faculty status). With the approval of the academic unit and the dean of the Graduate College, former ASU faculty with students completing their degrees may continue to serve as cochairs. At least 50 percent of the committee must be made up of faculty from ASU Main.

Foreign Language Requirements

A graduate degree program may require proficiency in a foreign language If foreign language proficiency 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 who are required to demonstrate proficiency in a foreign language must pass a foreign language examination specific to their particular graduate programs. The examina tions are administered three times each year by the Depart ment of Languages and Literatures, which certifies language competency. Students planning to take the examination must register in the Graduate College by the deadline. The chair of the student's supervisory committee is responsible for providing the Department of Languages and Literatures 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 may petition the Graduate College for a re examination, but must pass the examination in no more than three attempts.

Theses and Dissertations

The master's thesis or equivalent is an introduction to research writing. All doctoral degree candidates must sub mit a dissertation, with the exception of certain concentra tions in the Doctor of Musical Arts, which requires three recitals and a research paper. The Doctor of Philosophy dis sertation 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 intel lectual 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 (also available at www.asu.edu/graduate format manual/index.html . 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 Doctor ates 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 cop ies are placed in Hayden Library and University 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 College Calendar," found in the *Graduate Catalog*. All fees are payable at that time. Students applying for graduation after the deadline listed in the 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 are requested to complete a questionnaire which serves as a graduate exit survey. Students who do not complete all degree requirements by their anticipated graduation date are required to pay a refiling fee.

Withdrawal from the University

See "Withdrawal from the University," page 75.

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 "Summer Sessions," page 471.

Augie Fernandez follows tradition by cooling off in the Cady Mall fountain during band practice. Tim Trumble photo

Dates and Deadlines

The "Graduate College Calendar" 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.

The highest standards of academic integrity are expected of all students. The failure of any student to meet these standards may result in suspension or expulsion from the university and/or other sanctions as specified in the academic integrity policies of the individual colleges. Violations of academic integrity include, but are not limited to, cheating, fabrication, tampering, plagiarism, or facilitating such activities. The university and college academic integrity policies are available in the Office of the Senior Vice President and Provost.

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/or 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, refer to the current *Graduate Catalog*.

Policies and Procedures of the Graduate Council Appeals Board

The Graduate Council Appeals Board (GCAB) acts as the appeals body for graduate students seeking redress on academic decisions regarding their graduate program. Before filing an appeal, the graduate student should discuss the situation with the associate dean of the Graduate College to explore resolution of the matter at the unit or college level.

For more detailed information on the Graduate Council appeals policies and procedures, refer to the current *Graduate Catalog*.

ASU Graduate Degrees

Degree/Major	Concentration	Campus
Master of Accountancy		
Accountancy		Main
Master of Architecture		
Architecture		Main
Master of Arts		
Anthropology	Archeology, bioarcheology, linguistics, medical anthropology, museum studies, physical anthropology, social cultural anthropology	Main
Art	Art education, art history	Main
Communication		Main
Curriculum and Instruction	Bilingual education, comm unication arts, early childhood education, elementary education, English as a second language, Indian education, mathematics education, multicultural education,- reading education, science education, secondary educat on, social studies education	Main
Educational Psychology[1]		Main
English	Comparative literature, English linguistics, literature and language, rhetoric and composition	Main
French	Comparative literature, language and culture, literature	Main
Geography		Main
German	Comparative literature, language and culture, literature	Main
History	Asian history, British history, European history Latin American history, public history, U S history, U S western history	Main
Humanities		Main
Learning and Instructional Technology		Main
Mathematics		Main
Music	Ethnomusicology music history and literature music theory	Main
Philosophy		Main
Polit cal Science	American politics, comparative politics, international relations, political theory	Main
Religious Studies		Main
Social and Philosophical Foundations of Education		Main
Sociology		Main
Spanish	Comparative literature, language and culture, linguistics, literature	Main
Special Education[1]		Main
Theatre		Main
Master of Business Administration		
Business Administration		Main West
Master of Computer Science		
Computer Science		Main
Master of Counseling		
Counseling		Main
Master of Education		
Counselor Education		Main

This major is offered toward more than one degree at the same level

Applications are not being accepted at this time

This major has formalized concentrations; other areas of study are available.

[1] This collaborative program is offered by the three state universities. Refer to the 1999 2001 *Graduate Catalog* for more information.

Students apply to this degree program through the Graduate College.

This program is administered only by the College of Education and the Graduate College

This major is only offered with the University of Arizona

Students apply to this degree program through the College of Law, not the Graduate College

ASU Graduate Degrees (continued)

Degree/Major	Concentration	Campus
Master of Education (continued)		
Curriculum and Instruction[1]	Bilingual education, communication arts, early childhood education, elementary education, English as a second language, Indian education, mathematics education, multicultural education,[2] reading education, science education, secondary education, social studies education	Main
Educational Administration and Supervision		Main West
Educational Media and Computers[3]	Business education	Main
Educational Psychology		Main
Elementary Education	Bilingual education, educational media and computers, ESL education, reading	West
Higher and Postsecondary Education	Higher education	Main
Learning and Instructional Technology[1]		Main
Secondary Education		West
Special Education[1]	Gifted, mildly handicapped, multicultural exceptional, severely/multiply handicapped	Main
Master of Engineering[4]		
Engineering		Main
Master of Environmental Planning		
Environmental Planning	Urban planning	Main
Master of Fine Arts		
Art	Ceramics, drawing, fibers, intermedia, metals, painting, photographic studies, photography, printmaking, sculpture, wood	Main
Creative Writing[5]		Main
Dance		Main
Theatre	Performance, scenography, theatre for youth	Main
Master of Health Services Administration		
Health Services Administration		Main
Master of Mass Communication		
Mass Communication		Main
Master of Music		
Composition		Main
Music Education	Choral music, general music, instrumental music, jazz studies	Main
Performance	Music theatre musical direction, music theatre performance, performance pedagogy, piano accompanying, solo performance (instrumental, keyboard, voice)	Main
Master of Natural Science		
Natural Science	Biology, chemistry, geology, mathematics, microbiology, physics, plant biology	Main
Master of Physical Education		
Physical Education		Main
Master of Public Administration		
Public Administration	Public information management, public management, public policy analysis and evaluation, urban management and planning	Main
Master of Science		
Aerospace Engineering[1]		Main
Agribusiness	Agribusiness management and marketing, food quality assurance	East
Bioengineering		Main
Biology	Ecology	Main
Building Design	Computer aided design, energy performance and climate responsive architecture, facilities development and management	Main

ASU Graduate Degrees (continued)

Degree/Major	Concentration	Campus
Master of Science (continued)		
Chemical Engineering[1]	Biomedical and clinical engineering, chemical process engineering, chemical reactor engineering, energy and materials conversion, environmental control, solid state processing, transport phenomena	Main
Chemistry	Analytical chemistry, biochemistry geochemistry, inorganic chemistry organic chemistry, physical chemistry, solid state chemistry	Main
Civil Engineering		Main
Communication Disorders		Main
Computer Science		Main
Construction	Construction science, facilities, management	Main
Economics		Main
Electrical Engineering		Main
Engineering Science[1]		Main
Environmental Resources		Main
Exercise Science/Physical Education		Main
Family Resources and Human Development	Family studies, general family resources and human development	Main
Geology		Main
Industrial Engineering[1]		Main
Information Management		Main
Justice Studies		Main
Mechanical Engineering		Main
Microbiology		Main
Molecular and Cellular Biology		Main
Nursing	Adult health nursing, community health nursing, community mental health/psychiatric nursing, family health nursing, nursing administration, parent child nursing, women's health	Main
Physics		Main
Plant Biology[3]	Ecology, photosynthesis	Main
Recreation	Outdoor recreation, recreation administration, social psychological aspects of leisure, tourism and commercial recreation	Main
Statistics[5]		Main
Master of Science in Design		
Design	Graphic design, industrial design, interior design	Main
Master of Science in Engineering		
Aerospace Engineering		Main
Chemical Engineering[1]	Biomedical and clinical engineering, chemical process engineering chemical reactor engineering, energy and materials conversion, environmental control, solid state processing, transport phenomena	Main
Civil Engineering[1]		Main
Electrical Engineering[1]		Main
Engineering Science		Main
Industrial Engineering		Main
Mechanical Engineering		Main
Master of Social Work		
Social Work		Main

This major is offered toward more than one degree at the same level

Applications are not being accepted at this time

[3] This major is formalized concentration; other areas of study are available.

[4] This collaborative program is offered by the three state universities Refer to the 1999 2000 *Graduate Catalog* for more information.
Students apply to this degree program through the Graduate College.

[5] This program is administered jointly by the College of Education and the Graduate College
This major is jointly offered with the University of Arizona
Students apply to this degree program through the College of Law, not the Graduate College

ASU Graduate Degrees (continued)

Degree/Major	Concentration	Campus
Master of Taxation		
Taxation		Main
Master of Teaching English as a Second Language		
Teaching English as a Second Language		Main
Master of Science in Technology		
Technology	Aeronautical engineering technology, aviation human factors, aviation management, computer systems, electronic systems, environmental technology, information technology, instrumentation and measurement technology, management of technology, manufacturing engineering technology, mechanical engineering technology, microelectronics, security engineering technology	East
Doctor of Education		
Curriculum and Instruction[1]	Bilingual education, communication arts, curriculum studies, early childhood education, elementary education, English as a second language, Indian education, mathematics education, multicultural education,[2] reading education, science education, secondary education, social studies education	Main
Educational Administration and Supervision		Main
Higher and Postsecondary Education	Higher education	Main
Doctor of Musical Arts		
Music	Choral conducting, music composition, music education, solo performance (instrumental, keyboard, voice)	Main
Doctor of Philosophy		
Aerospace Engineering		Main
Anthropology	Archaeology, physical anthropology, social cultural anthropology	Main
Bioengineering		Main
Biology[3]	Ecology	Main
Business Administration	Accountancy, finance, health services research,[2] information management, management, marketing, supply chain management	Main
Chemical Engineering	Biomedical and clinical engineering, chemical process engineering, chemical reactor engineering, energy and materials conversion, environmental control, solid state processing, transport phenomena	Main
Chemistry	Analytical chemistry, biochemistry, geochemistry, inorganic chemistry, organic chemistry, physical chemistry, solid state chemistry	Main
Civil Engineering		Main
Communication	Communicative development, intercultural communication, organizational communication	Main
Computer Science		Main
Counseling Psychology		Main
Curriculum and Instruction[1,6]	Curriculum studies, early childhood education, educational media and computers, elementary education, English education, exercise and wellness education, music education, physical education, reading education, science education, special education	Main
Economics		Main
Educational Leadership and Policy Studies		Main
Educational Psychology	Lifespan developmental psychology, measurement, statistics, and methodological studies; school psychology	Main
Electrical Engineering		Main
Engineering Science		Main
English	Literature, rhetoric composition and linguistics	Main
Environmental Design and Planning	Design, history, theory, and criticism; planning	Main
Exercise Science[5]	Biomechanics, motor behavior/sport psychology, physiology of exercise	Main
Family Science	Marriage and family therapy	Main

ASU Graduate Degrees (continued)

Degree/Major	Concentration	Campus
Doctor of Philosophy (continued)		
Geography		Main
Geology		Main
History	Asian history, British history, European history, Latin American history, U.S. history	Main
History and Theory of Art[7]		Main
Industrial Engineering		Main
Justice Studies[3]	Criminal and juvenile justice, dispute resolution; law, justice, and minority population, law, policy, and evaluation; women, law, and justice	Main
Learning and Instructional Technology	Instructional technology, learning	Main
Mathematics		Main
Mechanical Engineering		Main
Microbiology		Main
Molecular and Cellular Biology		Main
Physics		Main
Plant Biology[3]	Ecology, photosynthesis	Main
Political Science	American politics, comparative politics, international relations, political theory	Main
Psychology	Behavioral neuroscience, clinical psychology, cognitive/behavioral systems, developmental psychology, environmental psychology, quantitative research methods, social psychology	Main
Science and Engineering of Materials	High resolution nanostructure analysis, solid state device materials design	Main
Social Work		Main
Sociology		Main
Spanish		Main
Speech and Hearing Science	Developmental neurolinguistic disorders, neuroauditory processes, neurogerontologic communication disorders	Main
Theatre	Theatre for youth	Main
Doctor of Public Administration		
Public Administration		Main
Juris Doctor[8]		Main

This major is offered toward more than one degree at the same level.

- Applications are not being accepted at this time

[3] This major has formalized concentrations, other areas of study are available

[4] This collaborative program is offered by the three state universities. Refer to the 1999–2000 *Graduate Catalog* for more information

[5] Students apply to this degree program through the Graduate College

[6] This program is administered jointly by the College of Education and the Graduate College

[7] This major is jointly offered with the University of Arizona.

[8] Students apply to this degree program through the College of Law, not the Graduate College

University Honors College

Ted Humphrey, Ph.D.
Dean

MISSION

The University Honors College is a community of learners dedicated to superior undergraduate education based on the pursuit of excellence, respect for the individual, commitment to integrity, and service to society.

The Honors College offers talented, motivated students educational opportunities designed to enrich and further their personal academic and career goals. It is a portal through which academically talented students gain unique access to the university's human and physical resources. Transdisciplinary in nature, the Honors College develops curricular and other learning opportunities to meet general and disciplinary undergraduate educational objectives. The Honors College supports undergraduate research, encourages study abroad, guides students to relevant internships, mentors applicants for fellowships and scholarships, and assists students with application to graduate school.

Unique in Arizona and the Southwest, the Honors College serves students seeking degrees on all of ASU's campuses: the Main Campus in Tempe, ASU West in northwest Phoenix, and ASU East (Williams Campus) in Mesa. This allows students across the university to take advantage of the university's full resources with the assurance of consistently distinguished teaching and research and with commensurately rigorous expectations for performance.

Students from all disciplinary colleges and academic majors enroll in the University Honors College. The Colleges of Business, Engineering and Applied Sciences, Liberal Arts and Sciences, Public Programs, and Nursing offer particularly strong programs. The College of Architecture and Environmental Design and the School of Social Work developed the nation's first honors curricula in their disciplines. Students with majors in the Colleges of Education and Fine Arts can also choose from a wide range of exciting courses, especially at the lower division.

CURRICULUM

Students seeking to graduate from the University Honors College must also graduate from a disciplinary college. The ASU honors curriculum normally allows students to finish all requirements within the 120 semester hours of credit usually required for graduation.

The first two years of the honors curriculum typically focus on General Studies. The second two years concentrate on the student's academic major and lead to graduation from both a disciplinary college and the University Honors College. Participating in this part of the curriculum allows students to complete an extended creative or research project appropriate to their academic interests while fulfilling their honors thesis requirement. In conceiving and completing this project, each student works closely with a faculty mentor to identify and develop an original concept that extends and integrates the student's work in a discipline.

SPECIAL PROGRAMS

Office of National Scholarship Advisement

The Office of National Scholarship Advisement (ONSA) assists honors and other high achieving students by identifying nationally competitive programs appropriate to each person's intellectual and career goals, nurturing these prospective applicants, and advancing their candidacy. This office, administered by the University Honors College, serves the entire ASU community. ASU students regularly earn distinction in the most rigorous and prestigious scholarship competitions. Many pursue enhanced degree programs and research projects under the auspices of Goldwater or Truman Scholarships. Other students undertake postgraduate study in the United States and abroad as Rhodes, Marshall, Fulbright, Udall, National Science Foundation, or Mellon Scholars. Many others have been recognized by a range of postgraduate awards, fellowships, and assistantships. *This office does not administer any need or merit based student financial assistance.* For more information on ONSA programs, call Professor William Weidemaier at 480 965 5894.

Study Abroad

University Honors College students have exclusive access to two summer study abroad programs: one in Britain, a second in Paris) and to ASU's International Programs Office that offers more flexible course registration and transfer arrangements. These plans allow Honors College students to earn honors credit while overseas.

Internships/Mentorships

Students in the University Honors College may participate in special internship opportunities or mentoring by leaders in government, industry, and the private sector throughout metropolitan Phoenix. Applications for these programs are coordinated through Associate Dean Janet Burke at 480 965 2359.

Events/Programming

University Honors College students participate in a range of cultural enrichment activities and are offered discounted tickets to selected performing arts events throughout Arizona, weekly lunches with the dean, and special access to the most important shapers of contemporary thought who visit ASU. Each year the Honors College hosts the university's premier scholar in residence program, The Centennial Lecture. Past guests include novelist Carlos Fuentes, paleontologist Steven Jay Gould, psychologist Robert Coles, microbiologist Lynn Margulis, and intellectual historian Susan Sontag.

The University Honors Co ege is home to the John J. Rhodes Chair, which is designed to bring to the college per sons who have significantly contributed to civic life and dis tinguished themselves as public service leaders. Students will have unique opportunities to engage intellectually with these outstandino visiting lecturers. In 1998, the col ege was honored to have Dr Henry A Kissinger serve as the inaugu ral chair.

ADDITIONAL BENEFITS

The University Hon ors College and all its facilities and services are fully available to every student, regardless of where he or she lives The Honors College Residential Complex offers students an integrated living learning envi ronment; faculty and academic advisors serve the students there. Classrooms, recreationa and study lounges, and a computing lab compose the principal facilities of the col lege.

Honors students have spec al advisors to help them p an individualized programs of study, and they receive priority at preregistration. Honors courses in disciplinary depart ments are typically limited to 22 students. Honors College courses (HON) are usua y limited to 18.

Students can receive transcript recognition for lower divi sion honors studies. Students who meet all upper division requirements of both their disciplinary college and the University Honors Co lege receive transcript recognition of that accomplishment, as well as special acknowledgment in the graduation ceremonies and collegiate honors convocations.

Participants in the U niversity Honors College have diverse interests and strong records of success. Many go on to the nat on's finest graduate and professional programs, including Chicago, Cornell, Harvard, Michigan, MIT, Northwestern, Stanford, UC Berkeley, Virginia, Wisconsin, and Yale. Many students have published portions of their honors theses and have presented their work at the national and regional meet ngs of scientific and honors societies.

ADMISSION

Students who have demonstrated high levels of academic achievement at the high school or university level are invited to apply for admission to the University Honors Col lege All candidates for admission must file a separate appli cation to the college

Applicants will initially be evaluated on the basis of their high school GPA Arizona Board of Regents GPA based on 16 competency courses , high school class rank, and performance on the SAT or ACT, or a student will possess other talents that contribute to academic leadership and commu nity service Continuing ASU or transfer students wil be evaluated on their co lege GPA.

The typical first year student in the University Honors College has the follow ing profile: high school GPA of 3.75; top six percent of his or her high school graduating class; and 28 composite on the ACT or 1270 composite on the SAT

Continuing and transfer students who have completed at least 12 semester hours of study with a cumulative GPA of at least 3.25 (4.00 A n ay app y for admission to the col lege In general, the college admits students entering with a 3 25 GPA and no more than 45 semester hours completed, or a 3.33 GPA and n o more than 60 semester hours com pleted, or a 3.40 GPA with more than 60 semester hours completed Community college transfer students who have graduated from their institution's honors programs are eligi ble to apply for Regents' Transfer Scholarships Information about this award is available through the Student Financial Assistance Office at 480/965 3355.

All students who believe they can better succeed at the university by participating in the University Honors College are encouraged to apply. Appl cation forms and additional information about the college and its activities are available by calling the college's office at 480 965 2359.

RETENTION

Honors students must maintain high standards of aca demic performance and show progress toward completion of graduation requirements n their disciplinary majors and the Honors College. Students must complete an average of one honors course each semester. The associate dean of the college must approve any deviation from this standard. Good standing in the University Honors College requires students to maintain the follow ing cumulative ASU GPAs 4 00 A)

1. less than 45 semester hours, 3 25;
2. between 45 and 80 semester hours, 3 33, and
3 above 80 semester hours, 3 40.

A student with a cumulative ASU GPA below 3.25 (4.00 A) is placed on probation and is withdrawn from the col lege if he or she does not make reasonable progress in rais ing the cumulative GPA during the following semester. Students who fail to complete at least one honors course in two semesters may be placed on inactive status. A student on inactive status within the college will not be eligible for honors housing, extended library privileges, early registra tion, or honors internship placement. Reinstatement to active status will require a formal application and appoint ment with an honors advisor.

COURSES

Only courses in which a student earns at least a grade of "C" may be used to meet University Honors College requirements.

Freshmen and students entering the college with fewer than 45 semester hours of course work must take HON 171 and 172 The Human Event. This cross disciplinary seminar acquaints them with ideas that form the foundation of a university education and emphasizes critical thinking, discus sion, and writing

Students entering the college after completing 45 semes ter hours must take HON 371, 374, or 394, junior level seminar courses introduce then to critical thinking, discussion, and writing in a topical area chosen by the instructor.

Departmental courses carrying footnote number 19 in the *Schedule of Classes* are limited to honors students and others who receive special permission from the instructor to enroll. Enrollment in these courses is limited Compared to their non honors equivalents, these courses are designed to offer a richer, more comp ex intellectual experience appro priate to the discipline and the level of the course for all stu dents enrolled. Other disciplinary honors courses group honors students in small cohorts to work on research projects of common interest.

Departmental courses carrying footnote number 18 in the *Schedule of Classes* allow honors students to contract with the instructor of designated non honors courses to earn hon ors credit by pursuing enrichment activities, which may include supplemental sessions with the instructor. Footnote 18 contracts must be filed during the first four weeks of class and completed during the semester in which the course is offered. Each contract form offers guidelines to aid stu dents and faculty in developing appropriate contracts

Course numbers listed in the *Schedule of Classes* as 298, 492 Honors Directed Study, 493 Honors Thesis, 497 Honors Colloquium, and all classes with the HON prefix are reserved for University Honors College students and always carry footnote 19. Students may receive credit for more than one of each of these courses in a given department

Departmental courses with the number 493 are reserved for honors students completing their honors theses. A student may enroll for these courses only with the approval of the sponsoring academic department and of the faculty member who serves as the student's thesis director Course numbers listed in the *Schedule of Classes* as 493 will fulfill the student's literacy and critical inquiry (L2 General Stud ies requirement. Students may receive a maximum of six semester hours of credit for an honors thesis, including any directed study (492, 499) and/or research preparation courses directly related to the thesis project University Honors College students may also enroll in graduate level courses that automatically earn honors credit.

All courses a student takes for honors credit count toward graduation, even if the student does not graduate from the University Honors College

HONORS TRANSCRIPT RECOGNITION

All courses used to fulfill lower division or upper divi sion/graduation requirements for the University Honors College must carry earned letter grades of at least "C." A "Y" grade does not meet University Honors College requirements.

Lower Division

To receive transcript recognition for lower division hon ors work, students must complete 18 semester hours of hon ors course work within 60 earned semester hours with a cumulative ASU GPA greater than or equal to 3 40 (4.00 A).

Courses *must* include HON 171 and 172 The Human Event. Courses that earn automatic honors credit, although not carrying a footnote number 19 in the *Schedule of Classes,* include ENG 105 (any section), CHM 117 and 118 (any section , and MAT 290 and 291 (any section .

Students may apply upper division honors course work toward lower division requirements; however, those classes may not also be used to meet University Honors College upper division/graduation requirements.

Upper Division/Graduation from the University Honors College

To graduate from the University Honors College, stu dents must

1. complete HON 171 and 172 The Human Event for con tinuing ASU or transfer students with less than 45 hours of credit *or* one of the following upper-division seminar courses. HON 371, 374, or 394 Selected Topics for continuing or transfer students with 45 or more hours of credit;
2. complete 18 additional semester hours of upper divi sion honors course work for an earned letter grade (Courses must include three to six semester hours of Honors Thesis and six semester hours must be outside the academic major. Courses may include graduate courses, 500 level or higher);
3. complete ASU graduation requirements in an academic major; and
4. earn a cumulative ASU GPA greater than or equal to 3.40 (4.00 A)

University Honors College

Ted Humphrey
Dean
(MCL 112) 480/965-2359
www.asu.edu/honors

PROFESSOR
HUMPHREY

SENIOR LECTURERS
FAC NELLI, STANFORD WEIDEMAIER

LECTURERS
BRUHN, BURKE DALTON, RAMSEYER, SUSSER, WALKER

HONORS (HON)

HON 171 The Human Event. 3 F
Landmarks n the soc a and nte ectua deve opment f the human race w th emphas s on Western c v zat on Enro ment restr cted to members of the Un versity H nors Co ege Consu t the Un vers ty Honors Co ege for app cab ty t d sc p nary co ege d str but on requ rements *Genera Stud es. L1/HU, H*

HON 172 The Human Event. 3) S
Continuation of HON 171 with emphas s on the Rena ssance through the modern per d *Genera Stud es L1/HU, H.*

HON 371 Freedom and Authority. (3 F, S SS
H stor ca overv ew of concepts of berty respons b l ty and power n Western soc et es emphas z ng 18th to 20th century developments Sem nar

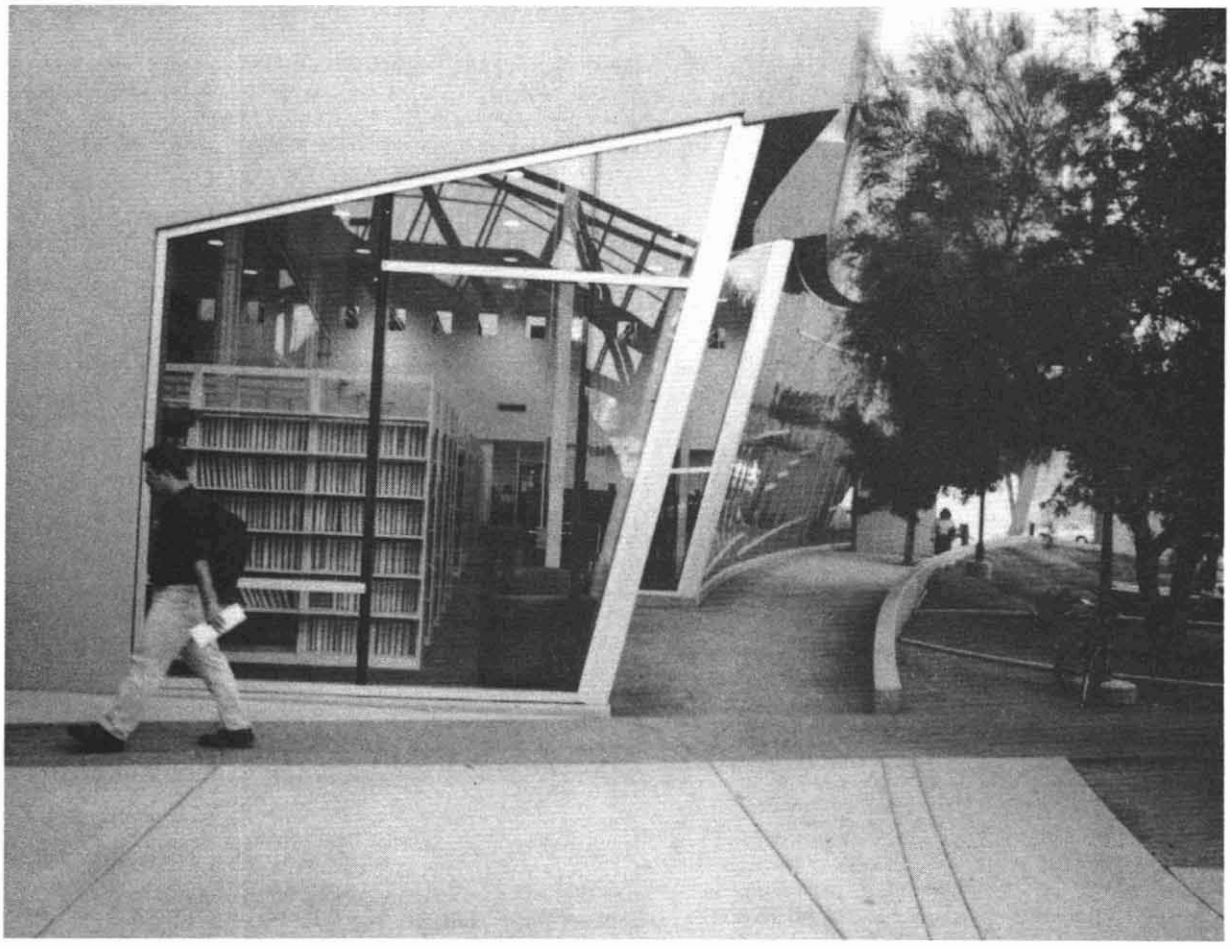
HON 374 Black and White Atlant c. 3 F S, SS
Exam nat on of deve opment 18th to 20th century) and cu tura man festat ons f B ack/Wh te race re at ons w th n the U S and between the U S and other nat ons Sem nar

HON 394 ST: Special Topics. 3) F, S SS

NOTE: For the Genera Stud es requ rement courses, and codes such as L1, N3 C, and H , see Genera Stud es. page 85 For graduat on requ rements see Univers ty Grad at on Requ rements, page 81. For an exp anat on of add t na omn bus courses offered but not l sted in th s cata og see "Class fication of Courses " page 58.

College of Law

Patricia D. White, J.D.
Dean



John J. Ross-William C. Blakley Law Library

John MacIsaac photo

PURPOSE

The p ime function of the College of Law is to train men and w n en for the practicing legal profession and related pr fessior assignments. In addition, the college has the resp nsibility tc contribute to the quality of justice adminis tred in our society

ORGANIZATION

Law Building and Law Library

The J hn S Armstrong Law Building is in the central campus ne ar other colleges of the university and Hayden l ibr ary The Law Building provides every modern facility for le al education and has been described by experts on planning law b uildings as setting a new standard in func tional desi n

The awa d winning John J Ross William C Blakley Law L brary named in memory of two prominent Phoenix attor neys, is one of the finest law libraries in the Southwest with a col ection of more than 351,000 volumes and microform vo ume equi alents. The collection includes a broad selec tion f Anglo Ar erican case reports and statutes as well as le al treatises, periodicals, encyclopedias, digests, citators, and adi inistrative n aterials The collection includes grow ing specia c llections in the areas of international law, Indian law, Mexican law, and law and technology. The lib ary is also a select ve U.S. government depository

The l brary is housed in a dramatic, functional building that opened in August 1993. The building provides accessi ble shelving for the expanding collections and comfortable st idy space at carrels tables, and lounge seating located thr ughout the library. The library has a 30 station com p ter lab as well as LEXIS and WESTLAW rooms which co tain 10 stations each, 27 meeting and study rooms, a n ici forms facility; and a classroon

St ide its also h ve ready access to the other campus ibr aries, including the Charles Trumbull Hayden Library the Dar iel E. Noble Science and Engineering Library, the Architecture and Environmental Design Library, and the Music Library. The c llections of the university libraries c mpris n ore than 3 million volumes

Special Programs

Center for the Study of Law, Science, and Technology. Th ASU Ce ter for the Study of Law, Science, and Tech n lo y is a multidisciplin ary research center founded by the Ar z na B ard of Regents in 1984. The center publishes research studies, sponsors seminars and symposia, and h uses visitin scholars and teachers. Through these pro am s, the center seeks to contribute to the formulation and in provement of law and public policy affecting science and technology a d to the wise application of science and tech n y n the legal system.

The C llege of Law offers a substantial number of c urses in the law, cience, and techno ogy area including bio ethics law and psychiatry, environmental law, health care law, intellectua property, land use regulation, law and evo ution ary biology, law and medicine, law and social sci ence mass communication, natural resources law, patent law, regulatory problems in law, science and technology, and water law. Each semester, the center publishes a student guide to ther less obvi us courses that contain science and technology iss ies In recent semesters this guide has listed courses in AIDS and the law, commercial law, employment law, law and the handicapped antitrust statistical proof in employment discrimination litigation, and several courses offered by other departments on campus available for regis tration by law students. In addition to re ular course offer ings, students can arrange independent studies with supervising faculty on to pics of special interest to them The center also invites guest speakers from legal or scientific fields to visit with interested law students generally during the noon hour.

In cooperation with the American Bar Association Sec tion on Science and Technology and under the leadership of a faculty editor, second and third year students edit the *Jurimetrics Journal of Law Science and Tech ol gy*. Stu dent editors do both edit rial work on submitted articles and original writing for publication in the j urnal.

Indian Legal Program. In the spring of 1988, the faculty of the College of Law voted to devote subst intial 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 College of Law provides its students with a quality legal education and an opportunity to gain know ledge and expertise in Indian law.

Students at the College of Law have the opportunity to participate in all phases of the Indian Legal Program and gain in depth understandin of the legal issues affecting Indian tribes and people Courses on Federal Indian law and seminars on advanced Indian law topics such as Tribal Court dispute resolution, economic development, American Indian cultural resources protection, and tribal environmen tal law are part of the curriculum Students may also partici pate 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 aca demic and work experience provides the students an out standing legal education with a firm gr unding in both the theoretical and pr actical aspects of Indian law.

Law Journal. The Co ege of Law publishes a professional law review, the *Arizona State Law Journ al*, edited by stu dents of the second and third year classes Membership on the law journal is determined by grade performance in the first year and submission of written work in a writing com petition Participation on the aw review is hard but reward ing work For those eligible the review provides one of the finest avenues for legal education thus far developed, con tributing to the student's intellectual advancement to the development of law and the legal profession, and to the stat ure of the College of Law.

ADMISSION

First year students are adn itted 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 un versity and 2 a score on the Law School Admission Test LSAT), administered by Law Serv ices, Box 2000, Newtown, Pennsylvan a 18940, in centers throughout the country

For more information regarding admission, call 480/ 965 7207 or write

ADMISSIONS OFFICE
COLLEGE OF LAW
AR ZONA STATE UN VERSITY
BOX 877906
TEMPE AZ 85287 7906

JURIS DOCTOR DEGREE

The College of Law offers a three year program of pro fessional studies at the graduate level leading to the degree of Juris Doctor.

For more information on the degree and courses, see the *Graduate Catalog*

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 pro gram, 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 pro gram, first year students prepare legal briefs and memo randa 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 educational 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 extern ships

Grading

College of Law courses are graded as shown in the "Grading Scale" table A grade of 60 or above is required to receive credit for any course.

Grading Scale

Grade	Definition
90–99	Distinguished
85 89	Excellent
80–84	Very Good
75 79	Good
70 74	Satisfactory
60–69	Deficient
59	Failing

Retention Standards. To be eligible to continue in the Col lege of Law, students must maintain a cumulative weighted GPA of 70 or higher 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 automat ica y placed on probation. Continuation of enrollment by probationary students is upon such terms and conditions as the college may impose.

A student w h se cumulative GPA falls below the required level o whose semester GPA is less than 70 in two consecu tive 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 ev dence of extenuating cir cumstances is convincing, readm ssion may be granted on a probationary status after a review of the reasons contribut ing 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 Col lege 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 percent of the class. Recipients of these awards are selected by th e law faculty on the basis of academic perfor mance

Honor Code. The legal profession, a self regulating associ ation, depends on the integrity, honor, and personal morality of each member Similarly, the it tegrity and value of an ASU College of Law degree depends on a reputation for fair con petition The college's *Honor Code* is intended as a measure to preserve the integrity of the school's diploma and to create an arena in which students can compete fairly and confidently. Copies of the *Honor Code* are availab e from the assistant dean in the college's Student Services Office

ACCREDITATION

The college is fully accredited by the American Bar Asso ciation 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 assis tance can be found in the *Bulletin of the College of Law*. To request the bulletin or application forms, call 480 965 7207 or write

ADM SSIONS OFF CE
COLLEGE OF LAW
ARIZONA STATE UN VERS TY
BOX 877906
TEMPE AZ 85287 7906

For general information about the College of Law, con tact Catherine Hevia at 480 965 1474 or v ew the college's World Wide Web page located at www law asu edu

LAW (LAW)

See the *Graduate Catalog* for the LAW courses.

College of Liberal Arts and Sciences

Gary S. Krahenbuhl, Ed.D.
Dean

The Agriculture Building, home to the African American Studies Program

John MacIsaac photo

PURPOSE

Like all major research universities, Arizona State University provides the means for undergraduates to acquire a liberal education, an education that broadens students' understanding in the major areas of human knowledge while providing students with in depth knowledge in their chosen areas of focus. While the professional schools and colleges can and do provide for important dimensions of a liberal education, the central academic setting for accomplishing this basic university purpose is the College of Liberal Arts and Sciences (CLAS). The college provides a particularly rich and varied set of opportunities for students to gain the kind of liberal education that helps to prepare them for a lifetime of continued learning and application of knowledge in a diverse and ever changing world.

As a consequence of the wide range of subjects CLAS offers in the humanities, the natural sciences and mathematics, and the social and behavioral sciences, instruction is provided in a number of core areas for undergraduate students from all of the other colleges. Students with majors in business, education, engineering, nursing, and other professional colleges rely on CLAS for basic foundation courses. CLAS also offers the majority of courses meeting the General Studies requirement.

CLAS initiated and continues to participate actively with the University Honors College. It also offers advising to undergraduates who are working out their undergraduate programs or are planning for graduate studies.

Most of the university faculty's engagement in the discovery and creation of knowledge and its dissemination occurs in CLAS. As an integral part of this activity, CLAS offers a wide range of graduate training programs leading to a master's or doctoral degree. For graduate degree application information, consult the *Graduate Catalog* and contact either the Graduate College or the academic unit in which the degree of interest would be earned, the latter in order to receive detailed information on particular degree requirements.

ORGANIZATION

CLAS consists of 23 academic departments, several interdisciplinary programs, seven centers and several research institutes and laboratories. The college offers 34 programs leading to a bachelor's degree, 28 programs leading to a master's degree, 20 programs leading to a doctoral degree, and interdisciplinary graduate programs in cooperation with other colleges. Undergraduate customized interdisciplinary degrees are also available in the college.

For more information, visit the college's Web site at www.asu.edu/clas.

ADMISSION

Any entering ASU student who has met the minimum university entrance requirements can be admitted to CLAS. Students with fewer than 50 earned hours of credit can, if they wish, be admitted as "no preference" students. Students with 50 or more hours must declare a major to be accepted into the college.

Any student with a cumulative GPA of at least 2.00 who is currently registered in good standing in any other college at ASU and who wishes to major in a subject offered by CLAS and to follow a program of study in the major may transfer into the college. (Students wishing to transfer into the majors of Computer Science or Economics must have an ASU cumulative GPA of at least 2.50.) The student transfers by applying and being initially advised in the Office for Academic Programs, SS 111. Students admitted from other ASU colleges are undergraduate advising during the first semester and must take courses leading directly to a degree in CLAS. Failure to follow mandated advice on course selection can result in enrollment and registration problems including cancellation and holds.

Transfer Students. The university standards for evaluation of transfer credit are listed under "Transfer Credit," page 63. All students who meet the university standards are admitted to CLAS, but students desiring to major in either Computer Science or Economics must have transfer GPAs of at least 2.50. Transfer students are urged to contact the relevant academic department or the Office for Academic Programs, SS 111, to ensure a smooth transition into CLAS. Students who have transferred courses from institutions other than Arizona community colleges must have their transcripts evaluated by an advisor in SS 111. Students who have attended only Arizona community colleges have evaluations performed in the department of the major.

Advising for Preprofessional Programs

Professional Field	Office Where Advisor Is Located
Dentistry	Pre Health Professions, LSC 260C
Foreign service	Department of chosen major
Health physics	Pre Health Professions, LSC 260C
Law	Office for Academic Programs, SS 111
Medicine	Pre Health Professions, LSC 260C
Ministry	Department of Religious Studies, LL B605
Occupational therapy	Pre Health Professions, LSC 260C
Optometry[1]	Pre Health Professions, LSC 260C
Osteopathy	Pre Health Professions, LSC 260C
Pharmacy	Pre Health Professions, LSC 260C
Physical therapy[1]	Pre Health Professions, LSC 260C
Podiatry[2]	Pre Health Professions, LSC 260C

Students preparing for a career in these areas should consult the Pre Health Professions office, 480 965 2305.

[1] No school in Arizona offers a program in dentistry, optometry, or podiatry. Students interested in pursuing these professional studies should confer with the Pre Health Professions advisor regarding out of state schools where they may complete the curriculum.

Courses transferred from two year community colleges are accepted as lower division credit only. Students are urged to choose their community college courses carefully in view of the fact that a minimum of 45 semester hours of work taken at the university must be upper division credit (see "Community Colleges," page 64).

"Undecided" or "Undeclared" Majors. Students in CLAS are not required to select a major upon entering the college as freshmen or at any time thereafter until the semester in which 60 semester hours are earned. Until such "no preference" students have chosen a major, they are advised through Cross college Advising Services, in the Undergraduate Academic Services Building. It is important to note that

an academic advisor before any enrollment a tivity Before or during the semester in which they earn 60 semester hours, students *must* select their ma or and transfer into the appropriate department.

Note. Students who wish to enter a program of study that has a rigidly structured curriculum should be aware that delay in choosing a major could resu t in added time and cost in the completion of requirements.

ADVISING

All students are urged to seek advising in the appropriate college unit before registration Students must follow the calendar published in the *Schedule of Classes* for each semester for information regarding enrollment, adding/dropping classes, and withdrawals.

Regular Advising. All students are strongly urged to seek advising in the appropriate college unit before registration

Advising Locations. CLAS students should seek routine advising at the locations shown in the "Advising Locations" table.

Advising Locations

Student	Location
Declared majors	Department of ma or
No preference, no preference, prelaw	Cross college Advising Services, UASB (480 965 4464)
No preference, premedical	LSC 206C (480 965 2365

The Office for Academic Programs, located in SS 111, is the central resource center for academic information in the college. Requests from students, departmental advisors, and faculty for clarification of rules, procedures, and advising needs of the college and university should be directed to that office.

Mandatory Advising. The following categories of Liberal Arts and Sciences students *must* receive advising and *must* be cleared on the Mandatory Advising Computer System (MACS before their classes may be scheduled

1 students in their first semester at ASU,
2 students on probation,
3 students with a cumulative GPA of less than 2.00,
4 students who have admissions deficiencies;
5 other students with "special admissions" status, and
6 students who have been disqua ified (these students are allowed to attend ASU summer and winter sessions only and must be advised in the Office for Academic Programs, SS 111).

Students in the above mandatory advising categories should consult an advisor in the appropriate location listed in the previous section Students with admission deficiencies are carefully monitored to ensure that they take courses that eliminate their deficiencies Students a e encouraged to check their mandatory advising status each semester before attempting registration transactions

Advising for Preprofessional Programs. Special advising is available for students planning to enter the fields listed in the "Advising for Preprofessional Programs" table. The professional programs shown in the table are not majors in themselves: that is, there are no m ajors called "premedical," "prelaw," etc In each program, the student must eventually select an established major in CLAS or in one of the other colleges.

DEGREES

Majors. Pr grams leading to the B.A and B.S degrees are offered by CLAS, with majors in the subjects listed in the "College of Liberal Arts and Sciences Baccalaureate Degrees and Majors" table, page 325. Each major is admin istered by the academic department indicated

Minors. Althou h not required for graduation, special college approved minors are available in most departments Check department program descriptions for details. Minors offered by departments n ust have at least 18 hours of desig nated courses, including 12 hours of upper division work The college requires a grade of at least "C" in al upper division courses in the minor. Some departments have stricter requirements A minimum of six upper division hours in the minor must be taken in residence at ASU Main.

University policies prohibit the "double counting" of courses from the major in the minor Specific questions concerning double counting as well as general questions about the approval processes for minors, should be taken up with an academic advisor in the department offering the minor or the Office for Academic Programs, SS 111

Refer to the CLAS portion of the "Minors" table, page 110.

UNIVERSITY GRADUATION REQUIREMENTS

In addition to fulfilling college and major requirements, students must meet all university graduation requirements For complete information, see "University Graduation Requirements," page 81

General Studies Requirement

All students enrolled in a baccalaureate degree program must satisfy a university requirement of a minimum of 35 hours of approved course work in General Studies, as described in "General Studies," page 85. Note that all three General Studies awareness areas are required. Consult your advisor for an approved list of courses

General Studies courses are listed in the "General Stud ies" section, page 87, n the course descriptions, in the *Schedu e of Classes*, and in the *Summer Sessions Bulletin*

COLLEGE DEGREE REQUIREMENTS

CLAS degree requirements are more extensive than the General Studies requirement. Additional course work in the humanities, natural sciences and mathematics, and social and behavioral sciences is required A well planned program of study enables students to complete the General Studies requirement whi e fulfilling college degree requirements Students are encouraged to consult with an academic advisor in planning a program to ensure that they meet all necessary requirements. It is also mportant to note that the college classification of the humanities, natural sciences and mathematics, and social and behavioral sciences is, in some courses, different from that used for General Studies

College of Liberal Arts and Sciences Baccalaureate Degrees and Majors

Major	Degree	Administered by
African American Studies	B.A.	African American Studies Program
Anthropology	B.A.	Department of Anthropology
Asian Languages Chinese Japanese	B.A.	Department of Languages and Literatures
Biology	B.S.	Department of Biology
Concentration: biology and society		
Chemistry	B.A.	Department of Chemistry and Biochemistry
Chemistry	B.S.	Department of Chemistry and Biochemistry
Emphasis: biochemistry		
Chicana and Chicano Studies	B.A.	Department of Chicana and Chicano Studies
Concentrations: humanities cultural sciences, social sciences policy		
Clinical Laboratory Sciences	B.S.	Department of Microbiology
Computer Science	B.S.	Department of Computer Science and Engineering
Conservation Biology	B.S.	Department of Biology
Economics	B.A., B.S.*	Department of Economics
English	B.A.	Department of English
Concentrations: linguistics, literature		
Exercise Science Physical Education	B.S.	Department of Exercise Science and Physical Education
Concentrations: exercise and wellness, exercise science physical education		
Family Resources and Human Development	B.S.	Department of Family Resources and Human Development
Concentrations: family resources and human development in business, family studies child development, human nutrition—dietetics		
French	B.A.	Department of Languages and Literatures
Geography	B.A., B.S.	Department of Geography
Concentrations: meteorology climatology, urban studies		
Geology	B.S.	Department of Geology
German	B.A.	Department of Languages and Literatures
History	B.A., B.S.	Department of History
Humanities	B.A.	Interdisciplinary Humanities Program
Concentrations: architecture architecture, culture, and society; business; design; film studies, humanities liberal arts; justice studies; planning		
Interdisciplinary Studies	B.A., B.S.	College of Liberal Arts and Sciences
Italian	B.A.	Department of Languages and Literatures
Mathematics	B.A.	Department of Mathematics
Mathematics	B.S.	Department of Mathematics
Options: applied mathematics computational mathematics, general mathematics, pure mathematics, statistics and probability		
Microbiology	B.S.	Department of Microbiology
Philosophy	B.A.	Department of Philosophy
Physics	B.S.	Department of Physics and Astronomy
Emphasis: astronomy		
Options: I, II		
Plant Biology	B.S.	Department of Plant Biology
Concentrations: environmental science and ecology molecular biosciences biotechnology, urban horticulture		
Political Science	B.A., B.S.	Department of Political Science
Psychology	B.A., B.S.	Department of Psychology
Religious Studies	B.A.	Department of Religious Studies
Russian	B.A.	Department of Languages and Literatures
Sociology	B.A.	Department of Sociology
Spanish	B.A.	Department of Languages and Literatures
Speech and Hearing Science	B.S.	Department of Speech and Hearing Science
Women's Studies	B.A., B.S.	Women's Studies Program

[1] The department is in the College of Engineering and Applied Sciences, which also offers this major, with different requirements

* The department is in the College of Business, which also offers this major, with different requirements

To graduate from CLAS, a student must satisfy separate requirements of three kinds in addition to the General Studies requirement: *proficiency requirements* indicate a minimal level of competence in written communication, quantitative reasoning, and a second language, *major requirements* involve concentrated course work in one field, and *distribution requirements* ensure that the student is exposed to disciplines outside the major field.

I. Proficiency Requirements. Each student is required to demonstrate proficiency in First Year Composition, a foreign language, and mathematics.

Each student must demonstrate proficiency by completing the courses specified below with a grade of "C" or higher in each course. Courses used to meet a proficiency requirement may not ordinarily be used to satisfy the distribution requirement; the two exceptions are specified under III.A and III.B.

A. First Year Composition
   1. ENG 101 and 102 or
   2. ENG 105 or
   3. ENG 107 and 108 for foreign students.

B. Second Language
   1. completion of foreign language course work at the intermediate level (202 or equivalent, see Department of Languages and Literatures listings for these equivalencies) or
   2. a foreign language course at the 300 level or above taught in the foreign language and having 202 or its equivalent as a prerequisite or
   3. completion of secondary education at a school in which the language of instruction is not English or
   4. completion of SHS 275 American Sign Language IV or its equivalent.

C. Mathematics
   1. MAT 114 or
   2. MAT 117 or
   3. MAT 170 or their equivalents or
   4. any higher level MAT course

II. Major Requirements. Each student is required to select a major from among the fields of study offered by CLAS. The requirements for completion of the major are described under departmental listings.

A. The major department may require up to 45 semester hours of course work. The minimum is 30 hours. A maximum of 15 additional hours may be required in related courses and prerequisites. No more than 60 semester hours of course work may be required to complete the major, related courses, and prerequisites. Some departments require calculus level mathematics, up to five of these semester hours may be excluded from the 60 hour maximum because they satisfy the mathematics proficiency requirement. A minimum of 12 upper division hours in the major must be taken in residence at ASU Main.

B. No credit is granted toward fulfilling major or minor requirements in any upper division course in that subject field unless the grade in that course is at least a "C." In CLAS, the assignment of a grade of "Y" indicates a level of performance that would have resulted in a grade of at least "C" had the normal grading scheme been used.

C. Major fields of study are classified into the following three divisions.

1. Humanities
   - African American Studies
   - Asian Languages (Chinese, Japanese)
   - Chicana and Chicano Studies
   - English
   - French
   - German
   - Humanities
   - Italian
   - Philosophy
   - Religious Studies
   - Russian
   - Spanish

2. Natural Sciences and Mathematics
   - Biology
   - Chemistry
   - Clinical Laboratory Sciences
   - Computer Science
   - Conservation Biology
   - Geology
   - Mathematics
   - Microbiology
   - Physics
   - Plant Biology

3. Social and Behavioral Sciences
   - African American Studies
   - Anthropology
   - Chicana and Chicano Studies
   - Economics
   - Exercise Science/Physical Education (Students majoring in this field must satisfy the distribution requirements in all three divisions.
   - Family Resources and Human Development (Students majoring in this field must satisfy the distribution requirements in all three divisions.)
   - Geography
   - History
   - Political Science
   - Psychology
   - Sociology
   - Speech and Hearing Science (Students majoring in this field must satisfy the distribution requirements in all three divisions.)
   - Women's Studies

III. Distribution Requirements. The purpose of the distribution requirement is to ensure that the student is introduced to disciplines outside the division of the major. A list of major fields and their respective divisions is given under II.C.

Unless the major field notes otherwise in II.C, students are considered to have fulfilled the distribution requirements in the division of the major.

Students majoring in Exercise Science/Physical Education, Family Resources and Human Development, and Speech and Hearing Science must satisfy distribu

tion requirements in social and behavioral sciences as well as in the other two divisions. Students majoring in African American Studies or Chicana and Chicano Studies satisfy either the humanities or social and behavioral sciences distribution requirements, depending on their concentrations.

Students majoring in Anthropology, Geography, and Psychology may not use ASM courses in the case of Anthropology majors, GPH courses in the case of Geography majors, or PSY courses in the case of Psychology majors to satisfy the natural sciences and mathematics requirements.

Note: In addition to the approved courses noted under each of the distribution requirement areas—humanities, natural sciences and mathematics, and the social and behavioral sciences—one course in each area may be selected from the larger set of General Studies approved course listings in each of these areas. (See "General Studies," page 87.)

A. Humanities (15 semester hours). Each student is required to complete five courses of at least three semester hours each. Course prefixes are identified in the following section.

At least three of the five courses must be taken in one or more of the following CLAS units: the African American Studies Program (AFH courses only), the Departments of Chicana and Chicano Studies (CSH courses only), English, Languages and Literatures, Philosophy, Religious Studies, the Interdisciplinary Humanities Program, and the Women's Studies Program. At least two of these three courses must be at the 300 level or above.

Note: Literature or "civilization" courses (300 level or above) taught in a foreign language may be used to satisfy the humanities distribution requirement, even if they are also used to demonstrate foreign language proficiency (see I B).

Course prefixes for the humanities distribution requirement:

1. APH (College of Architecture and Environmental Design)
2. ARS, DAH, MHL, MUS, THE (College of Fine Arts—only courses teaching the history of the discipline)
3. AFH (African American Studies Program)
4. CSH (Chicana and Chicano Studies)
5. ENG (Department of English; any literature course, including ENG 200 and 218)
6. CHI, FLA, FRE, GER, GRK, HEB, ITA, JPN, LAT, POR, RUS, SPA, (Department of Languages and Literatures; FLA 150 or any literature or "civilization" course at the 300 level or above)
7. HUM (Interdisciplinary Humanities Program)
8. PHI, HPS (Department of Philosophy)
9. REL (Department of Religious Studies)
10. WSH (Women's Studies Program)
11. One course may be selected from the larger set of General Studies course listings in humanities (HU). (See "General Studies," page 87.)

B. Natural sciences and mathematics (14 semester hours).

1. Part A (eight semester hours). Two courses (either lecture courses with included laboratories or lecture courses with appropriate accompanying laboratories) to be taken in the Departments of Biology, Chemistry and Biochemistry, Geography (GPH 111 and/or 212 if taken with 214), Geology, Microbiology, Physics and Astronomy, or Plant Biology. Laboratories need to meet for at least 30 hours per semester. See departmental listings.
2. Part B (six semester hours). Two courses to be taken from the Departments of Anthropology (ASM only), Biology, Chemistry and Biochemistry, Computer Science and Engineering, Geography (GPH only), Geology, Mathematics, Microbiology, Physics and Astronomy, Plant Biology, and Psychology (PSY only). See departmental listings. Students who complete Part A using courses from only one department may not use courses from that department in Part B.

Note: Only mathematics courses for which MAT 117 or a higher level mathematics course is a prerequisite may be used to satisfy natural sciences and mathematics distribution requirements. Mathematics courses for which MAT 117 is a prerequisite may be used to satisfy distribution requirements in natural sciences and mathematics, even if they were also used to demonstrate mathematics proficiency.

C. Social and behavioral sciences (15 semester hours). Each student is required to complete five courses of at least three semester hours each.

Courses used to fulfill the social and behavioral sciences distribution requirement must be taken from no fewer than two but no more than three departments.

At least two courses must be at the 300 level or above.

Course prefixes for the social and behavioral sciences distribution requirement:

1. AFS (African American Studies Program)
2. ASB (Department of Anthropology)
3. CSS (Chicana and Chicano Studies)
4. ECN (Department of Economics, College of Business)
5. GCU (Department of Geography)
6. HIS (Department of History)
7. PGS (Department of Psychology)
8. POS (Department of Political Science)
9. SOC (Department of Sociology)
10. WST (Women's Studies Program)
11. One course may be selected from the larger set of General Studies course listings in social and behavioral sciences (SB). (See "General Studies," page 87.)

IV. General Electives. Most CLAS majors can meet all of the above requirements with fewer than the 120 semester hours required for graduation. The remainder of their hours are general electives that may be selected

from any of the departments of CLAS and from the offerings of the other colleges

Program of Study/Declaration of Graduation. The program of study declaration of graduation, which is required by university regulations during the semester in which an undergraduate earns the 87th hour, must be filed and approved at least two weeks before the preregistration period for the subsequent semester. Students are expected to follow the approved program of study or to receive early college approval for proposed changes to the program of study. Students should contact the Office for Academic Programs, SS 111, regarding college graduation rules and deadlines. Deadlines for filing a program of study/declaration of graduation after enrolling in the 87th hour are March 1 and October 1 of each year. Students with 87 hours must have a college approved program of study declaration of graduation before registering for the next semester.

Credit Requirement. All candidates for graduation in the B.A. and B.S. degree curricula are required to complete at least 120 semester hours, of which at least 45 hours must consist of upper-division courses. A minimum ASU cumulative GPA of 2.00 is required for graduation.

Course Load. The normal course load is 15–16 semester hours. First semester freshmen and entering transfer students are not permitted to register for more than 18 semester hours in the initial semester. Other students who wish to register for more than 18 hours must have a GPA of at least 3.00 and must file a petition in the Office for Academic Programs, SS 111, before registration. Any petition for an overload in excess of 21 hours must be presented to the Standards Committee of the college.

SPECIAL CREDIT OPTIONS

Pass/Fail Grade Option. The pass/fail grade option is intended to broaden the education of Liberal Arts and Sciences undergraduates by encouraging them to take advanced courses outside their specialization. A mark of "P" contributes to the student's earned hours but does not affect the GPA. A failing grade is computed into the GPA.

Only CLAS students with at least 60 semester hours may take courses under the pass/fail option. The option may be used under the following conditions:

1. enrolment for pass/fail needs the approval of the instructor and the college;
2. enrolment under this option must be indicated during registration and may not be changed after the late registration period; and
3. a maximum of 12 hours taken for pass/fail may be counted toward graduation.

Students may not enroll under the pass/fail option in the following courses:

1. those taken to satisfy the foreign or English First Year Composition requirements;
2. those in the student's major or minor or certificate program;
3. those counted toward or required to supplement the major;
4. those counted as 499 Individualized Instruction;
5. those taken for honors credits; or
6. those counted toward satisfying the proficiency and distribution requirements of the college or the General Studies requirement.

The above option is not available to CLAS students for courses offered by other colleges except for courses in economics offered by the College of Business.

Audit Grade Option. A student may choose to audit a course, in which case the student attends regularly scheduled class sessions but no credit is earned. The student should obtain the instructor's approval before registering for the course. For more information, see "Grading System," page 73.

Note: This grade option may not be changed after the late registration period.

Independent Learning. Study by independent learning is not a normal part of a degree program; special circumstances must exist for a resident student to take independent learning courses. Any enrollment in such courses must have the prior approval of the college.

ACADEMIC STANDARDS

The standards for GPA and the terms of probation, disqualification, reinstatement, and appeal are identical to those of the university as set forth under "Retention and Academic Standards," page 77, except that the disqualified student in CLAS is suspended for at least two regular semesters at the university. When students are placed on probation, one of three things can happen:

1. the student may raise his/her cumulative GPA to a 2.00 or better, by taking new classes, and be removed from probation after the fall or spring semester;
2. the student may receive the required semester GPA, but not raise the cumulative GPA to the 2.00 level. In this case, the student may remain on probation for another semester. A student may continue on probation, earning the required semester GPA for as many semesters as it takes to raise the cumulative GPA above 2.00; or
3. the student may fail to achieve the required semester GPA and will be disqualified.

Students with cumulative GPAs of less than 2.00 who leave the university for a semester or more are not automatically readmitted. Such students, as well as all disqualified students, should contact the Office for Academic Programs, SS 111, regarding procedures and guidance for reinstatement and returning to good standing. By following recommendations and meeting established standards for summer school work or course work at other institutions, the possibility of successful reinstatement is enhanced.

Academic discipline is one of the functions of the Office for Academic Programs, SS 111. All students having academic difficulties of any kind should contact this office. Also available in this office is information on policies and procedures of the college on academic honesty, student grievances with respect to grades, and various petitions regarding college standards and graduation requirements.

Academic honesty is expected of all students in all examinations, papers, academic transactions, and records. The possible sanctions include, but are not limited to, appropriate grade penalties, loss of registration privileges, disqualification, and dismissal.

College of Liberal Arts and Sciences Graduate Degrees and Majors

Major	Degree	Administered by
Anthropology Concentrations: archaeology, bioarchaeology, linguistics, medical anthropology, museum studies, physical anthropology, social cultural anthropology	M.A.[1]	Department of Anthropology
Anthropology Concentrations: archaeology, physical anthropology, social cultural anthropology	Ph.D.	Department of Anthropology
Biology[2] Concentration: ecology	M.S., Ph.D.	Department of Biology
Chemistry Concentrations: analytical chemistry, biochemistry, geochemistry, inorganic chemistry, organic chemistry, physical chemistry, solid state chemistry	M.S., Ph.D.	Department of Chemistry and Biochemistry
Communication Disorders	M.S.	Department of Speech and Hearing Science
Creative Writing	M.F.A.[3,4]	Creative Writing Committee
English Concentrations: comparative literature, English linguistics, literature and language, rhetoric and composition	M.A.	Department of English
English Concentrations: literature, rhetoric composition and linguistics	Ph.D.	Department of English
Exercise Science Concentrations: biomechanics, motor behavior/sport psychology, physiology of exercise	Ph.D.[3]	Committee on Exercise Science
Exercise Science/Physical Education	M.S.	Department of Exercise Science and Physical Education
Family Resources and Human Development Concentrations: family studies, general family resources and human development	M.S.	Department of Family Resources and Human Development
Family Science[2] Concentration: marriage and family therapy	Ph.D.	Department of Family Resources and Human Development
French	M.A.	Department of Languages and Literatures
Geography	M.A., Ph.D.	Department of Geography
Geology	M.S., Ph.D.	Department of Geology
German Concentrations: comparative literature, language and culture, literature	M.A.	Department of Languages and Literatures
History Concentrations: Asian history, British history, European history, Latin American history, public history, U.S. history, U.S. Western history	M.A.	Department of History
History Concentrations: Asian history, British history, European history, Latin American history, U.S. history	Ph.D.	Department of History
Humanities	M.A.[3]	Graduate Committee on Humanities
Mathematics	M.A., Ph.D.	Department of Mathematics
Microbiology	M.S., Ph.D.	Department of Microbiology
Molecular and Cellular Biology	M.S., Ph.D.	Interdisciplinary Committee on Molecular and Cellular Biology

[1] 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.

[2] This major has formalized concentration(s); other areas of study are available.

[3] This program is administered by the Graduate College. See "Graduate College," page 301.

[4] Fiction, nonfiction, poetry, and screenwriting are options for students in this program offered by the faculty in the Department of English. Playwriting is also an option in this program offered by the faculty in the Department of Theatre.

College of Liberal Arts and Sciences Graduate Degrees and Majors (continued)

Major	Degree	Administered by
Natural Science	M.N.S.	
Concentrations:		
biology		Department of Biology
chemistry		Department of Chemistry and Biochemistry
geology		Department of Geology
mathematics		Department of Mathematics
microbiology		Department of Microbiology
physics		Department of Physics and Astronomy
plant biology		Department of Plant Biology
Philosophy	M.A	Department of Philosophy
Physical Education	M.P.E.	Department of Exercise Science and Physical Education
Physics	M S , Ph D.	Department of Physics and Astronomy
Plant Biology[2]	M S., Ph.D.	Department of Plant Biology
Concentrations: ecology, photosynthesis		
Political Science	M A., Ph.D.	Department of Political Science
Concentrations: American politics, comparative politics, international relations, political theory		
Psychology	Ph.D.	Department of Psychology
Concentrations: behavioral neuroscience, clinical psychology, cognitive/behavioral systems, developmental psychology, environmental psychology, quantitative research methods, social psychology		
Religious Studies	M.A.	Department of Religious Studies
Science and Engineering of Materials	Ph.D [3]	Committee on the Science and Engineering of Materials
Concentrations: high resolution nanostructure analysis, solid state device materials design		
Sociology	M.A , Ph.D.	Department of Sociology
Spanish	M A.	Department of Languages and Literatures
Concentrations: comparative literature, language and culture, linguistics, literature		
Spanish	Ph.D.	Department of Languages and Literatures
Speech and Hearing Science	Ph.D.[3]	Committee on Speech and Hearing Science
Concentrations: developmental neurolinguistic disorders, neuroauditory processes, neurogerontologic communication disorders		
Statistics	M.S.[3]	Committee on Statistics
Teaching English as a Second Language	M.TESL	Department of English

[1] 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

[2] This major has formalized concentration(s) ; other areas of study are available

[3] This program is administered by the Graduate College See "Graduate College," page 301

[4] Fiction, nonfiction, poetry, and screenwriting are options for students in this program offered by the faculty in the Department of English. Playwriting is also an option in this program offered by the faculty in the Department of Theatre.

STUDENT RESPONSIBILITIES

Any student enrolling in courses offered by CLAS is expected to follow the rules and deadlines specified in the *General Catalog* and the current *Schedule of Classes*. Students are urged to meet with their departmental academic advisors before registration. Students with additional questions or problems are also urged to meet with advisors in the Office for Academic Programs, SS 111, regarding the academic rules of the college and the university.

SPECIAL PROGRAMS

University Honors College. CLAS works closely with the University Honors College, which affords qualified undergraduates opportunities for enhanced educational experiences. For a complete description of the University Honors College requirements and opportunities, see "University Honors College," page 316.

Interdisciplinary Studies. An Interdisciplinary Studies major leading to the B A or B S degree provides students of outstanding ability in the humanities, natural sciences and mathematics, and social and behavioral sciences oppor

Certificates

Certificate Program	Administered by
African American Studies	African American Studies Program
Asian Studies*	Center for Asian Studies
East Asian Studies	Center for Asian Studies
Health Physics	Pre Health Professions Office
Jewish Studies*	Jewish Studies Committee
Latin American Studies*	Latin American Studies Center
Medieval and Renaissance Studies	Arizona Center for Medieval and Renaissance Studies (ACMRS)
Medieval Studies	ACMRS
Museum Studies	Department of Anthropology
Renaissance Studies	ACMRS
Russian and East European Studies*	Russian and East European Consortium
Scandinavian Studies	Department of Languages and Literatures
Scholarly Publishing	Department of History
Southeast Asian Studies	Program for Southeast Asian Studies
Translation	Department of Languages and Literatures
Women's Studies*	Women's Studies Program
Writing	Department of English

* Emphases are also ava lable in these programs.

tunities to pursue courses of studies that cut across depart mental boundaries and focus on specific topics or problem areas. Completion of 32 semester hours at ASU with a GPA of at least 3.25 and three letters of recommendation from ASU faculty members are required for admission. For more information about degree requirements, contact the Office for Academic Programs, SS 111.

Washington Semester Program. Students have a variety of opportunities for practicum and internship experiences that enable them to meld classroom learning with practical application. Among the severa individual departmental pro grams that provide internships for majors, the Department of Political Science is the ASU sponsor of the Washington Semester Program. The program provides students a one semester opportunity to study in Washington, D.C., through any one of several programs sponsored by the American University. The program is available to outstanding juniors or seniors and requires careful planning with an academic advisor early in the student's career. For more information, call the Department of Political Science, 480/965 6551.

Military Officer Training. The Departments of Aerospace Studies and Military Science offer programs leading to commissions in the armed forces, but they do not offer majors or minors For further information, see the appropriate department descriptions in this catalog.

Certificate Programs and Areas of Emphasis

Sixteen certificates are available from units in CLAS, as shown in the "Certificates" table Areas of emphasis are also available in some of the same areas.

Asian Studies. An Asian Studies certificate is offered through the Center for Asian Studies.

Students must complete two years (20 semester hours) of an Asian language plus 30 additional hours of Asian-area studies courses selected from core Asian studies courses or courses with a significant focus on Asia chosen in consultation with the Center for Asian Studies advisor. Students whose native language is an Asian language or who have otherwise mastered an Asian language may elect to take four additional Asian studies courses in place of the elementary and intermediate language classes. Language require ments may be selected from Chinese, Indonesian, Japanese, Korean, Thai, and Vietnamese

An East Asian Studies certificate is also available. Students must complete two years (20 semester hours) of Chinese or Japanese plus 30 additional semester hours of East Asian area studies courses; these courses must be selected from the core East Asian curriculum or must be courses with a significant focus on East Asia chosen in consultation with the Center for Asian Studies director

Note: Students whose native language is Chinese or Japa nese or who have otherwise mastered these languages may elect to take four additional East Asian studies courses in place of the elementary and intermediate language courses.

The center houses a comprehensive library and is involved in student and faculty exchange programs with several Asian universities as well as serving as a liaison with various Asian organizations.

For more information, contact the Center for Asian Stud ies, WHALL 105, 480/965 7184.

Health Physics. The curriculum of health physics involves work in CLAS and the College of Engineering and Applied Sciences. The purpose of the concentration is to serve undergraduate students who wish to prepare themselves for careers in health physics To qualify for professional status, a health physicist needs a B.S. degree in one of the physical or life sciences and a group of specialized courses in phys ics, mathematics, chemistry, engineering, and biology.

A Certificate of Concentration in Health Physics is awarded for the successful completion of a B.S. degree in a physical or life science that follows a prescribed program. Inquiries about the program should be addressed to the Pre-Health Professions Office, LSC 206C, 480/965 2365, where academic advising is available.

Jewish Studies. The Jewish studies program is designed with the following goals in mind:

1. to examine the history and culture of the Jews;
2. to provide a model for interdisciplinary teaching and research;
3. to generate and facilitate research on Judaica;
4. to provide the community with programs, courses, and research furthering the understanding of Judaica; and
5. to stand as an example of the university's commitment to a program of meaningful ethnic studies on a firm aca demic base.
6. The Certificate of Concentration in Jewish Studies may be combined with a major in any college. For information about the program, refer to the Department of History or the Department of Religious Studies or the chair of the Jewish Studies Committee listed in the current *Schedule of Classes.*

Latin American Studies. The Latin American Studies certificate program is designed to give students an understanding of culture, economies, political structures, and the history of Latin American nations. The Departments of Anthropology, Economics, Geography, History, Languages and Literatures (Spanish and Portuguese), Political Science, and the College of Business offer courses that combine to make up the interdisciplinary certificate. Students must complete 30 hours of upper division courses from the above departments/colleges with a concentration in Latin America 15 hours in the major subject and 15 hours in other disciplines. The certificate requires Spanish or Portuguese proficiency through the 313 level of conversation and composition. Only language courses above 313 in literature and civilization will count toward a major or interdisciplinary areas of preparation. Spanish and Portuguese courses above 313 in grammar and phonology will not count toward the major requirements.

The Latin American Studies Center will continue to offer the area of emphasis for students who do not wish to attain a high level of language proficiency.

For more information, visit the Latin American Studies Center at SS 213, or call 480 965 5127.

Medieval and Renaissance Studies. An undergraduate Certificate in Medieval and Renaissance Studies is offered by the Arizona Center for Medieval and Renaissance Studies (ACMRS). In addition to the course work and examinations required in a student's major field of interest, the following minimum requirements must be fulfilled to earn the certificate:

1. six to eight semester hours of classical Latin and six to eight semester hours of Latin (classical and/or medieval) or of a vernacular language of the period (e g , Old English, Old Norse, Old French, Renaissance Italian);
2. six to eight semester hours of course work in medieval and renaissance studies outside the major discipline;
3. three semester hours of thesis on a topic concerning the Middle Ages or Renaissance The thesis may be used to fulfill the Honors College thesis requirement for students enrolled in the Honors College; and
4. a minimum of a "C" average in all course work leading to the certificate

Students interested in the certificate program need to complete an application form before being accepted into the program. Applications are available by calling ACMRS at 480/965 1681

See the *Graduate Catalog* for information about the Certificate in Medieval Studies and the Certificate in Renaissance Studies, and "Arizona Center for Medieval and Renaissance Studies (ACMRS)," page 36, for information about the center

Museum Studies. See the *Graduate Catalog* or contact the Department of Anthropology for more information

Russian and East European Studies. Undergraduate students may complete an interdisciplinary certificate program leading to a bachelor's degree with a major in the chosen field with an emphasis in Russian and East European studies. The requirements for the Russian and East European Studies certificate follow:

1. three years (22 hours) of Russian or another Eurasian or East European language; and
2. 30 upper division semester hours in Russian/East European area related course work.

At least three disciplines must be represented in the area-related course work, and at least 12 hours must be outside the Department of Languages and Literatures (i.e., non RUS and non FLA courses). Fulfillment of these requirements will be certified by the Russian and East European Studies Consortium and will be recognized on the transcript by a bachelor's degree with "Major in [Discipline], Emphasis in Russian and East European Studies." The purpose of this undergraduate certificate program is to encourage students majoring in a chosen discipline to develop special competency in Russian or East European language and area studies. A major in any department may elect this emphasis.

For further information, contact the program coordinator of the Russian and East European Studies Consortium at 480/965 4188.

Scandinavian Studies. Students admitted to undergraduate degree programs in any field are eligible for the Scandinavian Studies certificate program. In addition to the course work and examinations required in the student's major, the student would be responsible for fulfilling the following minimum requirements (21 semester hours) before the certificate would be issued:

1 six semester hours of Norwegian or Swedish at the 200 level or above.
2. three semester hours in SCA 250 "Introduction to Scandinavian Culture "
3. nine credit hours of upper division course work in Scandinavian Studies outside the student's major discipline.
4. A minimum of a "C" average in all course work leading to the certificate.
5. three credit hours in an independent study thesis on a topic concerning Scandinavian Studies. The thesis may be used to fulfill the Honors College thesis requirement for students enrolled in the Honors College.

Students who test out of the basic language courses would under advisement take other approved courses to fulfill the minimum requirement of 21 semester hours

Scholarly Publishing. See the *Graduate Catalog* for information on this certificate program.

Southeast Asian Studies. A Certificate in Southeast Asian Studies is awarded to any undergraduate student who elects an interdisciplinary focus in Southeast Asian studies while completing degree requirements in any discipline or professional program. The certificate program offers two options: (1) an area studies specialization emphasizing courses in the social sciences and humanities and requiring one year of Indonesian, Thai, or Vietnamese and (2) a language specialization requiring a two year sequence in a Southeast Asian language and a proportional number of area studies courses.

Students wishing to study a Southeast Asian language other than those offered on campus may transfer credits earned at the Southeast Asian Studies Summer Institute, a consortium for intensive language and area studies, or at other accredited programs. Qualified students may request placement testing on other national languages of the region,

administered in accordance with the national American Council of Teachers in Foreign Languages (ACTFL) guide lines.

The ASU curriculum includes

1. language instruction in Indonesian, Thai, or Vietnam ese;
2. ASB/GCU/HIS/POS/REL 240 Introduction to South- east Asia:
3. HIS 308 Modern Southeast Asian History;
4. electives in the social sciences and humanities on the history, geography, culture, politics, and religion of the region; and
5. a culminating capstone seminar in which the students share multidisciplinary approaches to the region and integrate knowledge of Southeast Asia with their respective disciplinary orientations.

Courses counting toward the Certificate in Southeast Asian Studies fulfill requirements for undergraduate majors and General Studies in the social and behavioral sciences, humanities, literacy, and global and historical awareness areas. A two year sequence in Southeast Asian language study meets the foreign language requirement for under graduates in CLAS.

The Program for Southeast Asian Studies is a federally funded National Resource Center for Southeast Asia For more information, contact the Program for Southeast Asian Studies, LL C32, 480/965-4232.

Translation. See "Certificate Program in Translation," page 383, for information about the Certificate in Translation.

Women's Studies. The curriculum of women's studies involves courses from colleges throughout the university. The program is designed with the following goals in mind:

1. to examine the central issues of the quality and shape of women's lives;
2. to provide a model for interdisciplinary teaching and research;
3 to generate and facilitate research on women's experi ence;
4. to provide the university and the community with pro grams, courses, and research that acknowledge and expand the potential of women, and
5. to stand as a visible example of the university's commit ment to change in the status of women

A Certificate of Concentration in Women's Studies is awarded for the successful completion of WST 100 (or 300) and 498 and an additional 15 semester hours from the list of approved women's studies courses, only six hours of which may also be applied toward the student's major.

Inquiries about the program should be addressed to the Women's Studies Program, EC A209, 480 965-2358, where the current list of approved courses is available.

GENERAL INFORMATION

Research Centers. To expand educational horizons and to enrich the curriculum, CLAS maintains the following research centers

Arizona Center for Medieval and Renaissance Studies
Cancer Research Institute
Center for Asian Studies
Center for Meteorite Studies
Center for Solid State Science
Center for the Study of Early Events in Photosynthesis
Exercise and Sport Research Institute
Hispanic Research Center
Institute of Human Origins
Latin American Studies Center

See "Research Centers, Institutes, and Laboratories," page 32, for a description of these research centers.

The faculty also offers the following LIA course to famil iarize students with available resources and services for research purposes.

LIBERAL ARTS AND SCIENCES (LIA)

LIA 390 The Use of Research Libraries. 3) F S Interd sc'p nary resources and serv ces of brar es, part cularly th s un vers ty s with emphas s on research nformat on l teracy, and appl ed cr t ca th nking sk s Lecture discuss on s te v sits *General Stud es L1*

For more information on LIA courses, see the current *Schedule of Classes* or contact the Office for Academic Pro grams, SS 111, 480/965 6506.

Department of Aerospace Studies

Air Force ROTC

Col. John J. Gorman Jr.
Chair
(TC 311) 480/965-3181
www.asu.edu/clas/afrotc

PROFESSOR
GORMAN

ASSISTANT PROFESSORS
KORBAS, OLSON RIZZA, WARDEN

PURPOSE

The Department of Aerospace Studies curriculum con sists of the general military course and history for freshmen and sophomores (AES 101, 103, 201, 203) and the profes sional officer course for juniors and seniors (AES 301, 303, 401, 403).

General Qualifications. A man or woman entering the Air Force Reserve Officers' Training Corps (AFROTC) must be the following:

1. a citizen of the United States (noncitizens may enroll but must obtain citizenship before commissioning);
2. of sound physical condition, and
3. at least 17 years of age for scholarship appointment or admittance to the Professional Officer Course (POC)

Additionally, scholarship recipients must be able to fulfill commissioning requirements by age 27. If designated for flying training, the student must be able to complete all commissioning requirements before age 26 and a half;

persons in other categories must be able to complete all commissioning requirements before age 30.

FOUR-YEAR PROGRAM (GMC AND POC)

A formal application is not required for students entering the four-year program A student may enter the program by simply registering for one of the general military course (GMC) classes at the same time and in the same manner as other courses GMC students receive two semester hours for each AES 100 and 200 class completed for a total of eight semester hours. GMC students not on AFROTC scholarship incur no military obligation. Each candidate for commissioning must pass an Air Force aptitude test and a physical examination and be selected by a board of Air Force officers. If selected, the student then enrolls in the POC the last two years of the AFROTC curriculum. Students attend a four week field training course at an Air Force base normally between the sophomore and junior years. Upon successful completion of the POC and the college requirements for a degree, the student is commissioned in the U.S. Air Force as a second lieutenant. The new officer then enters active duty or may be granted an educational delay to pursue graduate work.

TWO-YEAR PROGRAM (POC)

The basic requirement for entry into the two year program is that the student have two academic years of college work remaining, either at the undergraduate or graduate level. Applicants seeking enrollment in the two year program must pass an Air Force aptitude and medical examination and be selected by a board of Air Force officers. After successfully completing a six week field training course at an Air Force base, the applicant may enroll in the professional officer course (POC in the AFROTC program. Upon completion of the POC and the college requirements for a degree, the student is commissioned.

Qualifications. The following requirements must be met for admittance to the POC

1. The four year student must successfully complete the general military course and the four week field training course.
2. The two year applicant must complete a six week field training course.
3. All students must pass the Air Force Officer Qualifying Test (AFOQT)
4. All students must pass the Air Force physical examination.
5. All students must maintain the minimum GPA required by the college
6. All students must meet the physical fitness requirements.

Pay and Allowances. POC members in their junior and senior years receive $150 00 per month for a maximum of 20 months of POC attendance. Students are also paid to attend field training. In addition, uniforms, housing, and meals are provided during field training at no cost to the student Students are reimbursed for travel to and from field training

Scholarships. AFROTC offers scholarships annually to outstanding young men and women on a nationwide competitive basis Scholarships can cover college tuition for nonresident students and provide an allowance for books, fees, supplies and equipment, and a monthly tax free allowance of $150.00. Scholarships are available on a four-, three , or two year basis To qualify for a four or three year scholarship, a student must be a U S. citizen and submit an application before December 1 of the senior year in high school. Interested students should consult their high school counselors or call AFROTC at ASU for application forms to be submitted to

HQ AFROTC
MAXWELL AFB
AL 36112-6663

Students enrolled in AFROTC at ASU are eligible for a limited number of three or two year scholarships Those students interested must apply through the Department of Aerospace Studies. Consideration is given to academic grades, the score achieved on the AFOQT, and physical fitness. A board of officers considers an applicant's personality, character, and leadership potential.

AEROSPACE STUDIES (AES)

AES 101 Air Force Today I. 2 F
ntroduct on to U S A r Force and AFROTC Top cs nc ude. the A r Force m ss on and organ zat on, customs and courtesies, off cer opportunit es off cersh p, and profess ona sm

AES 102 Leadership Lab. (0) F
Emphasis on common A r Force customs and courtes es, dr l and cer emon'es, hea th and phys ca f tness through group part c pat on Corequ s te. AES 101

AES 103 Air Force Today II. (2 S
Cont nuat on of AES 101 Top cs nc ude: the A r Force miss on and organ zat on, customs and courtes es, off cer opportun t es off cer sh p, and profess'ona sm. Prerequ s te. AES 101 or department approva .

AES 104 Leadership Lab. (0) S
Cont nuat on of AES 102 w th more n depth emphas s on learn ng the env ronment of an Air Force officer Corequ s te: AES 103.

AES 201 The Evolution of USAF Air and Space Power I. (2 F
Further preparat on of the AFROTC cand date Top cs nclude. A r Force her tage and eaders commun cation sk s eth cs eadersh p, qual ty A r Force and va ues Prerequ s te AES 103 or department approva .

AES 202 Leadership Lab. 0) F
App cat on of advanced dri and ceremon es ssu ng commands know ng f ag et quette, and deve op ng, d rect ng, and eva uating sk s to ead others Corequ s te AES 201

AES 203 The Evolution of USAF Air and Space Power II. (2) S
Cont nuat on of AES 201 Top cs nc ude. the A r Force m ss on and organ zat on, customs and courtes es, off cer opportun t es off cer sh p and profess ona sm. Prerequ s te· AES 201 or department approva .

AES 204 Leadership Lab. (0) S
Continuat on of AES 202 w th an emphas s on preparat on for fie d tra n ng Corequ s te: AES 203

AES 301 Air Force Leadership Studies I. 3) F
Study of communication skil s eadersh p and qual ty management fundamenta s, eadersh p eth cs and profess ona know edge required of an A r Force off cer Prerequ s te AES 203 or department approval.
General Stud es L2

NOTE: For the Genera Stud es requ rement courses, and codes (such as L1, N3 C and H), see 'Genera Stud es" page 85 For graduat on requirements see Un vers ty Graduat on Requ rements" page 81 For an exp anat on of add't ona omn bus courses offered but not sted in th s cata og, see C ass f cat on of Courses, page 58

AES 302 Leadership Lab. (0) F
Advanced leadership experiences applying leadership and management principles to motivate and enhance the performance of other cadets. Corequisite: AES 301.

AES 303 Air Force Leadership Studies II. (3) S
Continuation of AES 301. Topics include: communication skills, ethics, leadership, professional knowledge, and quality management required of an Air Force officer. Prerequisite: AES 203 or department approval. *General Studies: L2.*

AES 304 Leadership Lab. (0) S
Continuation of AES 302 with emphasis on planning the military activities of the cadet corps and applying advanced leadership methods. Corequisite: AES 303.

AES 401 Preparation for Active Duty I. (3) F
Examines advanced ethics, Air Force doctrine, national security process, and regional studies. Special topics include: civilian control of the military, military justice, and officership. Prerequisite: AES 303 or department approval. *General Studies: L2.*

AES 402 Leadership Lab. (0) F
Advanced leadership experience demonstrating learned skills in planning and controlling the military activities of the corps. Corequisite: AES 401.

AES 403 Preparation for Active Duty II. (3) S
Continuation of AES 401. Topics include: civilian control of the military, doctrine, ethics, military justice, the national security process, and officership. Prerequisite: AES 401 or department approval.

AES 404 Leadership Lab. (0) S
Continuation of AES 402 with an emphasis on preparation for transition from civilian to military life. Corequisite: AES 403.

Palm Walk — Tim Trumble photo

African American Studies Program

Leanor Boulin Johnson
Director
(AG 201) 480/965-4399
www.asu.edu/clas/aframstu

CORE FACULTY
Associate Professor: Boulin Johnson;
Assistant Professor: Ramey;
Clinical Associate Professor: Cox

AFFILIATED FACULTY

Anthropology
Senior Lecturer: Winkleman

Art
Professor: Young

Communication
Assistant Professor: Davis

Dance
Faculty Associate: Ganyo

Education
Associate Professors: Fisher, Hood;
Assistant Professor: Matthews

English
Professor: Lester;
Associate Professors: Chancy, DeLamotte, Miller;
Assistant Professor: Fuse

Family Resources and Human Development
Associate Professor: Wilson

History
Associate Professor: Hendricks

Humanities
Assistant Professor: Lund

Journalism and Telecommunication
Associate Professor: Bramlett-Solomon

Justice Studies
Professors: Romero, Zatz

Life Sciences
Associate Professor: Graves (ASU West)

Music
Professor: Sunkett

Political Science
Associate Professor: Mitchell

Psychology
Faculty Associate: Obleton

Religious Studies
Associate Professor: Moore

Sociology
Associate Professor: Keith; Assistant Professor: Rhea

African American Studies (AAS) is interdisciplinary and focuses on people of African descent throughout the world. Focus is given to the diversity of past and present experiences of those who live in the United States as well as in

Africa, the Caribbean, South America, and Central America. As an institutional program with a bidisciplinary emphasis, AAS is structured to

1. prepare students of all ethnicities to better understand, value, and more effectively participate in our increasingly diverse society,
2. combine knowledge of the African diaspora with intellectual and practical training in specific areas for the purpose of creating more effective community and global partnerships; and
3. provide students with a foundation for advanced studies in a variety of fields. While the program is dedicated to scholarly research, teaching, and creative activities, it also seeks to build partnerships with community based programs and organizations within Arizona and utilize channels for informing policies which affect the life of Blacks in the diaspora.

AFRICAN AMERICAN STUDIES—B.A.

Course Requirements. The major in African American Studies requires 45 semester hours of course work. A minimum of 30 semester hours must be AFR, AFS, and AFH courses. The remaining course work must be in a related field approved by an AAS advisor All majors must take 18 hours in the following core courses:

AFH 353	African American Literature: Beginnings Through the Harlem Renaissance *L2 HL, C*	3
	or AFH 354 African American Literature Harlem Renaissance to the Present *L2/HU, C* (3	
AFR 210	Introduction to African American Studies	3
AFR 429	African American Studies Theory and Methods	3
AFR 490	Field Studies in the Diaspora	3
	or AFR 498 PS Pro Seminar (3	
AFS 363	African American History I *SB C H*	3
AFS 364	African American History II *SB, C, H*	3

Within the 45 semester hours, AAS majors must also take 12 semester hours in one of three concentrations: Social and Behavioral Sciences, Humanities/Arts, or Politics and Society. These courses are in addition to the required 18 core course semester hours. Of the remaining course work, 15 hours must be taken in related courses (i e., non African American Studies' prefixes). These courses must be selected from the concentrations (at least one from each concentration in consultation with the major advisor.

In addition, AAS majors will be required to take a minor or a certificate program of a minimum of 18 hours in another academic field.

MINOR IN AFRICAN AMERICAN STUDIES

Course Requirements. The minor requires 18 semester hours. All African American Studies minors must take nine core hours from the following courses:

AFH 353	African American Literature Beginnings Through the Harlem Renaissance *L2/HU. C*	3
	or AFH 354 African American Literature. Harlem Renaissance to the Present *L2/HL, C* (3	
AFR 210	Introduction to African American Studies	3
AFS 363	African American History I *SB, C, H*	3
	or AFS 364 African American History II *SB C H* 3	

In addition, one course from each of the three concentrations (i.e., Social and Behavioral Sciences, Humanities Arts, Politics and Society must be taken These courses are in addition to the required core courses A minimum of 12 hours of upper division courses is required Courses should be selected in consultation with the major advisor

CERTIFICATE IN AFRICAN AMERICAN STUDIES

Course requirements. The certificate requires 24 semester hours Fifteen core hours must be taken from the following courses:

AFH 353	African American Literature Beginnings Through the Harlem Renaissance *L2 HL, C*	3
	or AFH 354 African American Literature Harlem Renaissance to the Present *L2/HL, C* 3	
AFR 210	Introduction to African American Studies	3
AFR 429	African American Studies Theory and Methods	3
AFS 363	African American History I *SB C, H*	3
AFS 364	African American History II *SB C, H*	3

In addition, one course from each of the three concentrations (i.e , Social and Behavioral Sciences, Humanities/Arts, Politics and Society) must be taken. These courses are in addition to the required core courses. Courses should be selected in consultation with the major advisor

AFRICAN AMERICAN STUDIES (AFH)

AFH 353 African American Literature: Beginnings Through the Harlem Renaissance. 3 F
Themat c and cu tura study of Afr can Amer can terature through the Har em Rena ssance Cross sted as ENG 353 Cred t s a owed on y for AFH 353 or ENG 353 *Genera Stud es L2/HU C*

AFH 354 African American Literature: Harlem Renaissance to the Present. (3) S
Themat c and cu tural study of Afr can Amer can terature from the Harlem Renaissance to the present Cross sted as ENG 354 Credit s a lowed on y for AFH 354 or ENG 354 *Genera Stud es L2/HU C*

AFRICAN AMERICAN STUDIES (AFR)

AFR 191 First Year Seminar.

AFR 194, 294, 394, 494, 598 ST: Special Topics.

AFR 210 Introduction to African American Studies. (3 F
Exam nat on of the po t cal h stor ca and cu tura orig ns f Afr can Amer can stud es as an academ c d sc p ne Lecture, d scuss on.

AFR 298, 492 Honors Directed Study.

AFR 429 African American Studies Theory and Methods. 3) S
Exam nes soc al and behav ora sc ence theor es and methodo og ca procedures perta n ng to Afr can Amer ca s. Prerequ s te: sen or stand ng

AFR 484, 584, 684, 784 Internship.

AFR 490 Field Studies in the Diaspora. 3 S
Introduct on t methods and pr nc p es of research app ed to B ack communit es w th n and outs de Ar zona Invo ves work ng w th f e d off cer and facu ty Lecture f e d study P erequ s te sen o standing Pre or corequ s te AFR 429

AFR 493 Honors Thesis.

AFR 497 Honors Colloquium.

AFR 498 PS: Pro-Seminar. 3 S
Top c s se ected by nstru tor n consu tat on w th the student Des gned to ntegrate and deve op research sk s Req red for majors Prerequ s te Sen or stand ng. Pre or corequ s te AFR 429

AFR 499 Individualized Instruction.
AFR 500, 600, 700 Research Methods.
AFR 580, 680, 780 Practicum.
AFR 583, 683, 783 Field Work.
AFR 590, 690, 790 Reading and Conference.
AFR 591, 691, 791 Seminar.
AFR 592, 692, 792 Research.
AFR 593, 693, 793 Applied Project.
AFR 594 Conference/Workshop.
AFR 595, 695, 795 Continuing Registration.
AFR 599 Thesis.
AFR 799 Dissertation.

AFRICAN AMERICAN STUDIES (AFS)

AFS 363 African American History I. (3 F
The African American n Amer can h story thought and cu ture from s avery to 1865. Cross l sted as H S 363 Cred t s a lowed on y for AFS 363 or H S 363 *Genera Studies· SB C, H*

AFS 364 African American History II. (3) S
The African American in Amer can history, thought and cu ture from 1865 to the present Cross l sted as H S 364 Cred t s a lowed only for AFS 364 or HIS 364. *General Stud es SB C H*

Department of Anthropology

Barbara L. Stark
Chair
(ANTH A124) 480/965-6213
www.asu.edu/clas/anthropology

REGENTS' PROFESSOR
TURNER

PROFESSORS
ALVAREZ, BAHR, BRANDT, CARR, CHANCE CLARK, COWGILL EDER, HUDAK, JOHANSON, K NTIGH, KOSS-CHIOINO, MARTIN MARZKE, MERBS, NASH, REDMAN, SCHOENWETTER, STARK WILLIAMS

ASSOCIATE PROFESSORS
BARTON, FALCONER, HEDLUND, HEGMON, KIMBEL, B. NELSON M NELSON, RICE, SPIELMANN

ASSISTANT PROFESSORS
BAKER REED STEADMAN, WELSH

SENIOR LECTURER
WINKELMAN

ASSOCIATE RESEARCH PROFESSOR
S MON

ASSISTANT RESEARCH PROFESSOR
McCARTNEY

ANTHROPOLOGY—B.A.

Course Requirements. The Anthropology major consists of 45 semester hours of which 36 must be in anthropology and nine in related fields At least 18 of the semester hours must be in upper division courses (300–400 level). Three of the nine hours in related fields must be in statistics Related fields are determined by the students in consultation with his or her advisor. No ASU courses are automatically classed as related and none are automatically classed as unrelated. In effect, and depending on the student's own program and special interests, any ASU or other university) course may be defined as related Course requirements for the major are distributed as follows

Required Courses
ASB 102 Introduction to Cultural and Social Anthropology *SB, G* 3
ASM 101 Human Origins and the Development of Culture *SB* 3
Total 6

Distribution Requirements
Archaeo ogy 6
Archaeology/Physical anthropology 3
Ethnographic 3
Linguist cs 3
Physical anthropology 6
Social/cultural 6

Related Fields
Approved Courses 6
Statistics 3

Elective
Anthropo ogy 3

Course work in anthropology completed at other institu tions will be evaluated through the Anthropology Under graduate Advising Office. The College of Liberal Arts and Sciences requires that transfer students complete at least 12 hours of upper division course work at ASU in the depart ment of their major in order to be eligible for graduation

In addition to a cumulative GPA of 2 00 or higher, all Anthropology students must obtain a minimum grade of "C" in all upper and lower division Anthropology courses and all related fields.

Each student's program of study must be approved by his or her advisor in consultation with the student. Consultation with the advisor is recommended each semester.

Latin American Studies Certificate or Emphasis. Stu dents majoring in Anthropology may elect to pursue a Latin American Studies Certificate or emphasis, combining courses from the major with selected outside courses of wholly Latin American content See "Latin American Studies," page 332, for more information.

Certificate in Museum Studies. See the *Graduate Catalog* or contact the Department of Anthropology for more information.

MINOR IN ANTHROPOLOGY

The Anthropology minor requires 18 semester hours. Two courses, ASB 102 and ASM 101, are required. The other 12 hours must be upper division and represent at least two of the three subfields of anthropology The three subfields include sociocultural anthropology (and linguistics), archae ology, and physical anthropology. At least one course in

NOTE: For the General Stud es requ rement courses and codes (such as L1 N3, C and H) see 'Genera Studies, page 85 For graduat on requ rements see Un vers ty Graduat on Requ rements page 81 For an exp anat on of add t onal omn bus courses offered but not isted n th s cata og, see C ass f cat on of Courses " page 58

each of the subfields selected should be drawn from the "Distribution Requirements" course listings for archaeol ogy, physical anthropology, and sociocultural/linguistics. A minimum grade of "C" is required for all courses taken for an Anthropology Minor

The minor in Anthropology provides students with a great deal of flexibility in selecting courses. The program has been designed to allow students to focus on areas within the discipline which articulate well with their major. All students interested in the anthropology minor are encouraged to discuss the options available with the Anthropology Undergraduate Advisor, whose office is located in ANTH A111.

SECONDARY EDUCATION—B.A.E.

Social Studies. The major teaching field consists of 63 semester hours, of which 30 hours must be in the anthropology courses required for the B.A. degree. Of the remaining hours, two groups of 15 hours are to be taken in related social sciences. Psychology or a single natural science may be used as one of the 15-hour fields. SED 480 is taken to provide the remaining three hours.

SED 480 Special Methods of Teaching Social Studies	3
Anthropology	30
Social sciences	15
Social sciences, natural sciences, or psychology	15
Total	63

The minor teaching field consists of 24 semester hours in anthropology. Courses ASB 102 and ASM 101 and two upper-division courses in each subfield (archaeology, physical anthropology, and social cultural anthropology) are required.

GRADUATE PROGRAM

The faculty in the Department of Anthropology offer programs leading to the M.A. and Ph.D. degrees Consult the *Graduate Catalog* for requirements.

ANTHROPOLOGY (ASB)

ASB 102 Introduction to Cultural and Social Anthropology. (3) F S
Principles of cultural and social anthropology with illustrative materials from a variety of cultures The nature of culture. Social, political, and economic systems; religion aesthetics, and language *General Studies SB, G*

ASB 202 Ethnic Relations in the United States. (3) F, S
Processes of intercultural relations, systems approach to history of U.S interethnic relations, psychocultural analysis of contemporary U.S. ethnic relations. *General Studies· C H.*

ASB 210 Sex, Marriage, and Evolution. (3) F
Examination of the sexual nature and behavior of humans from both a biological and an anthropological point of view

ASB 211 Women in Other Cultures. (3) N
Cross-cultural analysis of the economic social political and religious factors that affect women's status in traditional and modern societies *General Studies: G*

ASB 222 Buried Cities and Lost Tribes: Our Human Heritage. (3) S
Archaeology through its most important discoveries human origins Pompeii King Tut, the Holy Land Southwest Indians and methods of field archaeology. *General Studies. HU.*

ASB 223 Buried Civilizations of the Americas. (3) F, S
Archaeology through examination of several ancient civilizations of Meso-, South and North America.

ASB 231 Archaeological Field Methods. (4) S
Excavation of archaeological sites and recording and interpretation of data. Includes local field experience 2 hours lecture 8 hours lab Prerequisite ASM 101 or instructor approval. *General Studies: S2*

ASB 240 Introduction to Southeast Asia. 3) F
An interdisciplinary introduction to the cultures, religions, political systems, geography and history of Southeast Asia. Cross listed as GCU 240 HIS 240 POS 240 REL 240. Credit is allowed only for ASB 240 or GCU 240 or HIS 240 or POS 240 or REL 240 *General Studies G*

ASB 242 Asian American Experiences: An Anthropological Perspective. (3 F
The historical and contemporary experiences of Asian Americans in terms of the anthropological concepts of culture, ethnicity, and adaptation. *General Studies: L1 C*

ASB 250 Anthropology Topics. 3 S
Covers five areas of anthropological inquiry Emphasizes library research critical analysis and communication skills relevant to upper division anthropology course work Prerequisites ASB 102; ASM 101 (or equivalent), completion of the First Year Composition requirement *General Studies. L1.*

ASB 302 Ethnographic Field Study in Mexico. (3) SS
Fieldwork study of cultural adaptation, Mexican culture United States Mexican cultural conflict, ethnographic research methods, and local culture Lecture, discussion, field research Prerequisite: SPA 101 or equivalent *General Studies. L1/SB, G*

ASB 311 Principles of Social Anthropology. (3) S
Comparative analysis of domestic groups and economic and political organizations in primitive and peasant societies *General Studies. SB*

ASB 314 Comparative Religion. (3 F S
Origins, elements, forms, and symbolism of religion a comparative survey of religious beliefs and ceremonies the place of religion in the total culture Prerequisite ASB 102 or instructor approval

ASB 319 The North American Indian. (3) A
Archaeology ethnology, and linguistic relationship of the Indians of North America Does not include Middle America. Prerequisite· ASB 102 or instructor approval

ASB 320 Indians of Arizona. (3) F
The traditional cultures and the development and nature of contemporary political economic and educational conditions among Arizona Indians

ASB 321 Indians of the Southwest. (3) S
Cultures of the contemporary Indians of the Southwestern United States and their historic antecedents. Prerequisite. ASB 102 or instructor approval. *General Studies. L2/SB C H*

ASB 322 Indians of Mesoamerica. (3 S
Historic tribes and folk cultures. Prerequisite. ASB 102 or instructor approval *General Studies· SB G*

ASB 323 Indians of Latin America. (3) F
Indigenous cultures of the Amazon the Andean region, Central America, and southern Mexico Lecture, discussion. Prerequisite ASB 102 or instructor approval *General Studies· SB G*

ASB 324 Peoples of the Pacific. (3) N
Peoples and cultures of Oceania focusing particularly on societies of Melanesia Micronesia, and Polynesia Prerequisite ASB 102 or instructor approval *General Studies G*

ASB 325 Peoples of Southeast Asia. (3) F
A cultural-ecological perspective on the peoples of mainland and insular Southeast Asia Subsistence modes, social organization, and the impact of modernization Prerequisite· ASB 102 or instructor approval. *General Studies. G*

ASB 326 Human Impacts on Ancient Environments. (3) S
A world survey of successful and unsuccessful ancient societies and their impacts on the environment *General Studies· SB, H.*

ASB 330 Principles of Archaeology. (3) F S
Methods and theories for reconstructing and explaining the lifeways of prehistoric peoples Prerequisite 3 hours of archaeology. *General Studies· SB.*

ASB 333 New World Prehistory. (3) F
The variety of archaeological patterns encountered in the Western Hemisphere Covers the period from the appearance of humans in the New World to European contact; covers the area from Alaska to Tierra del Fuego Prerequisite· completion of the First Year Composition requirement Pre- or corequisite 1 upper-division course in ASU course *General Studies. L2/SB.*

ASB 335 Prehistory of the Southwest. 3) F S
Anthropolog cal understand ngs of major cu tura processes and events in the preh'story of the Amer can Southwest us ng ev dence from archaeo ogy *Genera Stud es SB C H.*

ASB 337 Pre-Hispanic Civilization of Middle America. (3) S
Preconquest cu tures and c v zat ons of Mex co The Aztecs, Mayas and the r predecessors Prerequ s te ASM 101 or nstructor approval. *General Stud es H*

ASB 338 Archaeology of North America. 3) N
Or g n spread, and deve opment of the preh stor'c Ind ans of North Amer ca up to the h stor c tr bes *Does not nc ude the Southwest* Pre requ s te. ASM 101 or nstructor approva

ASB 350 Anthropology and Art. 3 A
Art forms of people n re at onsh p to the r soc a and cu tura sett ng Prerequ s te: ASB 102 or nstructor approva

ASB 351 Psychological Anthropology. 3) S
Approaches to the nterre at ons between the personal ty system and the sociocu tura environment Prerequ s te ASB 102 or nstructor approva *General Stud es. SB*

ASB 353 Death and Dying in Cross-Cultural Perspective. (4) F
Humanist c and sc'entif'c study of ag ng sickness dy ng, death, funerals and grief and the'r ph losophy and eco ogy n non Western and Western cultures. 3 hours ecture, 1 hour d scussion *Genera Stud es· HU/SB, G*

ASB 355 Shamanism, Heal ng and Consciousness. (3 S
World v ews, pract ces and ro es of shamans and trad tiona and contemporary hea ers exp anatory b opsycho og ca mode s of con sciousness *General Stud es· HU SB*

ASB 361 Old World Prehistory I. (3 F
B osocia evo ut'on n the Ple stocene, emphas z ng techno og ca achievements and the re at onsh p between techno ogy and env ron ment n western Europe, sub-Saharan Afr ca Prerequ s te *ASM 101* or nstructor approva *General Stud es. H.*

ASB 362 Old World Prehistory II. (3) S
Transition from hunt ng and co ecting soc eties to domest cat on econ omies establi shment of sett ed v age ife emphas z ng the Near East Egypt Southwest Europe Prerequ s te ASM 101 or instructor approva *General Studies. H*

ASB 383 Linguistic Theory: Phonetics and Phonology. (4 F
Basic art cu atory phonet cs and contemporary theor es of the sound system of language 3 hours lecture 1 hour ab. *General Studies SB*

ASB 400 Cultural Factors in International Business. *(3)* S
Anthropolog ca perspect ves on nternat ona bus'ness relat ons app ied princip es of cross-cu tura commun cat on and management, reg onal approaches to cu ture and bus ness *Genera Stud es G*

ASB 411 Kinship and Social Organization. (3) S
Mean ngs and uses of concepts referr ng to k nsh p consangu nity affin ty descent al ance, and res dence n the context of a survey of the variet es of socia groups marr age ru es, and k nsh p termino og 'ca systems Prerequ s te 6 hours of anthropo ogy or instructor approva .

ASB 412 History of Anthropology. 3) F
H storica treatment of the deve opment of the cu ture concept and ts express on n the ch ef theoret ca trends n anthropo ogy between 1860 and 1950 Prerequ s te ASB 102 or nstructor approva *General Studies· L2/SB*

ASB 416 Economic Anthropology. (3) F
Econom c behav or and the economy n pre ndustria soc eties descr pt on and c ass fcat on of exchange systems, re at ons between product on exchange systems and other soc eta subsystems Pre requisite: ASB 102 or nstructor approva *Genera Stud es: L2/SB*

ASB 417 Political Anthropology. (3) A
Comparat ve exam'nat on of the forms and processes of po t ca organizat on and act v ty n pr m tive peasant and comp ex soc eties. Pre requ's te: ASB 102 or nstructor approval

ASB 462 Medical Anthropology: Culture and Health. 3) F 2000
Ro e of culture n hea th l ness, and cur ng, hea th status, prov der re ations and nd genous hea ng practices n Un ted States ethnic groups. Lecture d scuss on. *Genera Stud es C*

ASB 471 Introduction to Museums. 3 F
H story ph osophy, and current status of museums Exp orat on of co lect ng preservat on exh bition education and research act v t es n different types of museums. Prerequ s tes ASB 102 and ASM 101 *or* instructor approva . *Genera Studies· L2*

ASB 480 Introduction to Linguistics. 3 F
Descr pt ve and h stor cal inguist cs Survey of theor es of human lan guage emphas z ng synchron c ingu st cs *General Stud es· SB*

ASB 481 Language and Culture. (3) S
App cat on of ngu stic theories and f nd ngs to non ngu stic aspects *of culture anguage change, psycho ngu st cs Prerequisite ASB 102* or instructor approva . *Genera Stud es SB*

ASB 483 Sociolinguistics and the Ethnography of Communication. (3) N
Re ationsh ps between ngu st c and soc a categor es, funct onal ana ys s of anguage use, ma ntenance, and d vers ty nteraction between verba and nonverba commun cat on. Prerequ s tes ASB 480 and ENG 213 (or FLA 400) *or* instructor approval *General Studes· SB*

ASB 501 Applied Medical Anthropology. (3 F
Overv ew of anthropo ogy s app cat ons n med c ne and ts adapta t ons to U S ethn c popu at ons Requ res research project n med cal sett ng Lecture sem nar Prerequ s te graduate stand ng or nstructor approva .

ASB 502 Health of Ethnic Minorities. (3) S
Preva ence of ness r sk factors hea th eco ogy and med ca and indigenous treatments Lecture, seminar. Prerequ s te graduate stand ng or nstructor approva .

ASB 503 Advanced Medical Anthropology. (3) F
Theory n Med ca Anthropo ogy and cross cu tura stud es that us trate part cu ar theor es Lecture sem nar Prerequis te: graduate *stand g or nstructor approval*

ASB 504 Ethnic Relations. (3) F
Structura processes of ntergroup re at ons methods for nvest gat ng psychocu tural d mens ons of ethnic ty with focus upon U S ethn c groups. Lecture sem nar Prerequ s te graduate stand ng or nstructor approva

ASB 505 Culture and Psychiatry. 3) F
Psych atry as a cu tura phenomenon and ind genous def n t ons and treatments of menta d sorders across cultures Lecture, sem'nar. Pre requ s te graduate stand ng or nstructor approva

ASB 506 Gender, Emotions, and Culture. 3 S
Re ationsh ps among gender and emot on across cu tures Lecture sem nar Prerequ s te graduate stand ng or nstructor approva

ASB 529 Culture and Political Economy. 3 N
Or g n and spread of Western capita sm and ts impact on non-Western soc et es Ethnograph c and h stor ca case stud es are uti zed Prerequ'site· graduate stand ng

ASB 530 Ecological Anthropology. (3 A
Relat ons among the popu at on dynam cs social organ zat on, cu ture, and environment of human popu at ons, w th spec a emphas s on hunter gatherers and extensive agricu tura sts.

ASB 532 Graduate Field Anthropology. 2–8) S
ndependent research on a spec f'c anthropolog'ca prob em to be se ected by the student in consultat on with the staff May be repeated for cred t Prerequ s tes ASM 338 or equiva ent· nstructor approva .

ASB 536 Ethnohistory of Mesoamerica. (3) N
Ind genous soc et es of southern Mex co and Guatema a at Spanish contact and the r postconquest transformat on Emphasis s on the Aztec Emp re Prerequisite: graduate stand ng

ASB 537 Topics in Mesoamerican Archaeology. (3 N
Changing organ zat on of pre Co umb an civi zations in Mesoamer ca s explored through nterpret ve ssues, such as regiona ana ys s ch efdoms urban sm and exchange Prerequisite nstructor approval.

ASB 540 Method and Theory of Sociocultural Anthropology and Archaeology I. 3) F
Bas c ssues concern ng concepts of soc a and ethn c groups, cultura and soc o og cal theory, and the nature of anthropo og ca research. Prerequ s te nstructor approva

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NOTE: For the General Stud es requirement courses, and codes (such as L1 N3 C, and H), see Genera Stud es," page 85 For graduation requ rements see Un vers ty Graduat on Requ'rements ' page 81. For an explanat on of add t ona omn bus courses offered but not l sted n th's cata og see C ass f cat on of Courses,' page 58

ASB 541 Method and Theory of Social and Cultural Anthropology. (3) S
Continuation of ASB 540 Prerequisite ASB 540 or instructor approval.

ASB 542 Method and Theory of Archaeology II. 3) S
Modes of human evolution culture change and interpretation of hunter gatherer and tribal societies ceramic lithic and faunal materials Prerequisite instructor approval

ASB 543 Method and Theory of Archaeology III. (3) F
Covers concepts of social complexity along with economy demography and social dynamics followed by archaeological research design Prerequisite instructor approval

ASB 544 Settlement Patterns. 3) N
Spatial arrangement of residences, activities and communities over landscape Emphasis on natural and cultural factors influencing settlement patterns. Prerequisite instructor approval.

ASB 546 Pleistocene Prehistory. 3) F
Development of society and culture in the Old World during the Pleistocene epoch, emphasizing technological change through time and the relationship of people to their environment Prerequisite. ASB 361 or equivalent

ASB 547 Issues in Old World Domestication Economies. (3) S
Archaeological evidence for transitions in Old World subsistence economies from hunting and gathering to dependence on domesticated plants and animals Prerequisite ASB 362 or equivalent.

ASB 550 Economic Archaeology. 3 N
Prehistoric economies in hunter-gatherer tribal, and complex societies Subsistence strategies, craft production and specialization and exchange covered Prerequisite instructor approval

ASB 551 Prehistoric Diet. (3) N
Includes 1) a critical review of techniques for recovering dietary information and (2) theoretical models concerned with explaining diet and nutrition. Prerequisite instructor approval

ASB 555 Complex Societies. (3) S
Structural variations in hierarchically organized societies along with origins dynamics and collapse are examined Seminar

ASB 559 Archaeology and the Ideational Realm. 3 N
Post processual' and other views concerning relevance of mental phenomena for understanding social culture change Various approaches to inferring prehistoric meanings.

ASB 563 Hunter-Gatherer Adaptations. 3 N
Evolution of prehistoric hunter gatherer societies in the Old and New Worlds from the most ancient times through protohistoric chiefdoms. Prerequisite instructor approval

ASB 567 Southwestern Archaeology. (3) S
Broad coverage of Southwestern cultural developments focusing on current debates and rigorous use of archaeological data in making cultural inferences

ASB 568 Intrasite Research Strategies. (3) F
Research issues with an analysis site definition sampling, distributional analysis, and substantive interpretation.

ASB 571 Museum Principles. (3 F
History philosophy and current status of museums Exploration of collecting preservation exhibition education and research activities in different types of museums Prerequisites ASB 102 and ASM 101 *or* instructor approval

ASB 572 Museum Collection Management. (3) S
Principles and practices of acquisition documentation care and use of museum collections registration, cataloging and preservation methods; legal and ethical issues Prerequisite: ASB 571 or instructor approval

ASB 573 Museum Administration. (3 S
Formal organization and management of museums governance personnel matters; fund raising and grantsmanship, legal and ethical issues Prerequisite ASB 571 or instructor approval

ASB 574 Exhibition Planning and Design. (3) S
Exhibition philosophies and development processes of planning designing, staging installing evaluating and disassembling temporary and long term exhibits Prerequisites ASB 571 and 572 *or* instructor approval.

ASB 575 Computers and Museums. (3) F
Basics of museum computer application hardware and software; fundamentals of database management issues of research, collections management and administration.

ASB 576 Museum Interpretation. (3 F
Processes of planning implementing documenting and evaluating educational programs in museums for varied audiences—children adults, and special interest groups Lecture discussion Prerequisite ASB 571

ASB 577 Principles of Conservation. 3) S
Preservation of museum objects nature of materials environmental controls and causes of degradation recognizing problems, damage and solutions proper care of objects Prerequisites ASB 571 and 572 *or* instructor approval

ASB 579 Critical Issues in Museum Studies. 3 F
Current debates of museum practice from an anthropological perspective Issues of collection, presentation authenticity and authority are addressed Seminar Prerequisite. ASB 571 or instructor approval

ASB 591 Seminar. (3 N
Selected topics in archaeology linguistics and socio-cultural anthropology
(a) Archaeological Ceramics
(b Archaeology of North America
(c) Cultural Anthropology
(d) Culture and Personality
(e) Evolution and Culture
(f) Historical Archaeology
(g) Interdepartmental Seminar
(h) Language and Culture
Linguistics
(j) Museum Studies
(k) Problems in Southwestern Archaeology
) Problems in Southwestern Ethnology
(m) Social Anthropology

ANTHROPOLOGY (ASM)

ASM 101 Human Origins and the Development of Culture. 3) F S
Physical anthropology and archaeology. Evidence and processes of human evolution and of culture change Primates Fossil hominids and their relations Race variation and heredity Environment and human biology Prehistoric culture and society. *General Studies SB*

ASM 241 Biology of Race. 3 F, S
Human variation and its interpretation in an evolutionary context

ASM 246 Human Origins. 3 F
History of discoveries and changing interpretations of human evolution. Earliest ancestors to emergence of modern humans Humanity's place in nature

ASM 301 Peopling of the World. 3 S
Course reviews archaeological evidence for human dispersal during the last 100,000 years origins of language cultures races and beginnings of modern humans Prerequisite ASM 101 *General Studies SB*

ASM 338 Anthropological Field Session. 2–8 S
Anthropological field techniques analysis of data and preparation of field reports May be repeated for credit. Prerequisite instructor approval

ASM 341 Human Osteology. (4 F
Osteology, human paleontology and osteometry Description and analysis of archaeological and contemporary human populations. 3 hours lecture 3 hours lab Prerequisite ASM 101 or instructor approval

ASM 342 Human Biological Variation. 4 S
Evolutionary interpretations of biological variation in living human populations, with emphasis on anthropological genetics and adaptation. Nutrition and disease and their relation to genetics and behavior 3 hours lecture 3 hours lab Prerequisites ASM 101 and MAT 106 (or equivalent) *or* instructor approval *General Studies. S2*

ASM 343 Primatology. 3 F
Evolution and adaptations of nonhuman primates, emphasizing social behavior includes materials from fossil evidence and field and laboratory studies in behavior and biology Prerequisite ASM 101 or instructor approval

ASM 344 Fossil Hominids. 3 N
Ancient African Asian and European human and primate skeletal, dental, and cultural remains Human biological and cultural evolution Prerequisite ASM 101 or instructor approval *General Studies H*

ASM 345 Disease and Human Evolut'on. 3 F
nteract on of peop e and pathogens from preh stor c t mes to the present w th emphas s on d sease as an agent of genet c se ect on Prerequ s te ASM 101 or nstructor approva

ASM 348 Social Issues in Human Genetics. 3 S
Mora and soc a imp cat ons of deve opments n genet c sc ence part'cu ar y as they affect reproduct on med c ne and evo ut on *Genera Stud'es SB*

ASM 365 Laboratory Methods in Archaeology. (4 N
Techniques of artifact analysis Bas c ar haeo og ca research tech n ques, methods of report wnt g May be repeated for cred t for total of 8 hours Prerequ s te ASM 101 or nstructor approva

ASM 435 Archaeological Pollen Analysis. (3 F
Theory, methodo ogy and pract'ce of po en analyt c techn ques. Com pares uses n botany, geo ogy and archaeology 2 hours ecture, 3 hours ab, poss b e f e d tr ps. Prerequ s te instructor approva .

ASM 450 Bioarchaeology. 3 S
Surveys archaeolog ca and phys ca anthropo og ca methods and theor es for eva uat ng ske eta and bur a rema ns to reconstruct b ocu tura adaptation and feways Prerequ s te ASM 101 or nstructor approva

ASM 452 Dental Anthropology. 4) F
Human and pr mate denta m rpho ogy growth evo ut on and genet cs W th n and between-group var at n Denta patho ogy and behav oral cu tura d etary factors 3 hours ecture 3 hours lab Prerequ s te nstructor approva *Genera Stud es. S2*

ASM 454 Comparative Primate Anatomy. 4 S
Functiona anatomy of the cran a de tal and ocomotor apparatus of pr'mates nc ud ng humans emphas z ng the relat on of morpho ogy to behav or and env ronment 3 hours ecture 3 hours ab, d ssections, demonstrat ons Prerequ s te nstructor appr va

ASM 455 Primate Behavior Laboratory. 3) N
Instruct on and pract ce in meth ds of observat on and ana ys s of primate behav or D scuss on of the re at nsh p between class work on captive an ma s and f e d techn ques f r study ng free rang ng groups D rected read ngs, 6 hours ab Prerequ s tes ASM 343 nstructor approva *Genera Stud es. L2*

ASM 465 Quantification and Analysis for Anthropologists. (3) S
Stat st cal, quant'tat've and geometr c strateg es for env s on ng and explor ng archaeo og ca phys ca anthropo g ca b oarchaeo og cal and soc ocultura data. Un var ate and mu t var ate methods Prerequ s tes introductory stat st ca course, nstructor approva

ASM 472 Archaeological Ceramics. 3 N
Ana ys s and ident f cat on of pottery wares types and var eties. Sys tems for ceram c c assif cat on and cu tura interpretat on. 2 hours ec ture, 3 hours ab Prerequ s te nstructor approva

ASM 507 Anthropolog cal Study of Disease. (3) A
n-depth introduct on to the study of d sease processes from an anthropolog cal perspect ve. Lecture sem nar Prerequ site: graduate stand ng or nstructor approva

ASM 548 Geoarchaeology. 3) F
Geolog c context re evant to archaeo og ca research Top cs include sed ments, dep s t on env ronments so s anthropogen c and b ogen c depos ts, and quaternary chrono ogy Prerequ s te nstructor approva

ASM 555 Advanced Human Osteology. 3 N
Laboratory and f e d techn ques n dea ng w th the human ske eton. Emphas s on preparat on dent f cat on, rad ography sect on ng m croscopy and data process ng 1 hour ecture, 6 hours ab Prereq u site ASM 341 or nstructor approva

ASM 565 Quantitative Archaeology. (3) S
Formal methods of structur ng cod fy ng and ana yz ng data for archaeo og ca prob ems Des gn ng research to y e d data amenab e to product ve ana ys s

ASM 566 Advanced Topics in Quantitative Archaeology. (3) F
Archaeo og ca issues assoc ated w th quant tat ve ana ysis, e g. Bayesian and Monte Car o approaches, s mu at on d vers ty. May be repeated for cred t Prerequ s te ASM 565 or nstructor approva

ASM 573 Lithic Analys s. 3 N
Ana ys s and nterpretat on of ch pped stone art facts Focus on both techn ques and under y ng concepts and the r app cat on to rea col ections Prerequ s te nstructor approva

ASM 591 Seminar. 3) N
Se ected top cs n archaeo ogy and phys ca anthropo ogy
(a) B oarchaeo ogy
(b) Evo ution and Culture
(c) Interdepartmenta Sem nar
(d) Phys ca Anthropo ogy
(e) Primates and Behav or

Department of Biology

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REGENTS' PROFESSORS
ALCOCK, MARKOW

PROFESSORS
CAPCO, CHANDLER, CHURCH, COLLINS FAETH, FISHER, HAZEL, HEDR CK LAWSON, MAIENSCHEIN, McGAUGHEY, MINCKLEY, MOORE, OHMART, RISSING, RUTOWSKI, SATTERLIE, A. SMITH, WALSBERG

ASSOCIATE PROFESSORS
CARROLL, DEVICHE, DOWLING ELSER, FOUQUETTE, GOLDSTEIN, GRIMM, HARR SON, G. SM TH

ASSISTANT PROFESSORS
DeNARDO, FAGAN, FEWELL, K NZ G, KUMAR, NEWFELD, ORCHIN K RAWLS, STRICK

ACADEMIC PROFESSIONALS
DOUGLAS, KAZILEK

RESEARCH PROFESSOR
PEARSON

RESEARCH ASSOCIATE PROFESSOR
DAV DSON

BIOLOGY—B.S.

The major in Biology consists of a minimum of 43 semester hours in biology, and a minimum of 17 semester hours in related fields, plus a three semester hour mathe matics proficiency. Required major courses are as follows:

BIO	193	The Nature of Biological Science *S1/S2* or BIO 181 General Biology *S1/S2* 4) and BIO 182 General Biology *S2* 4	4
BIO	320	Fundamentals of Ecology	3
BIO	340	General Genetics	4
BIO	353	Cell Biology	3
BIO	360	Basic Physiology or MIC 360 Bacter al Phys ology 3) or PLB 308 Plant Phys ology 4)	4

NOTE: For the Genera Stud es requ rement courses and codes (such as L1, N3, C, and H) see "Genera Stud es " page 85 For graduat on requ rements see 'Un vers ty Graduat on Requ rements " page 81. For an exp anat on of add t onal omn bus courses offered but not sted in th s cata og see C ass f cat on of Courses page 58

BIO	370	Vertebrate Zoology 4
		or BIO 385 Comparative Invertebrate Zoology 4
		or MIC 206 Microbiology Laboratory *S2** 1
		and MIC 220 Biology of Microorganisms (3
		or PLB 300 Comparative Plant Diversity *L2/S2* (4)
BIO	445	Organic Evolution 3
Total		 25

* Both MIC 205 and 206 must be taken to secure S2 credit.

The remaining hours to bring the total to 43 will be selected from among upper division courses in BIO, MIC, and PLB, in consultation with a Department of Biology advisor. The major must include at least three upper division laboratory courses, and at least one upper division course in plant biology (PLB) or microbiology (MIC). Required courses in related fields plus math proficiency are as follows:

CHM	113	General Chemistry *S1/S2* . . 4
CHM	115	General Chemistry with Qualitative Analysis *S1/S2* 5
Choose between the combinations of organic chemistry courses below . . . . . 4 or 8		
	CHM 231	Elementary Organic Chemistry *S1/S2*[1] 3
	CHM 235	Elementary Organic Chemistry Laboratory *S1 S2* (
		or
	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)
MAT	210	Brief Calculus *N1* 3
		or any calculus
PHY	101	Introduction to Physics *S1/S2* . . 4
		or PHY 111 General Physics *S1 S2*- 3)
		and PHY 112 General Physics *S1 S2*[2] 3
		and PHY 113 General Physics Laboratory *S1/S2* 1
		and PHY 114 General Physics Laboratory *S1/S2* 1)
Total		. . . . . 20 or 24

[1] Both CHM 231 and 235 must be taken to secure S1 or S2 credit

[2] Both PHY 111 and 113 or PHY 112 and 114 must be taken to secure S1 or S2 credit.

CONSERVATION BIOLOGY—B.S.

The major in Conservation Biology consists of a minimum of 45 semester hours in the required major courses and a minimum of 13 hours in related fields, plus a three semester hour mathematics proficiency. Required courses are as follows:

BIO	193	The Nature of Biological Science *S1/S2* . 4
		or BIO 181 General Biology *S1/S2* (4
		and BIO 182 General Biology *S2* 4)
BIO	317	Conservation Biology 3
BIO	320	Fundamentals of Ecology 3
BIO	340	General Genetics 4
BIO	360	Basic Physiology 4
BIO	410	Techniques in Wildlife Conservation Biology *L2* 3
BIO	411	Advanced Conservation Biology I. 3
BIO	412	Advanced Conservation Biology II 3
BIO	415	Biometry *N2*. 4
Total		 31

The remaining hours to bring the total to 45 will be selected from among relevant upper division courses in BIO and PLB courses or in related departments, in consultation with the Department of Biology. Required courses in related fields plus math proficiency are as follows:

CHM	113	General Chemistry *S1/S2* 4
CHM	115	General Chemistry with Qualitative Analysis *S1/S2*. 5
Choose between the combinations of organic chemistry courses below . . . . . 4 or 8		
	CHM 231	Elementary Organic Chemistry *S1/S2** 3)
	CHM 235	Elementary Organic Chemistry Laboratory *S1/S2** 1
		or
	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)
MAT	210	Brief Calculus *N1* 3
		or any calculus
Total		. . . . . 16 or 20

* Both CHM 231 and 235 must be taken to secure S1 or S2 credit.

Concentration in Biology and Society

The major in Biology with a concentration in biology and society is intended for students with a strong interest in life sciences and in the interaction between life sciences and the society within which science is done. This option consists of a minimum of 44 semester hours in life sciences and societal interface courses, and 12 hours in related fields, plus a three-semester hour mathematics proficiency. Required courses are as follows:

BIO	193	The Nature of Biological Science *S1/S2* . . . 4
		or BIO 181 General Biology *S1/S2* (4)
		and BIO 182 General Biology *S2* 4)
BIO	311	Biology and Society. 3
BIO	320	Fundamentals of Ecology 3
		or BIO 445 Organic Evolution (3)
BIO	340	General Genetics . . . 4
BIO	419	Research Colloquium in Biology and Society *L2* 6
MAT	210	Brief Calculus *N1* 3
		or any calculus
Total		 23

The remaining courses to complete the major are determined by the student in consultation with a biology and society advisor and must be distributed in the following areas:

1. 12 hours of upper division electives from BIO, MIC, PLB;
2. 12 hours of interface courses from an approved list from at least three of these areas: ethics, history of science, philosophy of science, and social issues;
3. 11 hours of physical sciences (CHM recommended); and
4. four hours of an approved course in statistics

MINOR IN BIOLOGY

The Biology minor consists of 24 semester hours, including BIO 193 The Nature of Biological Science or BIO 181 General Biology and BIO 182 General Biology, and 16 to 20 hours selected with approval of an advisor in the Department of Biology; at least 12 hours must be in the upper division. Courses not available for credit in the Biology major cannot be used for the minor (e.g., BIO 100 The Living World and BIO 201 Human Anatomy and Physiology I). This minor is not available to students majoring in the life sciences.

SECONDARY EDUCATION—B.A.E.

Biological Sciences. The major teaching field consists of a minimum of 40 semester hours and at least 22 hours in supporting courses. Required major courses are as follows:

BIO	193	The Nature of Biological Science *S1/S2*	4
		or BIO 181 General Biology *S1/S2* 4 and BIO 182 General Biology *S2* (4	
BIO	320	Fundamentals of Ecology	3
BIO	340	General Genetics	4
BIO	360	Basic Physiology	4
BIO	445	Organic Evolution	3
MIC	206	Microbiology Laboratory *S2**	1
MIC	220	Biology of Microorganisms	3
PLB	300	Comparative Plant Diversity *L2/S2*	4
		or PLB 310 The Flora of Arizona (4 or BIO 385 Comparative Invertebrate Zoology (4) or BIO 370 Vertebrate Zoology 4)	
PLB	308	Plant Physiology	4
Total			30

* Both MIC 205 and 206 must be taken to secure S2 credit.

The remaining courses in the major (six hours minimum) should be selected to reflect a balance between BIO and PLB courses. Required supporting courses are as follows:

CHM	113	General Chemistry *S1/S2*	4
CHM	115	General Chemistry with Qualitative Analysis *S1/S2*	5
GLG	102	Introduction to Geology II (Historical) *S2*[1]	3
		or GLG 300 Geology of Arizona 3)	
HPS	330	History of Biology Conflicts and Controversies *H*	3
		or BIO 316 History of Biology: Conflicts and Controversies *H* (3	
MAT	170	Precalculus *N1*	3
PHY	101	Introduction to Physics *S1/S2*	4
		or PHY 111, 112 General Physics *S1/S2*[2] (6 and PHY 113, 114 General Physics Laboratory *S1/S2*[2] (2	
Total			22

[1] Both GLG 102 and 104 must be taken to secure S2 credit

[2] Both PHY 11 and 113 or PHY 112 and 114 must be taken to secure S1 or S2 credit

BIO 480 is required in the professional education program.

The minor teaching field consists of 24 semester hours as follows: BIO 181, 182; 16 additional hours in BIO, MIC, and PLB courses selected to reflect a balance across the disciplines and subdisciplines in biology. BIO 480 is required in addition to the 24 semester hours in biological sciences.

GRADUATE PROGRAM

The faculty in the Department of Biology offer programs leading to the degrees of Master of Natural Science, M.S., and Ph.D. (with a concentration in ecology for the M.S. and the Ph.D.). Consult the *Graduate Catalog* for requirements.

The department participates in the interdisciplinary program for the M.S and Ph.D. degrees in Molecular and Cellular Biology. See the *Graduate Catalog* for more information.

BIOLOGY (BIO)

BIO 100 The Living World. (4) F S SS
Principles of biology Cannot be used for major credit in the biological sciences 3 hours lecture 3 hours lab *General Studies S1/S2*

BIO 120 Human Physiology. (4) N
Basic concepts of general science are discussed using current issues and basic concepts of human physiology as a focus Cannot be used for major credit in biological sciences 3 hours lecture 3 hours lab. *General Studies. S2*

BIO 181 General Biology. (4) F S SS
Biological concepts emphasizing fundamental principles and the interplay of structure and function at the molecular cellular organism, and population levels of organization Secondary school chemistry strongly recommended 3 hours lecture, 3 hours lab. Prerequisite biological sciences major or preprofessional student in health-related sciences *General Studies S1 S2*

BIO 182 General Biology. (4) F, S, SS
Continuation of B O 181 Secondary school chemistry strongly recommended. Prerequisite: B O 181 *General Studies. S2*

BIO 193 The Nature of Biological Science. (4) F
Creative and critical thinking skills in biological research; nature of biological knowledge role of experimentation, predictions hypotheses theories values Lecture, laboratory, discussion Prerequisite high school biology *General Studies· S1 S2*

BIO 201 Human Anatomy and Physiology I. (4) F, S SS
Structure and dynamics of the human mechanism Cannot be used for major credit in the Department of Biology. 3 hours lecture 3 hours lab *General Studies S2*

BIO 202 Human Anatomy and Physiology II. (4) F, S, SS
Continuation of B O 201 Cannot be used for major credit in the Department of Biology 3 hours lecture 3 hours lab Prerequisite· B O 201 or instructor approval

BIO 218 Medical History. (1) F
Brief survey of humankinds important inventions and discoveries in the art and science of medicine, illustrating interrelationships of medical ideas

BIO 241 Human Genetics. (4) F
Introduction to basic concepts in genetics as they are applied to human heredity Cannot be used for major credit in the Department of Biology. 3 hours lecture, 3 hours lab Prerequisite: a course in the life sciences. *General Studies S2*

BIO 300 Natural History of Arizona. (3) F S
Plant and animal communities of Arizona Cannot be used for major credit in the biological sciences. Prerequisite· junior standing.

BIO 301 Field Natural History. 1) N
Organisms and their natural environment 2 weekend field trips, field project Cannot be used for major credit in the biological sciences. Pre- or corequisite· B O 300.

NOTE: For the General Studies requirement courses, and codes (such as L1 N3 C and H) see "General Studies" page 85 For graduation requirements see University Graduation Requirements page 81 For an explanation of additional omnibus courses offered but not listed in this catalog see "Classification of Courses" page 58.

BIO 302 Cancer and Heart Disease. (3) F
nc dence and morta ty stat stics for cancer and heart d sease, host and env ronmenta risk factors, d agnos s treatment and prevention strategies Cannot be counted toward a B o ogy major Prerequ s tes· 12 hours n l fe sciences and CHM 231 (or equiva ent and an L1 course *or* instructor approva *General Stud es L2*

BIO 303 Radiation and Life. (3) S
Benef ts and r sks of rad ation exposure in soc ety med ca app ca tions, food rradiat on, nuc ear power, so ar UV popu at on hea th effects Cannot be counted toward a B ology major Prerequisites 12 hours n fe sc'ences and CHM 231 (or equ valent) and an L1 course *or* nstructor approva *General Studies L2*

BIO 304 Radiation Medicine and Biology. (3) F
Uses of rad at on in medicine nc uding CT d agnostic x-ray MR , nuc ear med c ne ultrasound, b olog ca effects of rad at on w th emphasis on cancer Prerequ s tes 12 hours n l fe sc ences and PHY 112 and an L1 course *or* nstructor approva . *General Stud es· L2.*

BIO 310 Special Problems and Techniques. (1 3) F S
Qua if ed undergraduates may nvestigate a specif c b o og ca prob lem under the d rect on of a facu ty member May be repeated for a total of 6 semester hours Prerequ sites forma conference with the instructor; approva of the prob em by the instructor and department chair

BIO 311 Biology and Society. (3) S
Explores nteractions between b o og cal sc ences and soc ety e g. b omed cal environmenta , eth cal, h stor ca lega ph osophica pol tica and soc a ssues Lecture d scuss on Prerequ site· BIO 193 (or BIO 100) *or* B O 181 and 182

BIO 316 History of Biology: Conflicts and Controversies. (3) A
Focuses on 19th and 20th centur es, consider'ng biology as a d sci pl ne evolut on, and prob ems of heredity, deve opment, and ce l the ory. Cross isted as HPS 330 Cred t is a owed on y for BIO 316 or HPS 330. *General Stud es H.*

BIO 317 Conservation Biology. (3) F
The sc ent f c and techn ca means for management ma ntenance protect on and restorat on of bio ogica resources on th s p anet Pre requ s te 8 hours of b o ogy

BIO 318 History of Medicine. 3) A
Sc ent f c study of the human body, changing theories of d sease, evo ution of practical opin ons on treatment and the emerg ng nstitut on a zation of med ca practice. Cross- sted as HPS 331 Cred t is a owed on y for B O 318 or HPS 331 *General Studies· H.*

BIO 319 Environmental Science (Nonmajor). 3 F
Env ronmenta and b o ogical concepts used to understand ecolog ca systems with specif c references to prob ems caused by humans Cannot be used for major credit in the b olog ca sc ences Cross sted as PLB 320 Cred t s a owed on y for BIO 319 or PLB 320 *Gen eral Studies· G*

BIO 320 Fundamentals of Ecology. (3) F S
Organizat on funct'oning and deve opment of ecolog ca systems; energy f ow; b'ogeochemica cyc 'ng env ronmenta re at ons popula t on dynam cs Prerequ s te BIO 182 or 'nstructor approval

BIO 321 Introductory Ecology Laboratory. (3 S
Laboratory and field observat ons and experiments to test current con cepts and theories in eco ogy Lab. Pre- or corequ s te B O 320 *Gen eral Stud es. L2*

BIO 331 Animal Behavior. 3) F
Evo ut onary, genetic phys ological and ecolog ca bases of anima behav or. Prerequ s te B O 182 or equ valent

BIO 336 Sociobiology. (3) S
Survey of an ma and human social behav or examined from an evo u tionary perspective Suitable for nonmajors. B O 331 is recommended

BIO 340 General Genetics. (4 F, S SS
Science of heredity and var at on 3 hours ecture 1 hour recitation Prerequ s te. BIO 182

BIO 341 Genetic Analysis. (5) F 2000
Genera genetics: sc ence of heredity and var at'on us ng cr t cal inqu ry 3 hours ecture 6 hours lab. Not open to students who have taken BIO 340 Lecture lab Prerequ s tes B O 182, 193 (or equ va lent)

BIO 343 Genetic Engineering and Society. (4) F
Introduct on to genet c engineer ng, w th emphas s on app 'cat ons gene therapy DNA f ngerpr nt ng b oremed at on, transgen c an mals and p ants 3 hours ecture 3 hours lab Cross sted as PLB 352 Credit s a lowed only for B O 343 or PLB 352 Prerequ s te: BIO 181 or equiva ent.

BIO 351 Developmental Anatomy. (3) F
Genera deve opmental b o ogy (embryo ogy) and comparat ve struc ture of organ systems, i ustrated ma n y by vertebrate examp es Pre requ s te B O 182

BIO 352 Laboratory in Vertebrate Developmental Anatomy. 2) F, S
Morphology of representat ve embryon c and adu t vertebrates. 2 3 hour labs BIO 351 recommended Prerequ s te B O 182

BIO 353 Cell Biology. (3) F
Survey of major top cs n ce b ology inc ud ng structura b ochem cal and mo ecular aspects of ce funct on Prerequisite: BIO 182.

BIO 360 Basic Physiology. (4) F, S
Physiological mechan'sms of the h gher vertebrates 3 hours ecture 3 hours ab Prerequ s tes. B O 182 CHM 115; MAT 117

BIO 370 Vertebrate Zoology. (4) F, S
Character st'cs, class f cat on, evo ut'on and natura h story of the major groups of vertebrate an mals 3 hours ecture 3 hours ab Prerequ site. BIO 182

BIO 385 Comparative Invertebrate Zoology. (4 F
Character stics, fe cycles, adaptations, and evo ut on of nvertebrate an mals 3 hours lecture 3 hours ab. Prerequ s te BIO 182 or nstruc tor approva

BIO 386 General Entomology. (4) N
Form, activit es, and c assif cation of nsects 3 hours lecture 3 hours lab Prerequisite· BIO 182.

BIO 394 ST: Special Topics. (2 3) N
Topics of current or spec a interest in one or more aspects of an'ma b o ogy Top cs vary. Prerequ s te jun or stand ng

BIO 406 Computer Applications in Biology. 3 F
Computer analys s techn ques n b o ogy emphas z ng data entry, management and ana ysis and graph c portraya Employs ma nframe and microcomputers. 2 hours ecture 3 hours ab Cross- sted as PLB 432 Cred t is a lowed only for B O 406 or PLB 432. Prerequ sites BIO 182 and MAT 117 (or 210) *or* nstructor approva *Genera Studies N3*

BIO 410 Techniques in Wildlife Conservation Biology. (3) F
F e d and ana yt ca techn ques used n eva uat ng popu ation struc ture, v abi ty and env ronmenta mpacts Lecture lab Prerequ s tes· BIO 317 and 320 *or* nstructor approval. *General Stud es L2*

BIO 411 Advanced Conservation Biology I. (3 F
Princ'ples of conservation sc ence b o ogy of threatened species· management pr nc p es that meet conservat on goals emphas z ng North Amer can ecosystems Prerequ s tes BIO 317 320

BIO 412 Advanced Conservation Biology II. (3 F
G obal b od vers ty patterns processes and conservat on; g oba env ronmental change susta nab e use of natural resources; emphasiz ng international approaches to conservat on b o ogy Prerequ s tes BIO 317, 320.

BIO 415 Biometry. (4) F
Statistica methods app ed to b o og ca prob ems, des gn of exper ments, est mation s gn f cance, ana ys s of var ance, regress on, cor relation, chi square, and bioassay, the use of computers Does not sat sfy laboratory requ rements for the bera arts genera studies pro gram. 3 hours ecture, 3 hours ab Prerequ s te MAT 210 or equ va ent *General Stud es. N2*

BIO 416 Professional Values in Science. (2 3 A
Considers ssues related to va ues in sc ence such as co laboration f nances, ega issues med a, mentor ng, ownersh p of deas sc ent fic ntegrity D scuss on, student projects Cross l sted as HPS 410 Cred t s a lowed only for B O 416 or HPS 410 *General Stud es L2.*

BIO 419 Research Colloquium in Biology and Society. (3–6 F, S
Deve ops cr tical th nking ab t es research methods, and wr t ng sk is for research n the nteract'ons between b o ogica sc'ences and soc · ety. Discussion Prerequ s te BIO 311 or instructor approva *General Stud es. L2*

BIO 420 Field Zoology. (3) N
Exper ence n zoologica field techn ques Requ res weekend or onger f e d tr ps Prerequisite nstructor approva .

BIO 423 Population and Community Ecology. 3) N
Organizat on and dynam cs of p pu at on a d commun t es empha s z ng an ma s Theoret ca and emp r ca approaches Prerequ s te BIO 320 or nstructor approva

BIO 425 Animal Ecology. 3 N
Phys o og ca and behav ora adaptat ons of nd v dua an mals to both ab ot c and b ot c env r nments Prerequ s te BIO 320

BIO 426 Limnology. 4) S
Structure and funct on of aquat c ecosystems, w th emphas s on fresh water akes and streams 3 hours lecture 3 h urs ab or f eld tr p Pre requ s te B O 320 or nstructor approva *Genera Stud es L2*

BIO 428 Biogeography. (3 F
Env ronmenta and h stor ca processes determ n ng d str but ona pat terns of an ma s and p ants emphas z ng terrestr a fe Prerequisites BIO 182 (or equ va ent jun or stand ng *Genera Stud es· L2*

BIO 431 Human Development and Fertility. (3) S
G oba inf uences of human popu at on deve opment on the human env ronment nc ud ng understand ng human fert ty and c n ca nflu- ences on fert ty D scuss on presentat on Prerequ s te general b o - ogy

BIO 435 Research Techn'ques in Animal Behavior. (3) N
Exper menta and f e d stud es of an ma behav or, descr pt on and quant f cat on of an ma behav or and nterpretat'on of behav or w th n an evo ut onary framework 1 hour ecture 6 hours lab Prerequis te B O 331. *General Studies· L2*

BIO 441 Cytogenetics. 3) F
Chromosoma bas s of nher tance. Cross sted as PLB 412 Cred t s a owed on y for B O 441 or PLB 412 Prerequ s te BIO 340

BIO 442 Cytogenetics Laboratory. 2 F
M croscop c ana ys s of me os s m tos s and aberrant ce l d v s on. 6 hours ab Cross sted as PLB 413 Cred t s a owed on y f r BIO 442 or PLB 413 Pre- or coreqU s te· BIO 441 or PLB 412

BIO 445 Organic Evolution. 3 F
Processes f adapt ve change and spec at on n sexual popu at ons Prerequ site· BIO 241 or 340.

BIO 446 Principles of Human Genetics. 3 A
Genet cs in human popu at ons nc ud ng med ca aspects Prerequi s te B O 340 *Genera Stud es L2*

BIO 450 Advanced Developmental Biology. 3) S
Current concepts and exper menta methods nvo v ng d fferent at on and b osynthet c act v t es of e s and organ sms w th examp es from *m croorgan sms p ants and an ma s Prerequ s te B O 351*

BIO 453 Animal Histology. 4 S
M croscop c study of an mal t ssues 3 hours ecture, 3 hours ab. Pre requ s te B O 182 or nstructor approva

BIO 454 Aquatic Insects. 3 N
Systemat cs and eco ogy of aquat c nsects Prerequ site. BIO 386

BIO 464 Photobiology. (3 F 2000
Pr nc p es underly ng the effects of ght on growth deve opment and behav or of p ants an ma s and m croorgan sms Cross sted as PLB 440 Cred t s a owed on y for BIO 464 r PLB 440 Prerequ s'tes CHM 231 or 331 12 hours of courses n fe sc ences

BIO 465 Neurophys ology. 3 S
Deta ed treatme t of ce u ar and organisma neurophys o ogy and nervous system funct on Prerequ s te B O 360.

BIO 466 Neurophysiology Laboratory. (2 S
Intrace ular a d extrace u ar e ectr phys o og ca record ng tech n ques, h sto og ca preparat ons and dye f ng techn ques. 6 hours ab Pre- or coreqU s te BIO 465

BIO 470 Systematic Zoology. (4 S 2001
Ph osophy theory pract ce of nterpret ng an ma divers ty nc ud ng spec es concepts spec at on nomenc ature and evo ut onary and phy ogenet c c ass f cat on emphas z ng phy ogenet cs. 3 hours ec ture 3 hours ab Prerequ s tes jun stand ng, 18 hours n fe sci ences. *Genera Studies L2.*

BIO 471 Ornithology. (3 S
The biology of b rds 2 hours ecture, 3 hours ab weekend f eld tr ps Prerequ s te B O 370 r nstructor approva

BIO 472 Mammalogy. 4) F 2000
Class f cat on, structure hab ts eco ogy, and d str but on of mammals, emphas z ng North Amer can forms 3 hours ecture, 3 hours ab or f e d tr p weekend f eld tr ps Prerequ s te: BIO 370 or nstructor approva

BIO 473 Ichthyology. 3) S 2001
Systemat cs and b o ogy of recent and extinct f shes 2 hours ecture 3 hours ab or f e d tr p, weekend f e d trips requ red Prerequ s tes BIO 370 and 425 *or* nstructor approva

BIO 474 Herpetology. (3) S 2000
Systemat cs and b o ogy of recent and ext nct rept les and amph b - ans. 2 hours ecture 3 hours lab or f e d tr p. Prerequ s te B O 370

BIO 480 Methods of Teaching Biology. 3) S
Methods of nstruct on exper mentat on organ zation, and presenta tion of appropriate content n biology Prerequisite: 20 hours n the bio- og ca sc ences.

BIO 495 Undergraduate Thesis. (3 F, S SS
Gu ded research cu m nat ng in the preparat on of an undergraduate thes s based on superv sed research done n th s and prev ous semesters Prerequ s tes at east 3 hours of B O 310 (or 499); forma conference w th nstructor instructor and department cha r approva

BIO 499 Individualized Instruction. (1 3) F, S

BIO 502 Transmission Electron Microscopy. (3) F
Theory, use, and methods of prepar ng b o og ca materials for trans m ss on e ectron m croscopy Materials fee Lecture lab Prerequ s te. nstructor approva

BIO 505 Scanning Electron Microscopy. (3) S
Theory use, and methods of prepar ng b o og ca mater a s for scan- n ng e ectron m croscopy Mater a s fee 2 hours lecture 3 hours lab Prerequ site· nstructor approva

BIO 508 Scientific Data Presentation. (2) S
Techn ques necessary for presentation of sc ent f c data used n jour na pub cations grant proposals, and visua presentat ons Lecture lab. Prerequ s te nstructor approva

BIO 520 Biology of the Desert. (2 N
Factors affect ng p ant and an'ma l fe n the desert reg ons and adap tat ons of the organ sms to these factors. Prerequ's'te· 10 hours of b o- og ca sc ences or nstructor approval.

BIO 522 Populations: Evolutionary Ecology. (3 S
Pr nc p es of popu at'on b o ogy and community eco ogy w th n an evo ut onary framework 2 hours ecture, 2 hours rec tat on Prerequ s tes: *BIO 320 415 (or MAT 210) 545.*

BIO 524 Ecosystems. (3) F 1999
Structure and funct on of terrestr a and aquat c ecosystems, with emphasis on product v ty energet cs b ogeochemical cyc ng and systems ntegrat on Prerequ s te BIO 320 or equ va ent

BIO 526 Quantitative Ecology. (3 N
Sampl ng strategies, spat a pattern ana ys s, spec es d vers ty c ass - f cation and appl cat ons of mu tivariate techn ques to ecology 2 hours ecture, 3 hours ab Prerequisites B O 415 (or equiva ent a course n eco ogy

BIO 529 Advanced Limnology. 3 N
Recent terature deve opments, methods, and l mno og cal theory f eld and ab app cation to some part cular topic n l mno ogy Prereq- u s te B O 426.

BIO 543 Molecular Genetics. (3 F
Nature and funct on of the gene; emphas s on the mo ecu ar basis of nher tance and gene express on n procaryotes and eucaryotes Pre requisites: B O 340 a course n organ c chem stry

BIO 545 Populations: Evolutionary Genetics. 3) F
Mathemat ca mode s in the descr ption and ana ysis of the genet cs of popu at ons Prerequ s tes B O 320 and 415 and 445 *or* nstructor *approva*

BIO 547 Techniques in Evolutionary Genetics. (4) S
Pract ca exper ence n modern techn ques for the study of evo ut on. Lecture, lab. Prerequ s tes BIO 340 445 instructor approval

BIO 550 Advanced Cell Biology. (3) S
App cations of contemporary e ectron m croscop c and b ochemical/ molecu ar techn ques for study ng eukaryot c ce funct ons. Mecha n'sms of ntrace u ar prote n traff ck'ng Prerequisites B O 353 (or 360 or equiva ent or PLB 360) CHM 231 (or 331 or equ va ent)

NOTE: For the Genera Stud es equ rement courses, and codes such as L1 N3 C and H) see General Stud es " page 85 For graduation requ rements see "Un vers ty Graduat on Requ rements " page 81 For an explanation of add t ona omn bus courses offered but not isted n th s cata og see C ass f cation of Courses," page 58

BIO 551 Biomembranes. (3) N
Structure and function of biological membranes, emphasizing synthesis, fluidity, exocytosis, endocytosis, and cell responses to hormones and neurotransmitters. Prerequisites: BIO 353 (or equivalent); CHM 231 (or 331 or equivalent).

BIO 552 Developmental Genetics. (3) S 2000
Genetic approaches to the analysis of development during the life cycle of eukaryotic organisms, and the role of genes in the unfolding of the differentiated phenotype. Prerequisite: BIO 340.

BIO 560 Comparative Physiology. (3) N
The analysis of function in invertebrates and vertebrates, emphasizing evolutionary trends in physiological systems. Prerequisite: BIO 360 or equivalent

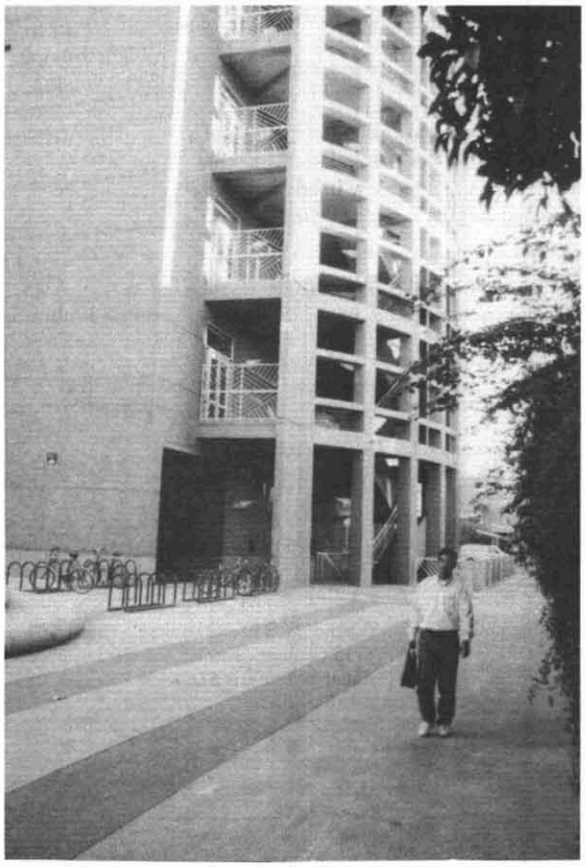
BIO 566 Environmental Physiology. (3) N
Physiological responses and adaptations of animals to various aspects of the physical environment. Prerequisites: BIO 320, 360.

BIO 568 Mammalian Physiology. (3) N
Detailed treatment of mammalian organ system functions emphasizing integrative mechanisms. Prerequisite: BIO 360 or equivalent.

BIO 569 Cellular Physiology. (3) N
Emphasizing the molecular basis for cell structure and function. Prerequisites: BIO 360; organic chemistry.

BIO 584 Internship. (1–12) F, S

BIO 591 Seminar. (1–3) F, S
Topics such as the following are offered:
(a) Adaptations
(b) Behavior
(c) Cell Biology
(d) Ecology
(e) Evolution
(f) Genetic Engineering
(g) Genetics
(h) Physiology
May be repeated for credit.



Life Sciences E-Wing John MacIsaac photo

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ASSOCIATE PROFESSORS
ALLEN, KOUVETAKIS, WOLF, YAGHI

ASSISTANT PROFESSORS
BLOOM, BOOKSH, CAUDLE, GOULD, HAYES

CHEMISTRY—B.A.

The B.A. degree in Chemistry consists of 46 semester hours. Required courses are as follows:

Choose between the course combinations below	9
CHM 113 General Chemistry *SI/S2* (4)	
CHM 115 General Chemistry with Qualitative Analysis *SI/S2* (5)	
— *or* —	
CHM 117 General Chemistry for Majors I* *SI/S2* (4)	
CHM 118 General Chemistry for Majors II* *SI/S2* (5)	
Choose between the course combinations below	9 or 8
CHM 317 Organic Chemistry for Majors I* (3)	
CHM 318 Organic Chemistry for Majors II* (3)	
CHM 319 Organic Chemistry Laboratory for Majors I* (1)	
CHM 320 Organic Chemistry Laboratory for Majors II* (2)	
— *or* —	
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)	
CHM 325 Analytical Chemistry	3
CHM 326 Analytical Chemistry Laboratory	1
CHM 341 Elementary Physical Chemistry	3
CHM 343 Physical Chemistry Laboratory	1
CHM 453 Inorganic Chemistry	3
CHM electives	1–2
Minimum total	30

* CHM 117, 118, 317, 318, 319, and 320 are strongly recommended for qualified students.

Related courses must include the following:

MAT 270 Calculus with Analytic Geometry I[1] *NI*	4
MAT 271 Calculus with Analytic Geometry II[1] *NI*	4

PHY 111 General Physics *S1/S2* 3
PHY 112 General Physics[2] *S1/S2*[3] 3
PHY 113 General Physics Laboratory[2] *S1/S2*[3] 1
PHY 114 General Physics Laboratory[2] *S1/S2* 1

Total 16

[1] Equivalent courses may be taken in place of MAT 270 and 271

[2] More advanced PHY courses may be taken in place of PHY 111, 112, 113, and 114.

[3] Both PHY 111 and 113 or PHY 112 and 114 must be taken to secure S1 or S2 credit.

The remaining courses to complete the major are determined by students in consultation with their advisors.

CHEMISTRY—B.S.

The program consists of 42 semester hours in chemistry. Required courses are as follows:

Choose between the course combinations below 9
CHM 113 General Chemistry *S1/S2* 4
CHM 115 General Chemistry with Qualitative Analysis *S1/S2* 5)
or
CHM 117 General Chemistry for Majors I* *S1/S2* 4)
CHM 118 General Chemistry for Majors II* *S1/S2* (5
Choose between the course combinations below .. 9 or 8
CHM 317 Organic Chemistry for Majors I* (3)
CHM 318 Organic Chemistry for Majors II* (3
CHM 319 Organic Chemistry Laboratory for Majors I* (1)
CHM 320 Organic Chemistry Laboratory for Majors II* (2
or
CHM 331 General Organic Chemistry 3
CHM 332 General Organic Chemistry 3
CHM 335 General Organic Chemistry Laboratory I
CHM 336 General Organic Chemistry Laboratory (1)

Total .... 18 or 17

* CHM 117, 118, 317 318, 319, and 320 are strongly recommended for qualified students

Additional required chemistry courses are as follows:

CHM 325 Analytical Chemistry 3
CHM 326 Analytical Chemistry Laboratory 1
CHM 421 Instrumental Analysis 3
CHM 422 Instrumental Analysis Laboratory 2
CHM 441 General Physical Chemistry 3
CHM 442 General Physical Chemistry 3
CHM 444 General Physical Chemistry Laboratory *L2** 2
CHM 452 Inorganic Chemistry Laboratory *L2** 1 2
CHM 453 Inorganic Chemistry 3

Total 21 22

* Both CHM 444 and 452 must be taken to secure L2 credit

The remaining chemistry courses to complete the major are determined by the student in consultation with an advisor. With the consent of the department chair, selected advanced courses from other related scientific disciplines may be accepted in lieu of elective chemistry courses to complete the major.

Additional required related field courses are as follows.

Choose between the course combinations below .... 15 or 13
MAT 270 Calculus with Analytic Geometry I *N1* 4
MAT 271 Calculus with Analytic Geometry II *N1* 4
MAT 272 Calculus with Analytic Geometry III *N1* (4
MAT 274 Elementary Differential Equations *N1* (3
or
MAT 274 Elementary Differential Equations *N1* 3
MAT 290 Calculus I *N1*(5
MAT 291 Calculus II 5)
PHY 121 University Physics I Mechanics *S1/S2*[1] 3
PHY 122 University Physics Laboratory I *S1/S2* 1
PHY 131 University Physics II Electricity and Magnetism *S1/S2*[2] 3
PHY 132 University Physics Laboratory II *S1/S2*[2] 1
PHY 241 University Physics III 3

Total .... 26 or 24

Both PHY 121 and 122 must be taken to secure S1 or S2 credit

[2] Both PHY 131 and 132 must be taken to secure S1 or S2 credit

Strongly recommended is an appropriate course in a computer language, such as CSE 181 Applied Problem Solving with Visual BASIC or CSE 183 Applied Problem Solving with FORTRAN.

Transfer students are interviewed and advised of possible preparatory work. They must contact the department to arrange for the interview in advance of registration. See "College Degree Requirements," page 324

American Chemical Society Certification. A student who satisfactorily completes the B.S. degree program is certified by the Department of Chemistry and Biochemistry to the American Chemical Society (ACS) as having met the specific requirements for undergraduate professional training in chemistry. Graduates meeting ACS guidelines can receive a certificate to indicate this fact

Emphasis in Biochemistry. The major in Chemistry with an emphasis in biochemistry consists of 38 semester hours in chemistry plus work in related fields. Required courses are as follows:

Choose between the course combinations below .... 8 or 9
CHM 113 General Chemistry S1/S2 4)
CHM 116 General Chemistry *S1/S2* 4
or CHM 115 General Chemistry with Qualitative Analysis *S1/S2* 5)

NOTE: *For the General Studies requirement courses, and codes (such as L1, N3, C, and H), see "General Studies," page 85 For graduation requirements see "University Graduation Requirements," page 81 For an explanation of additional nonbusiness courses offered but not listed in this catalog, see "Classification of Courses," page 58*

or

CHM 117 General Chemistry for Majors I *S1/S2* 4)
CHM 118 General Chemistry for Majors II[1] *S1/S2* 5

Choose among the course combinations below 9 or 8
CHM 317 Organic Chemistry for Majors I (3
CHM 318 Organic Chemistry for Majors II (3
CHM 319 Organic Chemistry Laboratory for Majors I (1)
CHM 320 Organic Chemistry Laboratory for Majors II (2

or

CHM 317 Organic Chemistry for Majors I (3)
CHM 318 Organic Chemistry for Majors II (3)
CHM 319 Organic Chemistry Laboratory for Majors I 1)
CHM 336 General Organic Chemistry Laboratory 1)

or

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)

CHM 325 Analytical Chemistry . . . 3
Choose between the course combinations below . . . 8
CHM 341 Elementary Physical Chemistry (3
CHM 463 Biophysical Chemistry 3)
CHM 464 Biophysical Chemistry Laboratory *L2*[2] (2

or

CHM 441 General Physical Chemistry (3
CHM 442 General Physical Chemistry (3
CHM 444 General Physical Chemistry Laboratory *L2* (2

CHM 453 Inorganic Chemistry . . . 3
CHM 461 General Biochemistry . . . 3
CHM 462 General Biochemistry . . . 3
CHM 467 General Biochemistry Laboratory *L2*[2] . . . 2

Total . . . 38 or 40

[1] CHM 117 and 118 are strongly recommended for qualified students.

[2] Both CHM 464 and 467 must be taken to secure L2 credit

[3] Both CHM 444 and 452 must be taken to secure L2 credit

Additional required related field courses are as follows:

BIO 181 General Biology *S1/S2* . . . 4
BIO 182 General Biology *S2* . . . 4
BIO 340 General Genetics . . . 4
Choose between the course combinations below . . . 12 or 10
MAT 270 Calculus with Analytic Geometry I *N1* (4
MAT 271 Calculus with Analytic Geometry II *N1* (4
MAT 272 Calculus with Analytic Geometry III *N1* 4)

or

MAT 290 Calculus I *N1* (5)
MAT 291 Calculus II (5)

PHY 121 University Physics I: Mechanics *S1/S2* . . . 3
PHY 122 University Physics Laboratory I *S1/S2* . . . 1
PHY 131 University Physics II: Electricity and Magnetism *S1/S2*[2] . . . 3
PHY 132 University Physics Laboratory II *S1/S2*[2] . . . 1

Total . . . 32 or 30

[1] Both PHY 121 and 122 must be taken to secure S1 or S2 credit.

[2] Both PHY 131 and 132 must be taken to secure S1 or S2 credit

The remaining courses to complete the major are determined by students in consultation with their advisors.

MINOR IN CHEMISTRY AND BIOCHEMISTRY

A minor in Chemistry and Biochemistry is awarded to students who complete the following required courses:

CHM 113 General Chemistry[1] *S1/S2* . . . 4
CHM 115 General Chemistry with Qualitative Analysis[1] *S1/S2* . . . 5
or CHM 116 General Chemistry[1] *S1/S2* 4)
CHM 325 Analytical Chemistry . . . 3
CHM 326 Analytical Chemistry Laboratory . . . 1
Choose between the course combinations below . . . 7 or 8
CHM 231 Elementary Organic Chemistry *S1/S2*[2] 3)
CHM 235 Elementary Organic Chemistry Laboratory *S1/S2*[2] (1)
CHM 361 Principles of Biochemistry 3

or

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)

Choose between the course combinations below . . . 4 or 8
CHM 341 Elementary Physical Chemistry[1] (3)
CHM 343 Physical Chemistry Laboratory (1)

or

CHM 441 General Physical Chemistry 3)
CHM 442 General Physical Chemistry (3)
CHM 444 General Physical Chemistry Laboratory *L2*[3] 2)

Minimum total . . . 24

Equivalent courses may be taken in place of CHM 113, 115 or 116, 341, and 343

[2] Both CHM 231 and 235 must be taken to secure S1 or S2 credit

[3] Both CHM 444 and 452 must be taken to secure L2 credit.

SECONDARY EDUCATION—B.A.E.

Chemistry. Students may pursue one of two options for the chemistry major teaching field.

Option One. The academic specialization consists of 48 semester hours in chemistry plus work in related fields. Required courses are as follows:

CHM 113 General Chemistry *S1/S2* . . . 4
CHM 115 General Chemistry with Qualitative Analysis *S1/S2* . . . 5
CHM 325 Analytical Chemistry . . . 3
CHM 326 Analytical Chemistry Laboratory . . . 1
CHM 331 General Organic Chemistry . . . 3

NOTE: For the General Studies requirement courses, and codes (such as L1, N3, C, and H) see "General Studies" page 85. For graduation requirements see "University Graduation Requirements" page 81. For an explanation of additional omnibus courses offered but not listed in this catalog see "Classification of Courses," page 58

CHM 332	General Organic Chemistry	3
CHM 335	General Organic Chemistry Laboratory	1
CHM 336	General Organic Chemistry Laboratory	1
CHM 341	Elementary Physical Chemistry.	3
	or CHM 441 General Physical Chemistry (3)	
	and CHM 442 General Physical Chemistry (3)	
CHM 361	Principles of Biochemistry	3
CHM 480	Methods of Teaching Chemistry	3
	or PHY 480 Methods of Teaching Physics (3)	
Total		30

The remaining chemistry courses to complete the special ization are determined by students in consultation with their advisors.

Additional required related field courses are as follows:

MAT 270	Calculus with Analytic Geometry I *N1*	4
MAT 271	Calculus with Analytic Geometry II *N1*	4
PHY 111	General Physics *S1/S2**	3
PHY 112	General Physics *S1/S2**	3
PHY 113	General Physics Laboratory *S1/S2**	1
PHY 114	General Physics Laboratory *S1/S2**	1
Total		16

* Both PHY 111 and 113 or PHY 112 and 114 must be taken to secure S1 or S2 credit.

Option Two. The academic specialization consists of 31 semester hours of chemistry, which includes all of the required chemistry courses listed in option one and selection of the corresponding option in either mathematics or physics, that is, completion of an additional 30 semester hours in the chosen area as specified by the department selected.

Minor Teaching Field. The minor teaching field consists of the following required courses:

CHM 113	General Chemistry *S1/S2*	4
CHM 115	General Chemistry with Qualitative Analysis *S1/S2*	5
Choose between the course combinations below		10 or 8
CHM 231	Elementary Organic Chemistry *S1/S2** (3)	
CHM 325	Analytical Chemistry 3)	
CHM 326	Analytical Chemistry Laboratory 1)	
CHM 361	Principles of Biochemistry (3	
	or	
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	
CHM 341	Elementary Physical Chemistry	3
Total		20 or 22

* Both CHM 231 and 235 must be taken to secure S1 or S2 credit

The remaining courses to complete the specialization are determined by students in consultation with their advisors.

GRADUATE PROGRAMS

The faculty in the Department of Chemistry and Biochemistry offer programs leading to the degrees of Master of Natural Science, M.S., and Ph.D. Consult the *Graduate Catalog* for requirements.

The department participates in the interdisciplinary program for the M.S. and Ph.D. degrees in Molecular and Cellular Biology. For more information, contact Barbara Tucker, LSE 411, 480/965-0743.

CHEMISTRY (CHM)

CHM 101 Introductory Chemistry. 4 F, S, SS
Elements of general chemistry. Adapted to the needs of students in nursing, home economics, agriculture, and physical education. Recommended for general studies credit. Normally followed by CHM 231. 3 hours lecture, 1 hour discussion, 2 hours lab. Credit is allowed for *only* CHM 101, 107, 113, 114, or 117. *General Studies S1, S2.*

CHM 107 Chemistry and Society. (4) F, S
General chemical principles and concepts presented in context of social and technological issues, e.g., energy pollution, global warming, and others. 3 hours lecture, 1 hour discussion, 2 hours lab. Credit is allowed for *only* CHM 101, 107, 113, 114, or 117. *General Studies S1, S2.*

CHM 113 General Chemistry. 4 F, S, SS
Principles of chemistry. Adapted to the needs of students in the physical, biological, and earth sciences. 3 hours lecture, 1 hour discussion, 2 hours lab. 1 year of high school chemistry recommended. Credit is allowed for *only* CHM 101, 107, 113, 114, or 117. Prerequisite: MAT 106 or 3 semesters of high school algebra. *General Studies S1, S2.*

CHM 114 General Chemistry for Engineers. (4) F, S
One semester college chemistry with emphasis toward engineering. 3 hours lecture, 1 hour discussion, 2 hours lab. Students without high school chemistry or chemical engineering majors must enroll in the CHM 113, 116 sequence instead of CHM 114. Credit is allowed for *only* CHM 101, 107, 113, 114, or 117 and for *only* CHM 114, 115, 116, or 118. Prerequisites: MAT 106 or 3 semesters of high school algebra, 1 year of high school chemistry. *General Studies S1, S2.*

CHM 115 General Chemistry with Qualitative Analysis. 5) F, S, SS
Continuation of CHM 113. Equilibrium theory, chemistry of metals, nonmetals, and metalloids and the introduction to organic chemistry. Laboratory includes qualitative analysis. 3 hours lecture, 2 hours discussion, 4 hours lab. Credit is allowed for *only* CHM 114, 115, 116, or 118. Prerequisite: CHM 113 or 2 years of high school chemistry. *General Studies. S1, S2.*

CHM 116 General Chemistry. (4) F, S
Continuation of CHM 113. Equilibrium theory, chemistry of metals, nonmetals, and metalloids and the introduction to organic chemistry. 3 hours lecture, 1 hour discussion, 2 hours lab. Credit is allowed for *only* CHM 114, 115, 116, or 118. Prerequisite: CHM 113 or 2 years of high school chemistry. *General Studies S1, S2.*

CHM 117 General Chemistry for Majors I. (4) F
Atomic and molecular structure, properties, and physical states of matter, thermodynamics, kinetics, acids and bases, chemical analysis and stoichiometry. 3 hours lecture, 1 conference, 2 hours lab. Credit is allowed for *only* CHM 101, 107, 113, 114, or 117. Prerequisites: 3 years of high school mathematics, minimum of 1 year of high school physics. Prerequisite with a grade of "B" or higher, minimum of 1 year of high school chemistry. *General Studies S1/S2.*

CHM 118 General Chemistry for Majors II. (5) S
Continuation of CHM 117. 3 hours lecture, 1 conference, 5 hours lab. Credit is allowed for *only* CHM 114, 115, 116, or 118. Prerequisite: CHM 117. Corequisite: MAT 270 or 290. *General Studies: S1, S2.*

CHM 231 Elementary Organic Chemistry. (3) F, S
Survey of organic chemistry, with emphasis on the reactivity of basic functional groups. Credit is allowed for *only* CHM 231, 317, or 331. Prerequisite with a grade of "B" or higher: CHM 101 or 114 or 115 or 116 or 117 or 1 year of high school chemistry *or* instructor approval. *General Studies S1/S2 (if credit also earned in CHM 235)*

CHM 235 Elementary Organic Chemistry Laboratory. (1) F, S
Organic chemistry experiments in synthesis, purification, analysis, and identification. Lab. Pre- or corequisite: CHM 231. *General Studies. S1/S2 (if credit also earned in CHM 231)*

CHM 302 Environmental Chemistry. (3) S
Explores major environmental issues, problems, and solutions from analytical and chemistry perspectives. Prerequisites: CHM 114 (or 115 or 116 or 118) 231 (or 331

CHM 317 Organic Chemistry for Majors I. (3) F
Structures react on mechan sms and k net cs and systemat c synthe ses of organ c compounds. Cred t is a owed for *only* CHM 231 317 or 331 Prerequisite CHM 115 or 118 Corequisite. CHM 319.

CHM 318 Organic Chemistry for Majors II. (3) S
Cont nuation of CHM 317. Cred t s al owed for *only* CHM 318 or 332 Prerequ s te. CHM 317. Corequ site: CHM 320

CHM 319 Organic Chemistry Laboratory for Majors I. 1 F
Emphas s on mechan sms, k netics and products of organ c reac tions. 1 conference, 3 hours lab Cred t is a lowed for *only* CHM 319 or 335 Pre or corequ s te CHM 317

CHM 320 Organic Chemistry Laboratory for Majors II. (2) S
Cont nuat on of CHM 319 1 conference 7 hours ab. Credit s a owed for *only* CHM 320 or 336 Prerequis te CHM 319 Corequ s te CHM 318.

CHM 325 Analytical Chemistry. (3) F SS
Principles and methods of chem ca ana ys s Prerequisite: CHM 115 or 116.

CHM 326 Analytical Chemistry Laboratory. (1) F SS
Exper ments n chem ca ana ys s 4 hours lab Corequ s te CHM 325

CHM 331 General Organic Chemistry. 3) F S, SS
Chemistry of organ c compounds. Credit s a owed for *on y* CHM 231 317, or 331 Prerequ s te. CHM 115 or 116 or 118.

CHM 332 General Organic Chemistry. (3) F, S, SS
Cont nuation of CHM 331 Credit s al owed for *on y* CHM 318 or 332 Prerequis te. CHM 331.

CHM 335 General Organic Chemistry Laboratory. (1) F, S SS
M crosca e organ c chem ca exper ments in separat on techniques, synthesis analys s and dentif cation, and re ative reactivity 4 hours lab Credit is a owed for *only* CHM 319 or 335. Corequisite· CHM 331

CHM 336 General Organic Chemistry Laboratory. (1) F, S SS
Cont nuation of CHM 335 4 hours lab Cred t s a owed for *only* CHM 320 or 336 Prerequ s te. CHM 335 Corequ s te CHM 332

CHM 341 Elementary Physical Chemistry. 3 F
Thermodynam cs equ ibrium, states of matter so ut ons and chemi ca kinet cs For students n premed ca b o og ca , and educat ona curricu a Not open to students who have taken CHM 441. Prerequ sites CHM 115 (or 114 or 118 or 325 231 (or 331), MAT 271 PHY 112.

CHM 343 Physical Chemistry Laboratory. (1) F
Phys ca chem stry exper ments. 1 hour conference 3 hours lab Credit s a owed for *only* CHM 343 or 444. Corequ s'te: CHM 341 or 441

CHM 361 Principles of Biochemistry. (3) F SS
Structures propert es and funct ons of prote ns enzymes nuc e c ac ds carbohydrates and 'p ds the uti zat'on and synthesis of these mater als by v ng systems and the re ationsh p of these processes to energy production and ut izat on Not open to students who have taken CHM 461 Cred t s a owed for *only* CHM 361 or 461 Prerequi s te CHM 231 or 318 or 332

CHM 367 Elementary Biochemistry Laboratory. 1) F, SS
Qua itat ve quant tative ana yses of const tuents of biological systems enzyme act v ty measurements and metabo ic stud es 1 hour confer- ence 3 hours ab Pre- or corequ s te CHM 361 or instructor approva

CHM 392 Introduction to Research Techniques. (1 3) F S, SS
Instrumenta methods and phi osophy of research by actua part c pa t on in chemical research projects May be repeated for a tota of 6 semester hours Prerequ s tes approvals of adv sor and research superv sor.

CHM 421 Instrumental Analysis. (3) S
Principles of nstrumenta methods in chemica analys s E ectroana- yt ca and optical techniques Prerequis tes CHM 325 326. Pre or corequ s te CHM 442

CHM 422 Instrumental Analysis Laboratory. 2) S
Experiments n chem ca ana ys s by e ectroanalyt ca and opt ca techn ques. 6 hours ab Corequ s te CHM 421.

CHM 424 Separation Science. (3) N
Bas c theory and pract ca aspects of gas l qu d, on exchange, and gel-permeation chromatograph es, and other mportant ndustr a and research techn ques 2 hours ecture 4 hours ab Prerequisite: CHM 318 or 332 or 442 or nstructor approva

CHM 431 Qualitative Organic Analysis. (3) S
Systemat c dent fication of organ c compounds 1 hour lecture 6 hours ab Prerequ s tes CHM 118 (or 326) and 320 (or 336) *or* nstructor approva

CHM 441 General Physical Chemistry. (3) F
Laws of thermodynam cs and the r app cat ons propert es of gases so ds l qu ds and so utions, react on kinet cs wave mechan cs, mo ecu ar spectroscopy and stat st ca thermodynamics. Cred t s a lowed for *only* CHM 341 or 441 Prerequ s tes· MAT 272 (or 291) PHY 241. Corequ site MAT 274

CHM 442 General Physical Chemistry. (3 S
Continuat on of CHM 441. Prerequ s tes: CHM 441, MAT 274

CHM 444 General Physical Chemistry Laboratory. (2) S
Phys ca chem ca exper ments 1 conference 5 hours lab Credit is a owed for *on y* CHM 343 or 444 Prerequ s te CHM 441. *General Stud es· L2 f cred t a so earned 'n CHM 452)*

CHM 452 Inorganic Chemistry Laboratory. (1 2) S
Preparat on and character zat n f typ cal norgan c substances emphasiz ng methods and techniques 1 conference 5 hours ab Pre requ s te· nstructor approval. *General Stud es L2 (if cred t also earned in CHM 444*

CHM 453 Inorganic Chemistry. 3) S
Pr nc p es and appl cat ns of norgan c chem stry Prerequ s te. CHM 341 or 441

CHM 461 General Biochemistry. 3) F
Structure chem stry and metabo sm of b omolecu es and the r ro e n the b ochem ca processes of iving organ sms Cred t s a lowed on y for CHM 361 or 461 Prerequ s tes CHM 318 or 332) and 341 (or 441) *or* nstructor approva

CHM 462 General Biochemistry. 3 S
Cont nuation of CHM 461 Prerequ s te CHM 461 or instructor approva

CHM 463 Biophysical Chemistry. 3) S
Pr nc p es of phys ca chemistry as app ied to b o og ca systems Pre- requis te· CHM 341 or 441

CHM 464 Biophysical Chemistry Laboratory. 2) F
Introduct on to phys cal methods n modern b ochemistry Prerequ s te CHM 463 *Genera Stud es L2 (f cred t a so earned n CHM 467)*

CHM 467 General Biochemistry Laboratory. (2) S
The app cat on of modern chem cal and phys ca methods to b o chem ca prob ems, pur f cat on and character zat on of b o og ca macromo ecu es quant tat ve measurement of enzyme act v ty and propert es, eva uat on of metabo c processes 1 conference, 5 hours ab Prerequ s te· CHM 461 *General Stud es L2 (f cred t also earned n CHM 464).*

CHM 471 Solid-State Chemistry. (3) F
Crystal chem stry, thermodynam cs and e ectrochem stry of so ds, nonsto ch ometr c compounds d ffus on and so d state react ons, crysta growth and selected top cs Pre or corequ s te CHM 441 or nstructor approva

CHM 480 Methods of Teaching Chemistry. 3 S
Organ zat on and presentat n of appropr ate content of chemistry, preparat on of reagents, exper ments, and demonstrations; organiza- t on of stock rooms and laborator es; exper ence n prob em so v ng Prerequ s te nstructor approva

CHM 481 Geochemistry. 3 F
Or g n and d str but on of the chem cal e ements Geochem cal cyc es operat ng n the earth s atmosphere hydrosphere and thosphere Cross- sted as GLG 481 Cred t s a owed on y for CHM 481 or GLG 481 Prerequ s te CHM 341 or 441) or GLG 321

CHM 485 Meteorites and Cosmochemistry. (3 N
Chem stry of meteor tes and the r relat onsh p to the or gin of the earth solar system, and un verse. Cross sted as GLG 485 Cred t s a owed only for CHM 485 or GLG 485

CHM 501 Current Topics in Chemistry. 1) F S
May be repeated for cred t Prerequis te nstructor approval.

CHM 521 Computer Enhanced Analytical Chemistry. (3) N
Overv ew of chemometr c tools n ana yt ca chem stry nc ud ng mu t - var ate ca bration spectral deconvo ut on and experimenta des gn 2 hours ecture 4 hours ab

CHM 523 Advanced Analytical Chemistry. (3 A
Theoret ca pr nc p es of ana yt ca nstrumentat on and measure- ments. Prerequ s tes: CHM 325 and 442 *or* instructor approval.

CHM 525 Spectrochemical Methods of Analysis. 4) N
Theoretica and pract ca cons derat ons nvo v ng the use of opt ca nstruments for chem ca ana yses Emphas s on state of the art trends 3 hours lecture 3 hours ab Prerequ s te CHM 442 or nstruc tor approval

CHM 526 X-ray Methods of Analysis. 4 N
Theoret ca and pract cal cons derat s nvo v ng the use of X ray dif fract on and spectroscopy for chem ca and structu al ana yses 3 hours ecture, 3 hours ab Prerequ site. CHM 442

CHM 527 Electrical Methods of Chemical Analysis. (4 N
Theoret ca and pract ca cons derat ons of po arograph c potent o- metric amperometr c techn ques nc ud ng m dern e ectrochem ca methods 2 hours ect re 6 hours ab. Prerequ s te CHM 442

CHM 531 Advanced Organ'c Chemistry I. 3) F
React on mechan sms react on k et cs, near free energy re at on sh ps trans t on state theory mo ecu ar orb ta theory and Woodward Hoffmann ru es Prerequ s tes CHM 318 (or 332) 442

CHM 532 Advanced Organic Chemistry II. 2 S
Cont'nuation of CHM 531 Prerequ s te CHM 531.

CHM 537 Organic Reactions. 3 S
mportant synthetic react ons of organ c chem'stry emphas z ng recent y d scovered react ons of preparat ve va ue Prerequ s te CHM 531.

CHM 541 Advanced Thermodynamics. (3) F
Equ l br um thermodynam cs chem ca reactions and phase equ b r a ntroduct on to stat st ca thermodynam cs cr t ca phenomena and k netics. Prerequ s te CHM 442

CHM 545 Quantum Chemistry I. 3) F
Bas c quantum theory chem ca bond ng and mo ecu ar structure Prerequ s te. CHM 442

CHM 546 Quantum Chemistry II. 3 S
Quantum theory f rate processes Pr nc p es f spectroscopy and non 'near opt cs Prerequ s te CHM 545

CHM 548 Chemica Kinetics. (2) N
K net c theory and rate processes Prerequ s te CHM 545

CHM 553 Advanced Inorganic Chemistry. (3) S
Pr ncip es of modern norgan c chem stry and the r app cat ons over the entire per od c system Prerequ s tes CHM 442 and 453 *or* equiv a ents

CHM 556 Topics in Inorganic Chemistry. (3 N
May be repeated for cred t. Prerequ s tes CHM 553 nstructor approva

CHM 563 Biophysical Chemistry. 3 N
Phys cal chem stry of macromo ecu es espec a y prote'ns, nuc e c ac ds and po ysacchar des Thermodynam cs hydrodynam cs and spectroscopy of and the r re at on to structure Prerequ s tes: CHM 442 462

CHM 568 Molecular Mechanisms of Photosynthesis. 3) S
Structure and funct on of photosynthet c comp exes mechanism of energy convers on n p ants bacter a and mode systems Cross sted as PLB 558 Cred t s a owed on y for CHM 568 or PLB 558 Prerequisite: nstructor approva

CHM 579 Topics in Solid-State Chemistry. 3 N
May be repeated for cred t Prerequ s te. instructor approva .

CHM 582 Topics in Geochemistry and Cosmochemistry. (3) N
Topics of current nterest for students n chem stry and other f e ds Samp ng of data and thought c ncern ng phase equ ibria e ement d strbut on meteor tes the Earth and other p anets. May be repeated for cred t Prerequ s te nstr ctor appr va

CHM 583 Phase Equilibria and Geochemical Systems. 3 N
Natural react ons at h gh temperatures and pressures; s cate su f de and ox de equ l br a Cross- sted as GLG 583 Cred t s a owed on y for CHM 583 or GLG 583

Department of Chicana and Chicano Studies

Vicki L. Ruiz
Chair
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www.asu.edu/clas/chicana

PROFESSORS
CANDELARIA, PADILLA, RU Z

ASSOCIATE PROFESSOR
ESCOBAR

ASSISTANT PROFESSORS
ALDAMA MAGANA

The Chicana and Chicano Studies program is an interdis ciplinary degree program that examines the experiences, culture, artistic endeavors, and current status of people of Mexican descent living in the United States. The curriculum focuses on the practical application of Chicana and Chicano Studies (CCS) for career development in selected profes sions and service to the community based on an understanding of the humanities, social sciences, and the arts.

CHICANA AND CHICANO STUDIES—B.A.

The major in Chicana and Chicano Studies requires 45 semester hours of course work. A minimum of 30 semester hours must be CCS, CSH, and CSS courses The remaining course work must be in a related field to be approved by an advisor All CCS majors must take 15 semester hours in the following core courses:

CCS 101 Introduct on to Chicana and Chicano Studies .. . 3
CCS 111 Introduction to Chicana and Chicano Culture .. . 3
CCS 498 PS Pro-Seminar. 3
Two semester sequence in Chicana and Chicano history . . . 6

Within the 45 semester hours, CCS majors must also take 18 semester hours in one of two concentrations humani ties/cultural studies or social sciences policy and 12 hours in the other concentration for a grand total of 45 semester hours

Majors will be expected to fulfill the college's language requirement in Spanish. Although the department advisor can make exceptions on a case by case basis, all majors must demonstrate proficiency in Spanish

All Chicana and Chicano Studies majors must take an established minor or credential of at least 18 semester hours in another field.

NOTE: For the Genera Stud es requ rement, courses and codes (such as L1, N3 C, and H), see Genera Stud es," page 85 For graduat o requ rements see ' Un vers ty G aduat on Requ rements " page 81 For an exp anat on of add t ona omn bus courses offered but not l sted n th s cata og see C ass f cat n f Courses page 58

CHICANA AND CHICANO STUDIES MINOR

The Chicana and Chicano Studies minor requires 18 semester hours of course work. All Chicana and Chicano Studies minors must take the following courses:

CCS	101 Introduction to Chicana and Chicano Studies ... or CCS 111 Introduction to Chicana and Chicano Culture (3	3
HIS	430 20th Century Chicano History...	3
Total		6

Students must also take at least three credits in both CCS concentrations: humanities/cultural studies and social sciences/policy.

Within the 18 semester hour requirement, students must take a minimum of 12 semester hours in CCS, CSH, and CSS courses. Any courses taken in a related field must be approved by an advisor.

CHICANA AND CHICANO STUDIES (CCS)

CCS 101 Introduction to Chicana and Chicano Studies. (3) F
H stor ca and contemporary ssues n the Ch cana and Chicano commun ty focus on economic, soc o og ca cultura and pol t cal status of Ch canas and Ch canos in the U S *General Stud es C.*

CCS 111 Introduction to Chicana and Chicano Culture. (3) S
nterd sc p nary ana ysis of customs va ues be ef systems and cu tura symbo s; special attent on is g'ven to cu tura cont nu'ty and *change General Studies C*

CCS 300 Chicana and Chicano Culture and Society. 3) F
Intens ve ana ysis of how Mexican Amer can wr ters artists fi m mak ers enterta ners and academ c ans have nterpreted aspects of the Ch cana and Ch cano exper ence *General Stud es· C*

CCS 445 Teaching Chicana and Chicano Studies in Native Language. (3) A
Approaches/techn ques for nfus on of Ch cana and Ch cano Stud es content nto elementary and secondary b ngua curr cu um Taught n Span sh Prerequisite: prof c ency n Span sh

CCS 446 Teaching Chicana and Chicano Studies in the Schools. (3) A
Approaches/techniques for infusion of Ch cana and Ch cano Studies content nto elementary and secondary curr culum; des gned for teachers who w l work with Ch cana and Ch cano students

CCS 498 PS: Pro-Seminar. (3) A
Required courses for majors on top c selected by nstructor, wr't'ng ntens ve course related to the deve opment of nterd scip nary research ski s.

CHICANA AND CHICANO STUDIES (CSH)

CSH 210 Chicana and Chicano Poetry. (3) S
Wr t ng seminar on Ch cana and Ch cano poet cs and ntens ve creat ve wr t ng workshop. Workshop, seminar.

CSH 220 Chicana and Chicano Cultural Expression. (3) A
nterre at on between economic soc a and po itica status and forms of art st c express on, .e., mus c, dance, drama terature and graph c arts.

CSH 310 Chicana and Chicano Folklore. (3) A
Ana ys's of Ch cana and Ch cano fo k be iefs trad t ons, and pract ces. *General Stud es· HU C*

CSH 350 Mexican and Mexican American Artistic Production. (3) A
Overv ew of Mex can and Mex can American art st c product on from co on a t mes to present; emphas s on rel g ous and fo k art

CSH 351 Contemporary Chicana and Chicano Art. (3) A
Intensive ana ysis of contemporary Ch cana and Ch cano art move ment as appra sed w th n the context of contemporary American art and the art of Mex'co *General Stud es HU C*

CSH 363 Chicana and Chicano Literature. 3 F
Deve opment of Ch cana and Ch cano terature study of genres and themes, attent on to terary antecedents Cross sted as ENG 363 Cred t s al owed on y for CSH 363 or ENG 363 *General Stud es L2/ HU C*

CSH 485 Chicana Writers. 3 A
Cr t ca read ng of Mex can Amer can women authors· emphas s on contemporary (post 1970) poetry, nove s short stor'es and essays *Genera Stud'es· L2/HU C*

CSH 498 PS: Pro-Seminar. 3 A
Requ red course for majors on top c se ected by nstructor· wr t ng ntensive course re ated to the developme t of nterd sc p nary research sk l s

CHICANA AND CHICANO STUDIES (CSS)

CSS 315 Chicano Family Structures and Perceptions. 3) A
Tradit ona and chang ng fam y re at onsh ps; emphas s on gender and ntergenerationa re at ons and mpact of modern soc ety on trad t onal fam y va ues

CSS 330 Chicana and Chicano Politics. (3) A
H'storical/contemporary ana ys s of Ch cana a d Ch cano pol tica deolog es, att tudes, strateg es and movements re at ons w th governmenta agenc es, part c pat on in pol tical process

CSS 331 Contemporary Issues in the Chicana and Chicano Community. (3) S
H stor ca demographic and soc o og ca overv ew of the status of Ch canas and Chicanos n the U S and of sal ent ssues affect ng that commun ty *Genera Stud es C*

CSS 336 Issues in Immigration and Migration. (3) A
H'storica contemp rary overv ew of Mex can mm grat on nto and with n the U.S. factors affect ng popula t on movement sett ement pat terns, and m grants' ncorporat on nto soc ety *General Stud es: C H.*

CSS 340 Chicanas and Chicanos in the U.S. Economy. (3 S
Histor cal/contemporary ana ysis of Ch canas' and Ch canos re at on sh p w th the American econom c system emphasis on mpact of chang ng Amer can economy on Ch cana and Ch cano commun ty *General Stud es C*

CSS 432 Issues in Chicana and Chicano Gender. (3) A
Analys's of soc'al construct on of gender dent t es emphas s on mpact of Amer can and Mex can cu tura values on normat ve gender *relat ons General Studies C*

CSS 490 Field Studies in the Chicana and Chicano Community. (3) A
ntroduct on to princ p es and methods of qua tat ve research app ed to the Chicana and Ch cano commun ty

CSS 498 PS: Pro-Seminar. 3) A
Requ red course for majors on top c se ected by nstructor, wr t ng ntens ve course re ated to the development of nterd sc p nary research sk l s

Computer Science

A major in Computer Science is offered in both the College of Liberal Arts and Sciences and the College of Engineering and Applied Sciences. For faculty and course descriptions, see "Department of Computer Science and Engineering," page 229.

COMPUTER SCIENCE—B.S.

The program in Computer Science consists of 34 hours of core course work and 15 semester hours of senior level breadth courses in the major. Also required are 18 semester hours of technical elective and mathematics courses approved by the department. The university requirement for literacy and critical inquiry is to be met in part by ECE 400 or a departmental L2.

A minimum cumulative GPA of 2.50 is required to begin upper-division work in the major. A minimum grade of "C" is required in all CSE courses used for degree credit.

For more information, contact an advisor in the Office for Academic Programs, SS 111, or the Computer Science and Engineering Advising Center in GWC 224.

The degree is accredited by the Computer Science Accreditation Board, so more than 120 semester hours are required to complete the degree.

Economics

The College of Liberal Arts and Sciences and the College of Business offer a B.A. or B.S. degree in Economics. Faculty, course descriptions, and the major requirements in the College of Business are listed under "Department of Economics," page 159

ECONOMICS—B.A. OR B.S.

The program in Economics consists of 45 semester hours of course work, 24 of which, at a minimum, must be in economics, and the remainder in closely related fields to be selected from the "Approved List of Related Field Courses" in consultation with the faculty advisor

The following lower division courses are required and must be counted as part of the 45 hour major:

ECN	111	Macroeconomic Principles *SB*	3
ECN	112	Microeconomic Principles *SB*	3
MAT	210	Brief Calculus *V1*	3
STP	226	Elements of Statistics *N2*	3
Total			12

While MAT 210 meets the minimum mathematics requirement to major in Economics, all Economics majors who anticipate going on to graduate school in economics or in business or to law school are encouraged to take MAT 270 Calculus with Analytic Geometry I. Majors are encouraged to pursue further course work in mathematics MAT 270 may be taken in lieu of MAT 210

To qualify for upper division course work in economics, the Economics major must earn a minimum grade of "C" in each of the previously listed courses, have junior class standing (56 semester hours), and have a minimum cumulative GPA of 2.50. ECN 313 Intermediate Macroeconomic Theory and ECN 314 Intermediate Microeconomic Theory are required and should be taken after the completion of the previously listed courses and before other upper division courses in economics.

Credit earned by an Economics major in ECN 484 Economics Internship whether as a legislative intern or through the Department of Economics Internship Program (and ECN 493 Honors Thesis), may not be used to satisfy the minimum 24 hours of economics course work requirement. However, up to six hours of ECN 484 and 493 may be used to meet the related fields requirement. See "College Degree Requirements," page 324

Latin American Studies Certificate or Emphasis. Students majoring in Economics may elect to pursue a Latin American Studies Certificate or Emphasis, combining courses from the major with selected outside courses of wholly Latin American content. See "Latin American Studies," page 332, for more information.

MINORS IN ECONOMICS

Minor in General Economics. The minor in General Economics consists of 18 semester hours of credit which includes ECN 111 and ECN 112 plus any 12 hours of upper division economics courses for which all prerequisites have been met.

Minors in General Economics are encouraged to take calculus and statistics, which are prerequisites for ECN 313 Intermediate Macroeconomic Theory and ECN 314 Intermediate Microeconomic Theory so that these courses might be included in the minor. The College of Business does not permit its professional program students to enroll in this minor.

Minor in Economics for Students Planning a Career in Law. One of the most dramatic recent developments in law is the integration of economic analysis in legal theory and decision making. Curricula at all major law schools reflect this change. Consequently, future lawyers are being trained with courses that rely increasingly on microeconomic theory and econometrics

The applications of economics to law have moved beyond the traditional areas of antitrust and regulation. First year law courses now include microeconomic theory with applications to contracts, torts, criminal law, property, and constitutional law.

The minor in Economics for Students Planning a Career in Law provides an opportunity for prospective law students to take courses that provide them with analytical tools essential for the study of law The prelaw minor consists of a minimum of 18 semester hours. The College of Business does not permit its professional program students to enroll in this minor.

Required courses are as follows

ECN	111	Macroeconomic Principles *SB*	3
ECN	112	Microeconomic Principles *SB*	3
ECN	314	Intermediate Microeconomic Theory *SB*	3
ECN	450	Law and Economics *L*	3
ECN	453	Government and Business	3
Total			15

Also required is at least one additional course from the following:

ACC	316	Managerial Uses of Accounting	3
ECN	421	Earnings and Employment *L SB*	3
ECN	480	Introduction to Econometrics *N2*	3
ECN	494	ST Public Choice	3
FIN	361	Managerial Finance	3

NOTE: For the General Studies requirement courses, and codes such as L1 N3 C and H) see General Studies page 85. For graduation requirements see "University Graduation Requirements" page 81. For an explanation of additional common business courses offered but not listed in this catalog see Classification of Courses, page 58

SECONDARY EDUCATION—B.A.E.

The minor teaching field consists of 21 semester hours. ECN 111 Macroeconomic Principles and ECN 112 Microeconomic Principles and MAT 210 Brief Calculus are required. The remainder must be approved by the advisor in consultation with the student.

Social Studies. See "Social Studies," page 426

GRADUATE PROGRAMS

The faculty in the Department of Economics offer programs leading to the M.S. and Ph.D. degrees. Consult the *Graduate Catalog* for requirements.

For faculty and course descriptions see "Department of Economics," page 159

Department of English

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www.asu.edu/clas/english

REGENTS' PROFESSORS
DUBE RIOS

PROFESSORS
BENDER, BJORK, BOYER, BRACK, BRINK, BUCKINGHAM, CARLSON, CROWLEY, DONELSON, HELMS, KEHL, LESTER, LIGHTFOOT, ANILSEN, D. NILSEN, RHODES, RICHARD, ROEN, SANDS

ASSOCIATE PROFESSORS
ADAMS, BATES, CASTLE, CHANCY, CORSE, DELAMOTTE, GOLDBERG, GREEN, GUTIERREZ, HORAN, JANSSEN, LUSSIER, D. B. MAHONEY, MAJOR, MILLER, MORGAN, NELSON, RAMAGE, SAVARD, SCHWALM, SENSIBAR, Van GELDEREN

ASSISTANT PROFESSORS
BIVONA, FUSE, GOGGIN, HARRIS, JOHNSON, McCABE, PERRY, PRITCHARD, STEVENS, THOMPSON, TOHE, VOADEN, WEBB

SENIOR LECTURERS
COOK, COOPER, DUGAN, D. M. MAHONEY, OBERMEIER, SUDOL

LECTURERS
DUERDEN, DWYER, HEENAN, KYBURZ, NORTON, RAY, WHEELER

ACADEMIC PROFESSIONAL
GLAU

ENGLISH—B.A.

The faculty in the Department of English offer courses in comparative literature, creative writing, English as a second language, English education, English linguistics, literature and language, and rhetoric and composition. Undergraduate degrees include the B.A. degree in English, with a concentration in either linguistics or literature, and a Secondary Education Bachelor of Arts in Education degree. The faculty also offer a Writing Certificate. Students interested in creative writing are encouraged to use electives to pursue a creative writing emphasis. Students should work with their advisors to design individual programs of study that take full advantage of the diversity within the department as well as interdisciplinary and multicultural contexts available in the college and university.

The BA degree in English with a linguistics concentration consists of 42 semester hours. Required degree hours are as follows:

ENG 200	Critical Reading and Writing about Literature *LI/HU*	3
ENG 213	Introduction to the Study of Language	3
ENG 221	Survey of English Literature *HU H*	3
	or ENG 222 Survey of English Literature *HU H* 3	
	or ENG 241 American Literature *HU* 3)	
	or ENG 242 American Literature *HU* 3	
ENG 312	English in Its Social Setting *HU SB*	3
ENG 313	Phonology and Morphology	3
ENG 314	Modern Grammar	3
ENG 413	History of the English Language *HU*	3
ENG 414	Studies in Linguistics to be repeated for a total of nine credit hours	9

Twelve additional hours are electives, chosen in consultation with the student's advisor. These courses must be at the 200 level or above. At least one must be a three credit course in a modern language other than English at the 400 level or above. A grade of 'C' or higher is required in all courses taken for the major. *No course may be used to satisfy more than one requirement.*

The B.A. in English with a literature concentration consists of 45 semester hours. Required courses are as follows:

ENG 200	Critical Reading and Writing About Literature *HU*	3
ENG 221	Survey of English Literature *HU H*	3
ENG 222	Survey of English Literature *HU H*	3
ENG 241	American Literature *HU*	3
ENG 242	American Literature *HU*	3
ENG 421	Shakespeare *HU*	3

Also required are

1. an upper division course in critical theory (3),
2. an upper division course in gender, American ethnic literatures, and/or postcolonial studies (3),
3. a course in the history and/or structure of language (3),
4. an upper division course in literature before 1660 exclusive of ENG 421 (3),
5. an upper division course in literature between 1660 and 1900 (3), and
6. an upper division course in literature after 1900 (3).

Courses may be used to satisfy more than one requirement. Additional hours needed to complete the 45 hours are free electives chosen from the department's offerings at the 200 level and above. At least 18 of the 45 hours must be taken at the 300 or 400 level. A grade of "C" or higher is required in all courses taken for the major.

MINORS

The minor in English with a Concentration in Linguistics consists of 24 semester hours. Required courses are as follows

ENG 200 Critical Reading and Writing about Literature *LI/HU* . . . 3
ENG 213 Introduction to the Study of Literature . . . 3
ENG 221 Survey of English Literature *HU H* . . . 3
or ENG 22_ Survey of English Literature *HU H* (3
or ENG 241 American Literature *HU* (3)
or ENG 242 American Literature *HU* (3)
ENG 312 English in Its Social Setting *HU/SB* . 3
ENG 314 Modern Grammar . . . 3
ENG 413 History of the English Language *HU* . 3

The six additional hours are electives chosen from the department's offerings, with at least one course (three hours) allowed at the 300 or 400 level. A grade of "C" or higher is required in all courses for the minor.

The minor in English with a Concentration in Literature consists of 24 semester hours. Required courses are as follows:

ENG 200 Critical Reading and Writing about Literature *LI/HU* . . . 3
ENG 221 Survey of English Literature *HU H* . . 3
or ENG 222 Survey of English Literature *HU, H* 3
ENG 241 American Literature *HU* . . . 3
or ENG 242 American Literature *HU* 3)
ENG 421 Shakespeare *HU* . . . 3

Also required are two upper division courses in literature (six hours) and two electives (six hours) chosen from among the department's offerings, with at least one course (three hours) at the 300 or 400 level. A grade of "C" or higher is required in all courses taken for the minor.

WRITING CERTIFICATE

The Writing Certificate consists of 19 semester hours. Initial entry into the program requires a minimum GPA of 3.00 in English 101 and 102, 105, or 107 and 108. Students must also have completed at least 30 hours of course work and must have a minimum GPA of 3.00. Required courses are as follows.

ENG 216 Persuasive Writing on Public Issues . . . 3
or ENG 412 Professional Writing (3)
ENG 301 Writing for the Professions *LI* . . . 3
ENG 372 Document Production *LI* . . . 3
ENG 472 Rhetorical Studies . . . 3
ENG 484 Writing Internship . . . 3
ENG 498 PS Pro Seminar Portfolio . . . 1

Total . . . 16

Also required is an additional writing course in English (three hours) or a writing or design course (three hours) selected from courses across campus. All students are required to submit a portfolio before receiving the certificate

SECONDARY EDUCATION—B.A.E.

The major teaching field consists of 42 semester hours in English. Required courses are as follows:

ENG 200 Critical Reading and Writing about Literature *LI/HU* . . . 3
ENG 212 English Prose Style *LI* . . . 3
or ENG 215 Strategies of Academic Writing *LI* (3)
or ENG 216 Persuasive Writing on Public Issues *LI* (3)
or ENG 217 Writing Reflective Essays *LI* (3
ENG 221 Survey of English Literature *HU H* 3
ENG 222 Survey of English Literature *HU H* . . . 3
ENG 241 American Literature *HU* . . . 3
ENG 242 American Literature *HU* . . . 3
ENG 312 English in Its Social Setting *HU/SB* . . . 3
or ENG 314 Modern Grammar (3)
ENG 421 Shakespeare *HU* . . . 3
ENG 471 Literature for Adolescents *HU* . . . 3
ENG 480 Methods of Teaching English . . . 3

Total . . . 30

Also required is one course in women's literature or American ethnic literature. Nine additional hours are free electives chosen from English department offerings, six hours of which must be in the upper division. ENG 471 and 480 must be taken before student teaching.

The minor teaching field consists of the following required courses:

ENG 200 Critical Reading and Writing about Literature *LI/HU* . . . 3
ENG 212 English Prose Style *LI* . . . 3
or ENG 215 Strategies of Academic Writing *LI* 3)
or ENG 216 Persuasive Writing on Public Issues *LI* (3)
or ENG 217 Writing Reflective Essays *LI* (3)
ENG 221 Survey of English Literature *HU, H* . . . 3
or ENG 222 Survey of English Literature *HU, H* (3)
ENG 241 American Literature *HU* . . . 3
or ENG 242 American Literature *HU* (3
ENG 312 English in Its Social Setting *HU/SB* . .3
or ENG 314 Modern Grammar (3)
ENG 471 Literature for Adolescents *HU* . . . 3
ENG 480 Methods of Teaching English . . . 3
Upper division English elective . . . 3

Total . . . 24

These courses are also recommended for Elementary Education majors.

GRADUATE PROGRAMS

The faculty in the Department of English offer programs leading to the M A. degree in English (with concentrations in comparative literature, English linguistics, literature and language, and rhetoric and composition), Master of Fine Arts degree in Creative Writing (options include fiction, nonfiction, poetry, and screenwriting), Master of Teaching English as a Second Language degree, and Ph.D. degree in

NOTE: For the General Studies requirement, courses, and codes (such as L1, N3, C, and H), see "General Studies" page 85 For graduation requirements see University Graduation Requirements," page 81 For an explanation of additional omnibus courses offered but not listed in this catalog see 'Classification of Courses" page 58.

English with concentrations in literature, rhetoric/composition, and linguistics. Consult the *Graduate Catalog* for requirements.

ENGLISH (ENG)

ENG 101 First-Year Composition. 3) F S, SS
D scover ng organ z ng and develop ng ideas n re ation to the wr ter s purpose subject and aud ence Emphas s on modes of wr t ten discourse and effect ve use of rhetor ca pr nc p es Foreign students see ENG 107 Prerequ s te see 'Un vers ty Test ng Requ rements page 70, and F rst Year Compos t on Requ rement" page 81.

ENG 102 First-Year Composition. 3) F S, SS
Cr t ca read ng and writ ng; emphas s on strateg es of academ c d s course. Research paper requ red. Fore gn students see ENG 108 Prerequ s te w th a grade of "C" or h gher ENG 101

ENG 105 Advanced First-Year Composition. 3 F, S
A concentrated compos t on course f r students w th superior writ ng sk s; ntensive read ng research papers og ca and rhetor ca effect veness Not open to students w'th cred t n F rst Year Compos t on Prerequ s te see Un vers'ty Test ng Requ rements" page 70 and 'F rst Year Compos t on Requ rement page 81

ENG 107 English for Foreign Students. (3 F S
For students from non Eng sh speak ng countries who have stud ed Eng sh n the r nat ve countr'es, but who requ re practice n the d oms of Eng sh. Intensive read ng, wr't ng, and d'scuss on Sat sf es the graduat on requ rement of ENG 101

ENG 108 English for Foreign Students. 3 F S
For foreign students· cr t ca read'ng and wr t ng strateg'es of aca dem c d scourse Research paper requ red Satisf es graduat'on requ rement of ENG 102. Prerequ s te w'th a grade of C" or h'gher: ENG 107

ENG 114 English Grammar and Usage. (3 F S
The fundamenta s of Eng sh grammar word and phrase structure and of Engl sh usage (punctuat on, grammat ca correctness).

Comp et on of the F rst Year Composit on requirement s a prerequ site for a l Eng sh courses above the 100 leve

ENG 200 Critical Reading and Writing About Literature. (3 F, S
ntroduct on to the term no ogy methods and object ves of the study of terature w th pract ce n nterpretat on and eva uat on Prerequ - s te· Eng sh ma or or m nor *Genera Stud es L1 HU*

ENG 201 World Literature. 3 F
The c ass cal and med eva per ods Se ect ons from the great tera ture of the wor d n trans at on and lectures on the cu tura background. *Genera Stud es HU H*

ENG 202 World Literature. 3 S
The Rena ssance and modern periods Se ect ons from the great iter ature f the world n trans at on and ectures on the cu tura background *Genera Stud es HU H*

ENG 204 Introduction to Contemporary Literature. (3) A
Poetry f ct on drama and poss bly other gen es *Genera Stud es: HU*

ENG 210 Introduction to Creative Writing. (3) F S
Beg nn ng wr t ng of poetry, f ct on and drama (both stage and screen Separate sect ons for each genre Each genre may be taken once

ENG 212 English Prose Style. 3) N
Ana ys s and pract ce of wr t ng n var ous c ass ca and modern prose sty es Prerequ s te. Eng sh major *or* approva of adv sor and nstruc tor Prerequis te w th a grade f B" or h gher. ENG 102. *General Stud es L1*

ENG 213 Introduction to the Study of Language. 3 F, S
Language as code phonet cs phonology morpho ogy and syntax the lexicon; anguage acqu s t on; soc o nguist cs

ENG 215 Strategies of Academic Writing. 3 F S
Advanced course n techn ques of ana yz ng and writ ng academ c expos tory prose Wr t ng s research based *Genera Stud es L1*

ENG 216 Persuasive Writing on Public Issues. (3 F, S
Advanced course n techn q es of ana yz ng and wr t ng persuasive arguments address ng top cs of current pub c nterest Papers are research based *Genera Stud es L1*

ENG 217 Writing Reflective Essays. 3 F S
Cr t ca exam nat on of the nf ences d scourse has on format on of dent ty narrat ve ana yses of self and culture *General Stud es L1*

ENG 218 Writing About Literature. (3) F S
Advanced wr ting course requ r ng ana yt ca and expos tory essays about f ct on poetry and drama For non-Eng sh majors *General Stud es. L1*

ENG 221 Survey of English Literature. 3 F, S
Medieva Rena ssance, and 18th century terature Emphas s on major writers and the r works n the r terary and h stor ca contexts *Genera Stud es HU, H*

ENG 222 Survey of English Literature. 3) F, S
Romant c V ctor an and 20th century 'terature Emphas s on major wr ters and the r works n the r 'terary and h stor cal contexts *General Stud es HU H*

ENG 241 American Literature. 3 F S
From co on a t mes to the C v War, nc ud ng the growth of nat ona sm and romant c sm *General Stud es HU*

ENG 242 American Literature. (3 F S
From the C v War to the present Deve opment of rea sm natura sm and modern sm, and contemporary trends n prose and poetry. *General Stud es· HU*

ENG 245 Popular Culture Issues 3 F S
Selected top cs n var ous forms of p pu ar cu ture related to wr tten texts. May be repeated for cred t when top c var es. *General Studies L1*

A term paper or equ va ent out of c ass written work s requ red 'n all upper-div sion (300–400 eve) ENG courses

ENG 301 Writing for the Professions. 3 F, S
Advanced pract ce n wr t ng and ed t ng expository prose Pr mar ly for preprofess ona majors *Genera Stud es. L1*

ENG 303 Classical Backgrounds of English Literature. (3) N
Se ected read ngs of Greek and Lat n terature n translat on, empha s z ng forms, deas and myths as they re ate to iterature n Eng sh. *General Stud es HU*

ENG 307 Utopian Literature. 3 N
Selected works from the present to the c assica per od nc ud ng *Walden Two Wa den Utop a* and *The Repub ic General Studies· L2/ HU, H*

ENG 310 Intermediate Creative Writing. (3) F S
Separate sect ons for f ct on and poetry. May be taken once for poetry, once for f ct on Lectures, writ ng ass gnments d scuss on cr t cism Prerequ s'te· ENG 210 or nstructor approval

ENG 312 English in Its Social Setting. (3) S
ntroduct on to the soc l ngu st c study of the Engl sh anguage *Gen era Stud es HU SB*

ENG 313 Phonology and Morphology. 3 S
ntroduct n to Eng sh morpho ogy phono ogy etymology and phonetic aspects of rhyme a terat on and other sound based iterary dev ces

ENG 314 Modern Grammar. 3 F, S
Modern descr ptive models of Eng sh grammar

ENG 321 Introduction to Shakespeare. (3 F S
Shakespeare s ma or comed es h stor es and traged es *General Stud es· L2/HU*

ENG 331 American Drama. 3 A
Major works n the deve opment of Amer can drama from ts beg n- n ngs to the present *Genera Stud es L2.*

ENG 332 Major American Novels. 3) A
Nove s from the 19th century to the present stud ed in the r h stor cal and cultura contexts *Genera Stud es L2*

ENG 333 American Ethnic Literature. 3 A
Exam nat on of Amer ca s mu t ethn c dent ty through works of l tera ture that dep ct Amer'can ethn c gender, and c ass sens b' t es *Gen era Stud es L2, C*

ENG 345 Selected Authors or Issues. 3–4) N
D fferent top cs may be offered F m top cs w th lab may carry 4 cred ts Repeat cred t for d fferent top cs

ENG 352 Short Story. 3 F S
Deve opment of the short story as a terary form ana ys s of ts tech- n que from the work of representat ve authors *General Stud es· HU.*

ENG 353 African American Literature· Beginnings through the Harlem Renaissance. 3) F
Thematic and cu tura study of Afr can Amer can terature through the Har em Renaissance Cross sted as AFH 353 Cred t a owed on y for AFH 353 or ENG 353. *Genera Stud es L2/HU C*

ENG 354 African American Literature: Harlem Renaissance to the Present. (3) S
Thematic and cultura study of Afr can Amer can l terature from the Har em Renaissance to the present Cross sted as AFH 354 Cred t 's a owed only for AFH 354 or ENG 354 *Genera Stud es. L2/HU C*

ENG 355 History of the Drama. 3 N
Deve opment of European drama from the Greek to the Romant c Per od *Genera Stud es L2/HU*

ENG 356 The Bible as Literature. 3 F S
Read ngs n O d and New Testaments, emphas z ng deas, terary types and sources as they appear n terature *Genera Stud es HU*

ENG 357 Introduction to Folklore (3 N
Survey of the h story genres, and dynam cs of fo k ore w th emphas s on oral tradit ons *Genera Stud es HU*

ENG 359 American Indian Literatures. 3 N
Se ected oral trad t ons of Amer can Ind ans and the r nf uences on contemporary Nat ve Amer can iterary works. *Genera Stud es· L2/HU, C*

ENG 361 Silent Film. (4) F
Deve opment of mot on p ctures from 1850 through 1930 3 hours ec- ture screen ngs *General Stud es HU.*

ENG 362 Sound Film Genres. 4) S
Exam nat on of the Western the horror f m the comedy and other genres 3 hours ecture, screen ngs *Genera Stud es HU*

ENG 363 Chicana and Chicano Literature. (3) F
Development of Ch cana and Ch cano terature, study of genres and themes attent on to terary antecedents Cross sted as CSH 363 Cred t is a owed on y for CSH 363 or ENG 363 *General Stud es L2/HU C*

ENG 372 Document Production. (3 F S
ntroduct on to document des gn and product on Pract ce n cr tique and n writ ng the content of pub cations Lecture d scuss on Prereq u s te F rst-Year Compos t on or nstructor approva *Genera Stud es L1*

Engl sh majors and m nors are expected to have comp eted ENG 200 before taking 400 eve terature courses

ENG 400 History of Literary Criticism. (3 N
Major cr t cs and crit ca trad t ons n the western wor d. Prerequ s te. 6 hours of terature or nstructor approva *Genera Stud es HU*

ENG 405 Style and Stylistics. 3 N
L ngu st c rhetor ca and terary approaches to the ana ys s of sty e n poetry, f ct on and other forms of wr tten d sc urse

ENG 409 Advanced Screenwriting II (3 N
App cat on of the pr'nc'ples taught n a comp ete feature ength screenp ay

ENG 411 Advanced Creative Writing. 3 F S
Separate poetry and f ct on wo kshops f r exper enced wr ters, emphas z ng nd v dua sty e May be taken once for poetry, once for f ct on. Prerequ s te ENG 310 or nstructor approva

ENG 412 Professional Writing. 3 N
Lectures and conferences concern ng techn ques of wr t ng for pub cat on. Prerequ s te ENG 310 or nstructor approva

ENG 413 History of the English Language. 3 A
Deve opment of Eng sh from the ear iest t mes to the modern per od Prerequ s te un or stand ng or nstructor approva *Genera Stud es HU*

ENG 414 Studies in Linguistics. 3 F S
The re ationsh p of nguist cs to terature gender power and other soc a ssues May be repeated for cred t Prerequ s te jun or stand ng

ENG 415 Medieval Literature. (3 N
Med eval Eng sh terature n trans at on from *Beowu f* to Ma ory (exc ud ng Chaucer emphas z ng cultura and nte ectua back grounds; nc udes cont nenta works Prerequ s te ENG 221 or nstructor approval *Genera Stud es HU*

ENG 416 Chaucer: *Canterbury Tales.* 3 A
Chauce 's anguage h s ast work and ts re at nsh p to cont ne ta and nsu ar trad t ns Prerequ s te ENG 221 o nstructor approva *Genera Stud es HU.*

ENG 417 Chaucer: *Troilus and Criseyde and the Minor Works.* 3 N
Chaucer s anguage h s ma or poem and h s ear y works n the r med eva context Prerequ s te. ENG 221 or nstructor approva *Gen era Studies HU*

ENG 418 Renaissance Literature. 3 F
Top cs auth rs, and themes n Eng sh terature 1485–16 3 Prereq u s te ENG 221 or nstructo approva. *Genera Stud es L2/HU*

ENG 419 English Literature in the Early 17th Century. 3 F
Top cs auth rs, and themes n E g sh terature 1603–1660 Prereq u s te ENG 221 or nstructor app ova. *Genera Stud es L2/HU*

ENG 421 Shakespeare. 3 F, S
A se ect on of comedies, h stor es and traged es Prerequ s te ENG 221 or nstructor approva *Genera Stud es HU*

ENG 422 Stud es in Shakespeare. 3 A
Top cs for u ose exam nat n n se ected dramat c and/or nondramat c works May be repeated f r cred t when t p cs vary Prerequ s te ENG 421 or nstructor approva *Genera Stud es HU.*

ENG 423 Renaissance Drama. 3 S
Top cs authors, and themes n the drama of the Tudor and ear y Stuart per ods Prerequ s te ENG 221 or nstruct r approva *Genera Stud es L2/HU*

ENG 424 Milton. 3 A
Se ected prose and poetry emphas z ng *Parad se Lost Parad'se Rega ned* and *Samson Agon stes* Prerequ s te ENG 221 or struc tor approva *Genera Stud es HU*

ENG 425 Studies in English Romanticism. 3 F
A genres of R mant c terature n cu tura contexts, B ake to the death of W rdsworth May be repeated for cred t *Genera Stud es HU*

ENG 426 Victorian Poetry. (3 F
Poetry of the second ha f of the 19th century May nc ude such poets as Tennyson Brown ng and Arn d Prerequ site ENG 222 or nstruc- tor approva *Genera Stud es L2/HU.*

ENG 427 Restoration and Early 18th Century. 3 N
Wr ters and m veme ts n the nondramat c terature of the Restora- t on and ear y 18th century Prerequ s te ENG 221 or nstructor approva *Genera Stud es HU*

ENG 428 The Later 18th Century. (3 N
Wr ters m vements and books dur ng the second ha f of the 18th century Prerequ s te ENG 221 or nstructor approva *Genera Stud es HU*

ENG 430 Victorian Cultural Backgrounds. 3 N
Soc a re g ous and other cu tura ssues of the per od May nc ude Car y e Rusk n Darw n, Arno d Pater, and Morr s Prerequ s te ENG 222 o nstructor approva *Genera Stud es. L2/HU*

ENG 435 19th-Century American Poetry. 3 N
Themes and developments n Amer can poetry to 1900 nc ud ng Poe, Wh tman and D ck ns n *Genera Stud es HU*

ENG 439 Restoration and 18th-Century Drama. 3 S 2001
Eng sh drama 1600--1800 Prerequ s te ENG 221 or nstructor approva *Genera Stud es. HU.*

ENG 440 Studies in American L terature to 1815. 3 N
Th ught and express on from the t me of f rst c ntact to 1815 May be repeated for cred t Prerequ s te ENG 241 or nstructor approva *Gen- era Stud es· HU*

ENG 441 20th-Century American Drama. 3 N
Amer can drama s nce Wor d War espec a y exper menta tech- n ques Prereq 's te ENG 241 o 242 or nstructor approval *Genera Stud es HU*

ENG 442 20th-Century British and Irish Poetry. 3 N
Theory and pract ce of poetry s nce 1900 Prerequ s te ENG 222 or nstructor approva

ENG 443 American Poetry, 1900–1945. 3 N
Deve opments n theory and pract ce of major poets Prerequ s te ENG 241 or 242 or nstructor approva *General Stud es HU*

NOTE: For the Genera Stud es requ rement courses, and codes such as L1 N3 C a d H), see Genera Stud es " page 85. For graduat on requ reme ts see Un vers ty Graduat on Requ rements ' page 81 For an exp anat n of add t na om bus courses offered but not sted n th s catalog see "C ass f cat on of Courses " page 58

ENG 444 Stud es in Amer can Romanticism, 1830–1860. 3 F
Cu tura express on n works of representat ve wnters. May be repeated for red t Prerequ s te· ENG 241 or nstructor approva *Gen era Stud es HU*

ENG 445 Studies in American Realism, 1870–1910. 3 S
Wr ters a d nf uences that shaped the deve opment of terary rea sm May be repeated for cred t Prerequ s te ENG 242 r nstructor approva *Genera Stud e L2/HU*

ENG 448 20th-Century British and Irish Novel. 3) N
Theory and pract ce of the novel s nce 1900 Prerequ s te ENG 222 or nstruct approva *Genera Studies HU*

ENG 451 The Novel to Jane Austen. (3) N
From or g ns f pr se f ct on through the 18th century *General Stud es HU H*

ENG 452 The 19th-Century Novel. 3 S
May nc ude s h nove sts as Austen D ckens E ot and Conrad *Gen ra Stud es HU*

ENG 453 The American Novel to 1900. (3 N
The r se a d deve opment of the nove to Dre ser Prerequ s te ENG 241 or nstruct r appr val *Genera Stud es HU*

ENG 454 The American Novel, 1900–1945. 3 N
Deve pments n theory and pract ce of major nove sts Prerequ s te· ENG 41 or 242 or nstructor approval *Genera Stud es· HU*

ENG 455 The Form of Verse: Theory and Practice. 3) N
Types h sto y cr t c sm and schoo s of theory of metr ca form. Ana y s s of yr c narrat ve and dramat c poetry.

ENG 457 American Poetry Since 1945. (3 A
Maj r Amer can p ets of the per od Deve opments n theory and prac t ce Prerequ s te ENG 241 or nstructor approva . *Genera Stud es· HU*

ENG 458 American Novel Since 1945. 3) N
Major nove sts of the per od Deve pments n theory and pract ce Prerequ s te ENG 242 or nstructor approva *Genera Stud es L2/HU*

ENG 460 Western American Literature. (3 A
Cr t ca exam nat on of deas and trad t ons of the terature of the west- ern n ted States c ud ng the nove *Genera Stud es L2/HU*

ENG 461 Women and Literature. (3 N
Se ected top cs n terature by or about women May be repeated for red t when top cs vary. *Genera Stud es· HU*

ENG 462 20th Century Women Authors. 3 N
Cr t ca exam nat on of terature by 20th century women wr ters May be repeated f r cred t when top cs vary. *Genera Stud es· HU*

ENG 463 European Drama from Ibsen to 1914. 3 N
Ch ef c t nenta and Br t'sh dramat sts of the per od emphas z ng the beg nn ngs a d deve opment of rea sm *General Stud es HU*

ENG 464 European Drama from 1914 to the Present. 3 N
Ch ef c nt nenta and Br t sh dramat sts of the per od emphasiz ng exper menta tech ques *Genera Stud es. HU.*

ENG 470 Symbols and Archetypes in Children's Literature. 3 F
Var us cr t a approaches and recurr ng themes are stud ed 'n re a t on to c ass a a d contemporary ch dren s terature Lecture d s cuss on read ng

ENG 471 Literature for Adolescents. (3 F S
Pr se and poetry that meet the nterests and capab t es of un or h gh and gh sch o students Re ent terature stressed A pass ng grade of at east C requ red before students are perm tted to student teach n Eng sh *Genera Stud es HU*

ENG 472 Rhetorical Studies. 3 F S
Deve pments n theory and pract ce of ma or rhetor ca nqu r es Sem nar w rkshop Prerequ s te. jun r stand ng

ENG 480 Methods of Teaching English. (3) F S
Meth ds of stru t on rganizat on and presentat on of appropr ate c ntent n Eng sh. A pass ng grade of at east C" requ red before stu dents are perm tted to student teach n Eng sh. Prerequ s te ENG 312 r 314 or 413

ENG 484 Writ ng Internship. 3 N

ENG 498 PS: Pro-Seminar: Portfolio. 1 N

ENG 500 Research Methods. 3) A
Method gy and resource mater a s for research. Analys s of cr t c sm a d scho a sh p, nc ud ng eva uat on of sources

ENG 501 Introduction to Comparative Literature. 3) N
P b ems meth ds, and pr nc p es, ustrated by se ected cr t ca es ays a d te ary texts

ENG 502 Contemporary Critical Theory. 3 A
An advanced survey of major schoo s of 20th century f terary and cr t ca theory Lecture d scuss on Cross l sted as HUM 549 Cred t s a owed on y for ENG 502 r HUM 549

ENG 507 Old English. 3 N
E ements of O d Eng sh grammar w th se ected read ngs

ENG 508 Old Eng ish Literature. 3) N
Intens ve terary ngu st'c and cu tura study of O d Eng sh terature May be repeated for cred t when top cs vary Prerequ's te· ENG 507

ENG 509 Middle English. 3 N
A study of the pr nc pa d a ects f the anguage w th se ected read ngs Prerequ s te graduate stand ng

ENG 512 The Teaching of Composition. 3) N
The theory and pract ce of teach ng wr t ng at a eve s Emphas s on current research Prerequis tes teach ng exper'ence; nstructor approva

ENG 515 Middle English Literature. 3 N
Eng sh terature from the 12th through the 15th centur es exc us ve of Chaucer Prerequ s te ENG 509 or structor approva

ENG 517 Contemporary Rhetorical Theory. 3) A
nvest gat on of the work of such mportant rhetor ca theor sts as Burke To m Pere man Gates and C xous.

ENG 520 Renaissance L terature. 3 N
Poetry and prose of the Eng sh Rena ssance exc ud'ng drama

ENG 521 Shakespeare. 3 A
A se ect on f comed es, h stor es and traged es presented n the con- text of terary h story and cr t ca theor es w th an emphas s on c assi- ca and med eva backgrounds

ENG 525 Amer can Literary Criticism. (3) N
Ana ys s and d scuss on of ead ng h stor ca and cr t ca nterpreta t ons of Amer can terature from the beg nn ngs t the present

ENG 530 Classical Rhetoric and Written Composition. 3) F
Re at onsh p of ma or texts n c ass ca rhetor c to deve opments n comp s t on theory terary theory and pract ce through the 19th cen tury

ENG 531 Rhetorical Theory and L terary Criticism. (3) S
Intens ve study of major rhetor ca theor sts of the 20th century n such areas as tera y cr t c sm d scourse theory, and compos t on theory

ENG 532 Composition Theory 3) N
Intens ve study n the rheto ca categor es of nvention arrangement sty e a ms, m des and f rms of wr tten d scourse

ENG 545 Studies in English Literature. 3 N
Th s course offers se ected authors or ssues and may be repeated for cred t

ENG 547 Studies in American Literature. (3 N
Th s course offers se ected authors or ssues and may be repeated for cred t

ENG 549 Studies in Comparative Literature. 3 N
Th s course offers se ected authors or ssues and may be repeated for cred t

ENG 550 Contemporary Comparative Literature. (3) N
Comparat ve stud es n m dern te ature 'n Eng sh and other l tera tures n trans at on May be repeated for cred t when content var es

ENG 560 Studies in Dramat c Forms. 3 F N
Se ected top cs n dramat c and c nemat c terature h story cr t c sm the ry and cross-d sc p nary study May be repeated for cred t when top c var es Lecture stud

ENG 571 Advanced Study in Literature for Adolescents. (3 N
H story and cr t c sm of ado escent terature Prerequ s te· ENG 471 or nstructor approva

ENG 573 Censorship and Literature. 3 N
The h st ry f censorsh p, pr mar y n the Un ted States and s gn f cant court dec s ons that affe ted wr ters and books

ENG 591 Seminar. 3 F S
Se ected top cs regu a y ffered n the var ous areas of Eng sh stud es

LINGUISTICS (LIN)

See the *Graduate Cata og* for the LIN courses.

WRITING ACROSS THE CURRICULUM (WAC)

WAC 101 Introduct on to Academic Writing 3 F S
Comb nes c assroom and supp ementa nstruct on to teach academ c genres of wr t ng nc ud ng def n t n summary and analys s

WAC 107 Introduction to Academic Writing for International Students. 3) F S
For students from non Eng sh speak ng countr es Comb nes c ass room and supp ementa nstruct on w th ntens ve read ng wr t ng and d scuss on

Department of Exercise Science and Physical Education

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REGENTS' PROFESSOR
D M LANDERS

PROFESSORS
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ASSISTANT PROFESSORS
CHEN, ETNIER, GERR TSEN, KELLEY PHILLIPS ROBERTSON, SWAN, TREASURE

SENIOR LECTURER
D.M LANDERS

LECTURERS
JONES PR DE WOODRUFF

EXERCISE SCIENCE/PHYSICAL EDUCATION—B.S.

The B S degree in Exercise Science/Physical Education consists of 42 semester hours, including 21 semester hours of required EPE core c ourses EPE 110 may be repeated for credit) The remaining 21 semester hours of EPE and other courses are prescribed by the specific concentration the student selects.

The required EPE core courses are as follows:

EPE	110 Moven ent Analysis Lab orat ry	6
EPE	2) Introduct on to Exercise Science and Physical Education	3
EPE	335 Biomechanics.	3
EPE	34 Physi olo y of Exercise	3
EPE	345 Motor and Developmental Learning	3
EPE	352 Psychosocial Aspects of Physical Activ ty	3
Total		21

Each EPE core course has specific prerequisite courses that must be taken before taking the respectiv c re co irse These prerequisite courses include the f ol ow in .

BIO	2 Hun an Anaton y and Phys ol gy I S	4
BIO	202 Human Anaton y and Pl ys y I	4
CHM	10 Introductory Chemistry *SI S*	4
MAT	117 College Algebra *SI*	3
PGS	1)1 Introduction to Psycho ogy *SB*	3
PHY	111 General Physics *SI S2**	3
Total		21

* Both PHY 111 and 3 must be taken to ec re SI r S? credit

All prerequisite and EPE courses must be con pleted with a minimum grade of "C." The requirements for the spec fic concentrations are described below.

Majors must elect either the exercise science, exercise and wellness, or physical education cc ncentratic n

Exercise and Wellness Concentration. Candidates for the exercise and wellness concentration must con plete 21 semester hours beyond the required EPE core courses by taking the following:

EPE	300 Foundations of Exerci e and We ness	3
EPE	32) Program Development an l Leader l ip	3
EPE	420 Exercise Testing	3
EPE	425 Exercise Prescript n.	3
EPE	484 It ternship	6
Total		18

Three semester hours must be selected from an appr ved list of concentration electives that includes EPE c urses and courses from nutrition, computer science stat stics, and business

Exercise Science Concentration. Candidates for the exer cise science concentration must con p ete 21 semester ho irs beyond the core courses in the ma c r field, at least 2 of which must carry EPE prefixes be upper divis on co irses and concern the theoretical subjects of the core The remain ing nine semester hours may carry either EPE pref xes or prefixes from related disciplines selected with the adv c and consent of a faculty advisor Activity cou rses may not be used to fulfill part of the 21 sen ester h ir requ ren ent No more than six semester hours may be in u dependent study courses.

Physical Education Concentration. C andidates must com plete 21 semester hours beyond the EPE core courses. 12 of which must carry EPE prefixes fron the requ red c rse list below

EPE	361 Physical Educati n in the Sec ondar Sc	
EPE	376 Physical Edu ation for th E el ri ry S	
EPE	38? Physical Educat on for t e Atyp ca Studen	
EPE	480 Methods of Teaching Phys ca Fducati n	3
Total		2

The remaining nine semester hours of related ourse work can carry either EPE psychol y, special d ation n

NOTE: For the Genera Stud es equ rement courses and codes such as L1 N3, C and H see Genera Stud es' page 85 F r grad at n requ rements see Un vers ty Graduat on Requ rements, page 81 For an exp anat on of add t ona omn bus courses ffe ed but n t ted n th s cata og see 'C ass f cat on f Courses " page 58

child development, and/or education prefixes Activity courses (EPE 110) may be used to fulfill part of the 21 semester hour requirement (additional four semester hours maximum). No more than six semester hours may be taken in internship. Internship experiences may only be in elementary and secondary school teaching and coaching settings. A maximum of six semester hours may be in independent study.

EXERCISE SCIENCE/PHYSICAL EDUCATION MINOR

The minor in Exercise Science/Physical Education consists of the core sequence in exercise science and physical education as follows, plus all prerequisite courses

EPE	110 Movement Analysis Laboratory	6
EPE	200 Introduction to Exercise Science and Physical Education	3
EPE	335 Biomechanics	3
EPE	340 Physiology of Exercise	3
EPE	345 Motor and Developmental Learning	3
EPE	352 Psychosocial Aspects of Physical Activity	3
Total		21

SECONDARY EDUCATION—B.A.E.

Physical Education. Candidates for the B.A.E. degree are required to complete the following courses in physical education in addition to the required EPE core courses

EPE	361 Physical Education in the Secondary School	3
EPE	376 Physical Education for the Elementary School	3
EPE	382 Physical Education for the Atypical Student	3
EPE	480 Methods of Teaching Physical Education	3
EPE	(see advisor)	3
Total		15

Students must also complete a four semester Physical Education Teacher Preparation Program professional sequence in the College of Education (38 semester hours). Entry into this degree program requires filing an application, passing scores on a Pre Professional Skills Test (PPST) or American College Test (ACT), 56 semester hours of completed university study, and a minimum GPA of 2.50. See the "College of Education" section for additional requirements.

GRADUATE PROGRAMS

The faculty in the Department of Exercise Science and Physical Education offer programs leading to the Master of Physical Education degree and the M.S. degree in Exercise Science/Physical Education. The department also participates with the Graduate College in the program leading to the Ph.D. degree in Exercise Science and with the College of Education and the Graduate College in the program leading to the Ph.D. degree in Curriculum and Instruction with concentrations in exercise and wellness and in physical education. Consult the *Graduate Catalog* for requirements.

EXERCISE SCIENCE/PHYSICAL EDUCATION (EPE)

A $5.00 towel and locker fee is required each semester by students using towel and locker facilities for physical education classes and intramural activities

Physical education activity classes (EPE 105, 205, 305, 310) may not be taken for audit. Excessive absences and/or tardiness are considered disruptive behavior

EPE 100 Introduction to Health and Wellness. (3) F, S, SS
Current concepts of health and wellness. Cross-listed as HES 100. Credit is awarded only for EPE 100 or HES 100.

EPE 105 Physical Education Activity. 1. F, S, SS
Beginning instruction in a wide variety of sports such as aerobics, aquatics, racquet sports, physical conditioning, and golf. 3 hours/week. "Y" grade only. May be repeated for credit.

EPE 110 Movement Analysis Laboratory. (1-2) F, S, SS
Practical application of biomechanical, physiological, and learning principles in the analysis of skill acquisition and performance. May be repeated for credit. Prerequisites: EPE 105 proficiency, ESPE major.

EPE 200 Introduction to Exercise Science and Physical Education. (3) F, S, SS
Introduction to the disciplines and professions associated with ESPE including an overview of historical and philosophical foundations.

EPE 205 Physical Education Activity. 1) F, S, SS
Intermediate level. Continuation of EPE 105. 3 hours/week. May be repeated for credit.

EPE 283 Prevention and Care of Athletic Injuries. 3. F
Taping, injury recognition, emergency care, and observation procedures in athletic training. Prerequisites: BIO 201, 202.

EPE 290 Sports Officiating. 3) F
Rules and mechanics of officiating used in football, basketball, and volleyball.

EPE 292 Sports Officiating. (3) S
Rules and mechanics of officiating used in softball, slow and fast pitch baseball, and track and field.

EPE 300 Foundations of Exercise and Wellness. (3) F
Analysis of research in various disciplines which contribute to health promotion and wellness.

EPE 301 Fitness for Living. 1. F, S
Application of principles of physical activity to personal fitness testing and program planning for people of all ages. Telecampus course. Not open to Exercise Science and Physical Education majors or to students who have credit for EPE 325.

EPE 305 Physical Education Activity. 1. F, S, SS
Advanced level. Continuation of EPE 205 with instructor's approval. 3 hours a week. May be repeated.

EPE 310 Collegiate Sports. 1. F, S
Participation in men's or women's intercollegiate competition. May be repeated for 4 credits, 1 per year. "Y" E" grade.

EPE 320 Program Development and Leadership. 3. S
Principles of planning, organizing, promoting, and leading fitness and wellness programs. For majors only.

EPE 325 Fitness for Life. 3. F, S
Physical fitness and benefits of exercise with emphasis on self evaluation and personalized program planning for a lifetime. Not open to students with credit in EPE 301.

EPE 334 Functional Anatomy and Kinesiology. 3. S
Muscles, bones, joints, and nerves and how they produce movement. Emphasis on muscle origins, insertions, actions, and innervations. Lecture, lab. Prerequisites: BIO 201, 202.

EPE 335 Biomechanics 3. F, S, SS
Basic anatomical and mechanical principles applied to human movement. Emphasis is placed on kinematic and kinetic concepts. Lecture, recitation, lab. Prerequisites: BIO 201, MAT 117, PHY 111.

EPE 340 Physiology of Exercise. 3. F, S, SS
Physiological mechanisms of acute responses and chronic adaptations to exercise. Lecture, recitation, lab. Prerequisites: BIO 202, CHM 101.

EPE 345 Motor and Developmental Learning. 3) F, S, SS
Principles of motor skill acquisition across the lifespan, focusing on the learner and the learning environment. Lecture, recitation, lab. Prerequisites: BIO 201, PGS 101.

EPE 348 Psychological Skills for Optimal Performance. 3 F S SS
App cation of psycho og ca techn ques and the r use to mprove effect veness and performance n sport and re ated areas.

EPE 352 Psychosocial Aspects of Physical Activity. 3 F S SS
nterrelat onsh ps between phys ca act v ty and psychosoc a vari- ab es nc ud ng soc a izat on cu tural va ues aggress on and mot va t on. Inc udes the psycho og ca benef ts of phys ca act v ty and exerc se adherence Lecture recitat'on Prerequ sites· B O 201 PGS 101

EPE 361 Physical Education in the Secondary School. (3) F, S
Current trends and theor es such as e ect ve programs, coed c asses, egal ssues contract teach ng, curr culum, and adm n strat on

EPE 370 Advanced First Aid. (3 N
Assessment, management treatment of wounds njur es shock, po son ng burns, sudden ness, emergency rescue, and card opulmo nary resusc tation Lecture, lab

EPE 376 Physical Education for the E ementary School. (3) F S
Scope and va ues of phys ca educat on in the elementary schoo . Methods, materia s and pract ce in teaching act v t es for pr mary intermed ate and upper grades

EPE 378 Curriculum Development for Physical Education. (3) F, S
Study of the des gn mp ementat on, and eva uat on of phys ca education curr culum. Analys s of d fferent curr cu um teaching sty es

EPE 382 Physical Education for the Atypical Student. (3) F S, SS
Teach ng nd v dua s w th hand capp ng condit ons phys ca sk s and act v t es Prerequ s tes B O 201 202

EPE 412 Biomechanics of the Skeletal System. 3 F
B omechan cs of t ssues structures and major joints of the muscu oske eta system. D scuss on of njury mechan sms. Lecture d scuss'on some labs. Prerequ s te EPE 335 or nstructor approva

EPE 413 Qualitative Analysis in Sport Biomechanics. (3) S
Develop ng systemat c approach for detecting and correct ng errors n human performance us ng anatom cal and mechan ca pr nc p es Lecture, lab Prerequ s te EPE 335

EPE 414 Electromyographic Kinesiology. (3) F
Muscu ar contr butions to human movement musc e mechan cs e ectrophys o og ca bas s and pract ca app cat on of e ectromyography. Lecture d scuss on Prerequ s tes EPE 335, 340 nstructor approva

EPE 420 Exercise Testing. 3 F S SS
Theoret ca bas s and pract ca app 'cat on of screen ng exerc se test ng, estimates of energy expend ture, and nterpretat on of resu ts Lecture stud o Prerequ s te EPE 340

EPE 425 Exercise Prescription. (3) S
Theoret ca bases for and app cat on of genera pr nc ples of exerc se prescr'pt on to var ous ages, f tness eve s and hea th states Prereq u s te EPE 420

EPE 440 Exercise Biochemistry. (3) F
Study of b oenerget cs and metabo 'sm of ce lu ar (ske etal muscle heart and ver) organe es and prote ns dur ng exercise Prerequ s te EPE 340

EPE 441 Physiology of Women in Sport. (3) S
Phys o og ca aspects of women engag ng in phys cal act v ty. Factors affecting performance and health throughout fe are emphas zed Pre requisite· EPE 340. *General Stud es L2.*

EPE 442 Physical Activity in Health and Disease. (3) F
The ro e of phys ca act v ty and phys ca fitness in the development of morb d ty and morta ty throughout the human l fe span Prerequ s'tes· BIO 201, 202 EPE 340 *General Stud es L2.*

EPE 443 Exercise Endocrinology. (3) S
D scuss ons of current research and theory concern ng hormona changes dur ng exerc se Lecture d scuss on. Prerequ s te EPE 340 or nstructor approva *General Stud es L2*

EPE 444 Metabolic Adaptations to Exercise Training. (3) F S, SS
Exam nat on of phys o og c adaptations to exerc se tra'n ng as they relate to metabo sm and t ssue funct ons Prerequ s te EPE 340

EPE 448 Applied Sport Psychology. 3) S
Psycho og ca theor es and tech ques app ed to a sport to enhance the performance and persona growth of ath etes and coaches Lec ture d scussion Prerequis te. EPE 352 or equ va ent *General Studies L2.*

EPE 452 Exercise Physiology. 3 S
Contemporary research and theory as re ated to human behav or and health in an exerc se sett g Prerequ s te· EPE 352

EPE 460 Theory of Strength Training. 3 S
Research and theor es n deve p ng muscu ar strength pr gram for deve op ng muscu ar strength Lecture d scuss on Prerequ s tes EPE 335 340 *Genera Stud es L2*

EPE 478 Student Teaching in Secondary Schools. 3–12 F
The pract ce of teach ng The re at onsh p of pract ce and the ry n teach ng. Prerequ s te two c mp ete semesters of b ock o equ va ent

EPE 480 Methods of Teaching Physical Education. 3 F S
Methods of nstruct on, organ zat on and presentat on of appropr ate content in e ementary and secondary phys ca educat Concu rent with student teach ng or nstructor approva Prerequ s tes EPE 361 376

EPE 484 Internship. (6 N

EPE 485 Advanced Techniques of Athletic Training. 3 S
An advanced course n ath et c tra n ng des gned f r tudent seek ng NATA cert f cation Emphas s on therapeut c moda t es and rehab ta t on procedures Prerequ s tes EPE 283 370 CPR cert f cat on

EPE 500 Research Methods. 3 F
An ntroduct on to the basic aspects of research, nc ud ng p ob em select on, l terature rev ew 'nstrumentat on data ha d g methodo ogy, and the wr ting of research reports and art es

EPE 501 Research Statistics. 3 S
Stat st ca procedures samp ing techn ques exerc se test ng exerc se prescript on hypothes s test ng and exper menta de gns as they re ate to research pub cat ons

EPE 505 Applied Exercise Physio ogy Techn ques. 3 F
nvestigat ve techn ques used n the app ed exerc se phys ogy abo ratory Emphas s on pu m nary funct on body compos t n and car d oresp ratory assessment. Lectu e ab Prerequ te EPE 340

EPE 510 Introduction to Biomechanics Research Methods 3 F
App cat on of mechan cs to human movement ana ys s In udes con siderat on of two d mens ona imag ng techn ques, force measure ment e ectromyography, and data process ng methods Lecture d scuss on some abs. Prerequ s te EPE 335 or nstructor appr va

EPE 520 Sport Psychology. 4 F
Current research n sport psycho gy nc udes quest nna re psycho physiologica and behav ora research techn q es. Lectu e, d s us s on Prerequ s tes: EPE 448, 500

EPE 521 Motor Development, Control, and Learning. 4 S
Theory and research on mot r sk acqu s t on nc d ng ea ng n tro and development .e., growth, ch dren and exerc se and deve p ment earn ng) Lecture d scuss'on some abs Prerequ s tes EPE 345, 500, 501

EPE 522 Exercise Psychology. 3 S
Contemporary research and theory as re ated to human be av or a d hea th n an exerc se sett ng Lecture d scuss on Prerequ s te EPE 500

EPE 530 Exercise Physiology. 3 F
Immed ate and ong term adaptat ons to exerc e w th spec a refer ence to tra n ng and the ro e of exerc se n card vascu ar hea th Pre requ s te EPE 340

EPE 531 Physiology of Women in Sport. 3 S
Phys o og ca aspects of women engag ng n phys a act v ty. Factors affect ng performance and hea th throughout fe are emphas zed Pre requ s te: EPE 340

EPE 534 Sports Conditioning. 3 F
Bases of sports cond t on ng nc ud ng aerob c a d a aerob c p wer, strength, f ex b ty and ana ys s of cond t on ng c mp ents for sports

EPE 535 Factors Influencing Exercise Performance 3 S
Physio og ca factors that can affect the ab ty to exerc se and the body s response to exerc se ecture sem nar Pre equ s te EPE 530.

EPE 536 Physiology of Physical Activity, Exerc se and Chron c Disease. 3 F, S
Ro e of phys o og ca mechan sms assoc ated w th acute and ong term phys ca exerc se and ts nf uence n chron c d sease and we ness

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NOTE: For the Genera Stud es requ rement courses, and codes (such as L1 N3 C and H) see General Stud es, page 85 For graduat o requ rements see Un vers ty Graduat on Requ rements " page 81. For an explanat on of add t ona omn bus courses offered but not sted n th s cata og see 'Class f cat on of Courses " page 58

EPE 542 Health Promotions. (3) S
Theory and research concern ng f tness and we ness programs n nutr t on, phys ca act v ty smok ng cessat on and stress manage ment

EPE 544 Fitness/Wellness Management. (3) F
Deve opment of the f tness/wel ness ndustry P ann ng, organizing promot'ng and manag ng f tness we ness programs

EPE 561 Administration of Athletics. (3) N
Manag ng an ath et c program nc ud ng f nanc ng budget po c es stag ng and promot on of ath et c contests, schedu es trave nsur- ance and current ath et c trends.

EPE 570 Programs and Spec al Topics in Adapted Physical Education. 3) F
Contemporary adapted deve opmenta remedia , and correct ve phys ca educat on programs; understand ng of princ ples, prob ems and recent deve opments n th s area

EPE 571 Improving Sport Skills. 3) SS
Factors in successfu motor performance n sk ! s used n nd v dua dua and team sports

EPE 572 Trends and Issues in Physical Education. (3) S
Literature research and pract ces n contemporary physica educa t on, nc ud ng f nances T t e X teach ng and coach ng ph losoph es school organ zat on, and nonteach ng phys ca educat on programs.

EPE 573 Curriculum and Instruction in Secondary Physical Education. (3) F
Current curr cu um and nstruct on pract ces and research n second ary schoo phys ca educat on Prerequ s te ESPE major or teaching experience

EPE 574 Analysis of Teaching Behavior in Sport and Physical Education. (3 N
Use of systemat c d rect observat on techniques in analyz ng and eva uat ng instruct on n sport and phys cal educat on Lecture, ab

EPE 575 Teaching Lifetime Fitness. 3) S
Organ z ng and mp ement ng physica f tness programs n the schools w th emphas s on nd v dua prob em so v ng

EPE 576 Physical Education for Elementary School Children. (3) F
Current pract ces and research perta n ng to e ementary schoo phys ca educat on programs

EPE 578 Student Teaching in Secondary Schools. (6–12) F, S
The pract ce of teach ng Re at onsh p of theory and pract ce n teach ng Prerequ s te comp et on of al requ red coursework or equ va ent pr or to student teaching

EPE 610 Advanced Topics in Biomechanics. (3) S
Three d mens ona mag ng techn ques, data ana ysis theory and nte- grat on of b omechan cs research too s; nc udes or g na research project Lecture d scuss on, some abs. Prerequ s te EPE 510 or nstructor approva

EPE 620 Developmental Motor Skill Acquisition. 3 S 2001
Cogn t ve motor theor es of earn ng/performance app ed to ch dren's motor sk acquisit on Study of know edge deve opment and research ana ysis tech ques Lecture d scussion Prerequ site EPE 521

EPE 621 Motor Learning/Control. (3 F
D scuss on of c ntemporary research ssues 'n motor earn ng and contro inc udes behav ora and neurophys o og ca ssues Lecture, d scuss on Prerequ site EPE 521

EPE 642 Exerc se Epidemiology. (3) S
Phys ca act v ty, exerc se and phys ca f tness and the deve opment of chr n c d sease. Not open to students who have taken EPE 442 Pre requ s tes EPE 340, 500 501

HEALTH SCIENCE (HES)

HES 100 Introduction to Health and Wellness. 3 F, S SS
Current concepts of hea th and we lness Cross l sted as EPE 100 Cred't s a owed on y for EPE 100 or HES 100

Students who satisfactorily complete selected HES 494 courses are eligible to quality for a certificate of accom plishment from the Centers for Disease Control, U.S. Department of Health and Human Services. See "Omnibus Undergraduate Course Descriptions," page 58, for information on 494 and other omnibus courses

Department of Family Resources and Human Development

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ASSISTANT PROFESSORS
ESTRADA, HAMPL HANISH, MADDEN DERDICH, UPDEGRAFF

SENIOR LECTURERS
R. MARTIN, WEIGAND

LECTURER
BODMAN

FAMILY RESOURCES AND HUMAN DEVELOPMENT—B.S.

For the B.S. degree in Family Resources and Human Development (see "College Degree Requirements," page 324), students must select one of the following three con centrations shown in the "Family Resources and Human Development Concentrations and Options" table.

Family Resources and Human Development Concentrations and Options

Concentration	Option
Family resources and human development in business	Food service management
Family studies/child development	
Human nutrition—dietetics	General dietetics
	Human nutrition

Family Resources and Human Development in Business

Food Service Management Option. The food service management option consists of 42 hours of the following required departmental courses:

FON	100	Introductory Nutrition....3
FON	142	Applied Food Principles 3
FON	344	Nutrition Services Management *LI* 3
FON	442	Experimental Foods 3
FON	445	Quantity Food Production.. 3
MGT	301	Management and Organization Behavior 3
		or MGT 394 ST: Special Topics (3)
MKT	300	Principles of Marketing 3
		or MKT 394 ST: Special Topics (3)
AGB or business courses 6		
Total		27

An additional 15 semester hours within the department must be taken to complete the major. The courses are determined by the students in consultation with their advisor.

In addition, the following courses are required:

CHM 101	Introductory Chemistry *S1/S2*	4
CHM 231	Elementary Organic Chemistry *S1/S2*[1]	3
CHM 235	Elementary Organic Chemistry Laboratory *S1/S2*	1
MIC 205	Microbiology *S2*[2]	3
MIC 206	Microbiology Laboratory *S2*[2]	1
Total		12

[1] Both CHM 231 and 235 must be taken to secure S1 or S2 credit

[2] Both MIC 205 and 206 must be taken to secure S2 credit.

Additional business courses are selected in consultation with an advisor.

Family Studies/Child Development

The concentration in family studies/child development consists of the following core courses:

CDE 232	Human Development *SB*	3
CDE 430	Infant/Toddler Development in the Family *SB*	3
CDE 498	PS: Pro Seminar. or FAS 498 PS: Pro Seminar 3)	3
FAS 331	Marriage and Family Relationships *SB*	3
FAS 361	Introduction to Family Child Research Methods *L1*	3
FAS 370	Family Ethnic and Cultural Diversity *C*	3
FAS 431	Parent Adolescent Relationships	3
FAS 435	Advanced Marriage and Family Relationships *L2/SB*	3
FAS 440	Fundamentals of Marriage and Family Therapy	3
FON 100	Introductory Nutrition	3
Total		30

In addition, 15 hours of electives must be taken, with at least nine hours from the following:

CDE 337	Early Childhood Intervention	3
CDE 338	Child Development Practicum	2–4
CDE 437	Observational and Naturalistic Methods of Studying Children *L2/SB*	3
CDE 444	Children and Poverty	3
CDE 498	PS: Pro Seminar or FAS 498 PS Pro Seminar 3) or FAS 499 Individualized Instruction 3)	3
FAS 330	Personal Growth in Human Relationships *SB*	3
FAS 332	Human Sexuality	3
FAS 484	Internship	1 3
FAS 390	Supervised Research Experience	1 3
FAS 432	Family Development	3
FAS 436	Conceptual Frameworks in Family Studies	3
FON 450	Nutrition in the Life Cycle I	3
FON 451	Nutrition in the Life Cycle II	3

The remaining courses are selected in consultation with an advisor.

Human Nutrition—Dietetics

The American Dietetic Association (ADA) has approved the human nutrition—dietetics concentration as a Didactic Program in Dietetics (DPD . Graduates of a DPD program may apply for dietetic internships or preprofessional practice programs to establish eligibility to write the Dietetic Registration examination In addition to the required courses, the following courses are required by both the ADA and the Department of Family Resources and Human Development:

BIO 201	Human Anatomy and Physiology I *S2*	4
BIO 202	Human Anatomy and Physiology II	4
CHM 113	General Chemistry *S1/S2*	4
CHM 231	Elementary Organic Chemistry *S1/S2**	3
CHM 361	Principles of Biochemistry	3
Total		18

* Both CHM 231 and 235 must be taken to secure S1 or S2 credit

Additional courses required by the American Dietetic Association for completion of DPD requirements must be selected upon consultation with an advisor. Most of the DPD requirements also satisfy College of Liberal Arts and Sciences graduation requirements.

The following departmental courses are required·

FON 142	Applied Food Principles	3
FON 241	Human Nutrition.	3
FON 440	Advanced Human Nutrition I	3
FON 441	Advanced Human Nutrition II	3
FON 444	Diet Therapy	3
Total		15

General Dietetics Option. For the general dietetics option, the following departmental courses are required

FON 341	Introduction to Planning Therapeutic Diets.	3
FON 344	Nutrition Services Management *L1*	3
FON 445	Quantity Food Production.	3
FON 446	Human Nutrition Assessment Lecture/Laboratory	3
FON 448	Community Nutrition *L2*	3
FON 494	ST· Nutrition and Health Promotion	3
Total		18

Human Nutrition Option. An additional 15 semester hours of courses within the department must be taken to complete this option. The courses are to be determined by the students in consultation with an advisor.

FAMILY RESOURCES AND HUMAN DEVELOPMENT MINOR

The minor in Family Resources and Human Development consists of 18 semester hours in which students must specialize in one of three emphases. These emphases consist of the following:

1. family studies/child development;
2. foods and nutrition in business; and
3. nutrition.

NOTE: For the General Studies requirement courses, and codes (such as L1 N3 C and H), see General Studies, page 85 For graduation requirements see University Graduation Requirements " page 81 For an explanation of additional common business courses offered but not listed in this catalog see 'Classification of Courses " page 58.

Each of these emphases requires that at least 12 of the 18 hours must be in upper division courses.

Family Studies/Child Development. The family studies/child development emphasis requires that students take the following courses

CDE 232	Human Development *SB*	3
CDE 337	Early Childhood Intervention	3
FAS 331	Marriage and Family Relationships *SB*	3
FAS 440	Fundamentals of Marriage and Family Therapy	3
Total		12

This emphasis also requires that two courses (or six semester hours be selected from the following

CDE 430	Infant/Toddler Development in the Family *SB*	3
CDE 437	Observational and Naturalistic Methods of Studying Children *L2/SB*	3
CDE 498	PS Pro Seminar	3
FAS 431	Parent Adolescent Relationships	3
FAS 498	PS Pro Seminar	3

Foods and Nutrition in Business. The foods and nutrition in business emphasis requires that students take the following courses:

FON 100	Introductory Nutrition or FON 241 Human Nutrition	3
FON 142	Applied Food Principles	3
FON 344	Nutrition Services Management *L1*	3
FON 394	ST: Computers in Nutrition and Foods	3
FON 442	Experimental Foods	3
FON 445	Quantity Food Production.	3
Total		18

Nutrition. The nutrition emphasis requires that students take the following courses:

FON 241	Human Nutrition	3
FON 341	Introduction to Planning Therapeutic Diets.	3
FON 440	Advanced Human Nutrition I	3
FON 441	Advanced Human Nutrition II	3
FON 444	Diet Therapy	3
Total		15

This emphasis also requires that one additional upper-division course (three hours) be selected from among the following:

FON 446	Human Nutrition Assessment Lecture/Laboratory	3
FON 448	Community Nutrition *L2*	3
FON 450	Nutrition in the Life Cycle I	3
FON 451	Nutrition in the Life Cycle II	3
FON 531	Recent Developments in Nutrition	3
FON 532	Current Research in Nutrition I	3
FON 533	Current Research in Nutrition II	3

SECONDARY EDUCATION—B.A.E.

Family Resources and Human Development. The major teaching field consists of 42 semester hours in family resources and human development and six hours in interior design. Major courses required are as follows:

CDE 232	Human Development *SB*	3
CDE 337	Early Childhood Intervention	3
FAS 330	Personal Growth in Human Relationships *SB*	3
FAS 331	Marriage and Family Relationships *SB*	3
FAS 431	Parent Adolescent Relationships.	3
FON 100	Introductory Nutrition.	3
FON 142	Applied Food Principles	3
FRD 451	Field Experience	1–12
HEE 461	Presentations in Home Economics	3
HEE 480	Methods of Teaching Home Economics	3–4
HEE 481	Teaching Occupational Home Economics	3
Total		31–43

Also required are two interior design courses

The College of Education has additional requirements for teacher certification Arizona Teacher Proficiency Exam (professional knowledge only), 35 hours within the Professional Teacher Preparation Program, and the following courses

POS 110	Government and Politics *SB*. or POS 310 American National Government *SB* 3	3
POS 311	Arizona Constitution and Government or POS 417 The Arizona Political System *SB* 3	2

GRADUATE PROGRAMS

The faculty in the Department of Family Resources and Human Development offer programs leading to the M.S. and Ph.D. degrees Consult the *Graduate Catalog* for requirements.

CHILD DEVELOPMENT (CDE)

CDE 232 Human Development. 3 F S
Lifespan development from conception through adulthood with emphasis on family influences Recognition of individuality within the *universal pattern of development* Prerequisites: PGS 101 SOC 101. *General Studies: SB*

CDE 337 Early Childhood Intervention. 3 F
Explores how child development theory affects practice with children and families emphasizing development of young children and early intervention Prerequisite CDE 232 or equivalent

CDE 338 Child Development Practicum. 2–4 F S
Supervised practicum in the Child Development Lab preparing students for work in child care centers and agencies serving young children and families Laboratory Pre or corequisite *CDE 337*

CDE 430 Infant/Toddler Development in the Family. 3) F
An examination of the development of infants toddlers the socialization processes of families, and the interactions of these processes Prerequisite CDE 232 or equivalent *General Studies SB*

CDE 437 Observational and Naturalistic Methods of Studying Children. (3 N
In depth examination of implementing observational and naturalistic studies of children in a variety of settings 2 hours lecture 3 hours lab Prerequisites CDE 430 6 hours of psychology *General Studies L2/SB*

CDE 444 Children and Poverty. 3 F
The impact that poverty has on children and their families 2 hours lecture 3 hours lab Prerequisites CDE 232 or equivalent 6 hours of upper-division social science credits

CDE 498 PS: Pro-Seminar. 3 N

CDE 531 Theoretical Issues in Child Development. 3 S
Major developmental theories related research and their application to family interaction Prereq sites CDE 430 and 437 or equivalent) or instructor approval

CDE 533 Research Issues in Child Development. 3 S
An in depth exploration and critique of research focusing on child development in a family setting Prerequisites CDE 531 FAS 500

CDE 534 App ied Child Development. 3 S
ntegrat n of ch d deve opme t esearch and theory to understand deve opmenta prob ems and the r re evance to ntervent on strateg es Prerequ s tes CDE 531, FAS 500

FAMILY STUDIES (FAS)

FAS 301 Introduction to Parenting. 3 F, S
Integrated approach t u derstand ng parent ng and parent ch ld nteract ons Te ev s on course Prereq s tes PGS 101 SOC 101 (or equ va ent

FAS 330 Personal Growth in Human Relationships. 3 F S
Persona deve pment and behav o as re ated to competency n nter persona re at onsh ps w th n the fa y P cesses of fam ly nterac t on Prerequ s tes PGS 101 SOC 101 or equ va ent *General Stud es SB*

FAS 331 Marriage and Family Relationships. 3 F, S
Issues cha enges and opport n t es re at ng to prese t day marr age and fam y v ng Fact rs nf ue c ng nterre at ons w th n the fami y. Prerequ s te course n psycho ogy or soc ogy *Genera Stud es SB.*

FAS 332 Human Sexuality. 3 F S
Re at onsh p of sexua ty to fam y fe and to major soc eta ssues Emphas s on deve op ng hea thy pos t ve and respons ve ways of ntegrat'ng sexua and other aspects of human v ng Prerequ s te PGS 101.

FAS 361 Introduction to Fam ly/Child Research Methods. (3) S
Exam nes bas c methods app ed to fam y ch d research cr't ques current research terature and app es methods n current topics. Pre requ s tes CDE 232 FAS 331 *Genera Stud es L1*

FAS 370 Family Ethnic and Cultural Diversity. 3) S
An ntegrat ve approach to understand ng h stor ca and current ssues re ated to the structure and nterna dy am cs f d verse Amer can fam es Prerequ s te PGS 101 or SOC 101 *General Stud es C.*

FAS 390 Supervised Research Experience. 1 3 F, S SS
Pract ca f rsthand exper ence w th n cur ent faculty research projects n fam y stud es r ch d deve pment 'Y grade only may be repeated for t ta of 6 hours Prerequ s tes FAS 361, 3 00 GPA n major approva of superv s ng facu ty member bef re reg stration

FAS 431 Parent-Adolescent Relationships. 3 F
Dynam cs of the re at nsh ps between parents and ado escents Deve pmenta character t cs of ado escence and the correspond ng adult stage Prerequ s tes CDE 232 FAS 331

FAS 432 Family Development. 3 N
Normative changes n fam es over t me fr m format on unt d ssolu tion Emphas s on the mar ta subsystem n m dd e and later years Prerequ sites CDE 232 and FAS 331 *or* nstructor approval

FAS 435 Advanced Marriage and Family Re ationships. (3 F
Recent research, ssues and trends re at ng to marr age and fam y nteract on nf uence of fam y comp s t on, phys cal env ronment, fam y patterns and va ues on fam y dynam cs Prerequ s tes FAS 331 361 *Genera St d es· L2/SB*

FAS 436 Conceptua Frameworks in Family Studies. 3) S
Approaches to study fam es focus ng on systems nteract onal, exchange conf ct and deve pmenta frameworks App cat ons to d verse nd v dua and fam y s tuat ons Prerequ s tes CDE 232 FAS 331 361

FAS 440 Fundamentals of Marriage and Family Therapy. 3 S
ntroduct n to the fundamenta or entat ons of marr age and fam y therapy

FAS 457 Third-World Women. 3 F
Econom c soc opo t ca and demograph c context for understand ng the ro es f th rd wor d women hea th, fam y, work, educat on and commun ty Prerequ s te 6 hours of soc a sc ence cred t or nstructor approva .

FAS 484 Internship. 1 3 N

FAS 498 PS: Pro-Sem nar. 3 N

FAS 499 Individua ized Instruction. 3 N

FAS 500 Research Methods. 4 F
Purposes of research Exper me ta de gn methods of data co ec t on and thes s proposa deve opment Inc udes pract ca app cat on research aboratory 3 hours ecture 3 hours ab

FAS 530 Introduction to Marr'age and Family Therapy. 3) F
ntroduct on of major marr age and fam y therapy or entations Rev ew h story theory app cat on and outcome research for each orienta- t on Prerequ site. adm ss on to graduate program n FRHD w th a con- centration n fam y stud es r nstructor approva

FAS 531 Family Theory Development. 3) S
H stor ca and current approaches to theory deve opment eva uation and appl cat on n fam y stud es Prerequ s te FAS 435 or nstructor approva

FAS 536 Dysfunctional Marriage and Family Relationships. (3) N
A cr t ca rev ew of current theory and emp r ca ev dence connect ng mar tal and fam y nteract o patterns w th aberrant behav r. Prereq- u s te PGS 466 r PSY 573 or equ va ent or nstructor approval

FAS 537 Interpersonal Relationsh ps. 3 F
Cr t ca exam nat on of current theoret cal and research deve opments n the area of nterpersona re at onsh ps App cat ons for research and ntervent on emphas zed Prerequ s te FAS 435 or equiva ent) or nstructor approva

FAS 538 Advanced Techniques n Marriage and Family Therapy. (3 N
An in depth rev ew of assumpt ons and advanced techn ques assoc - ated w th contemporary marr age and fam y therapy approaches Pre- requ s te a graduate leve course n marriage and fam ly therapy or nstructor approva .

FAS 539 Research Issues in Fam ly Interaction. (3) F
Cr t ca rev ew of current and past research n the area of fam ly dynam cs. Emphas zes nteract ona processes w th n the fam y Pre- requ s te FAS 435 (or equ va ent) r nstructor approva

FAS 540 Assessment in Marriage and Fam ly Therapy. (3) S
nstruct'on n the assessment and outc me eva uat on of coup es and fam es nvo ved n mar ta and fam y therapy Lecture lab Prerequi s tes FAS 500 or equ va e t PSY 530, nstructor approva .

FAS 580 Marriage and Family Therapy Practicum. (3) F, S
Supervised cl n ca exper ence n marr age and fam y therapy; nc udes deve opment of assessment a d outcome eva uat on ski s Lecture ab Prerequ s te structor approva
(a F rst semester 3
(b) Second semester 3
(c) Th rd semester (3)

FOOD AND NUTRITION (FON)

FON 100 Introductory Nutrition. 3 F S SS
Bas c concepts of human nutr t on A ternat ve d ets and how food cho ces affect persona health Prerequ s te nonma or

FON 142 Applied Food Principles 3 F S
App ied sc ent f c pr nc p es of food preparat on and production. 2 hours ecture 3 hours ab

FON 241 Human Nutrition. 3 F S SS
Pr nc ples of human nutr t n re at ve to hea th Emphas s on nutrients and the factors affect ng the r ut zat on n the human body Prerequi s te CHM 101 or equ va ent.

FON 341 Introduction to Planning Therapeutic Diets. (3) S
Cu tura hea th, and econom c aspects of d et p ann ng Computer and manua assessment of food compos t on Rev ew of common ther apeut c d ets Prerequ sites. FON 142 a d 241 or equ va ent).

FON 344 Nutrition Services Management. 3 S
Organ zat on, adm n strat'on and management of food and nutrit on serv ces n hosp ta s and other nst tut ons F e d tr ps may be nc uded *Genera Stud es· L1.*

FON 394 ST: Special Top cs. 3 N
(a Computers n Nutrit on and Foods

FON 440 Advanced Human Nutrition I. 3 F
Metabol c react ons and nterrelat onsh ps of v tam ns m nera s, and water CHM 332 recommended Prerequ s tes: B O 202; CHM 361, FON 241 or equ va ent)

FON 441 Advanced Human Nutrition II. 3 S
Metabo c react ons and nterre at onsh ps of carbohydrate l p d, and prote n CHM 331 and 332 rec mmended Prerequ s tes B O 202 CHM 361 FON 241 or equ va ent .

NOTE: For the Genera Stud es requ rement courses and codes (such as L1, N3 C, a d H), see Genera Stud es, page 85 For graduation requ rements see 'U vers ty Graduat on Requ rements page 81. For an exp anat on of add t ona omn bus courses offered but not sted n th s cata og, see C ass f cat on of Courses," page 58

FON 442 Experimental Foods. (3) F
Food product development techn ques food eva uat on and test ng and nvest gat on of current research nto food compos t on 2 hours ecture 3 hours lab Prerequ s tes CHM 231· FON 142.

FON 444 Diet Therapy. (3) S
Pr nc'ples of nutr tiona support for prevent on and treatment of d s ease. Prerequ sites. B O 202 FON 241 (or equ va ent)

FON 445 Quantity Food Production. (3) S
Standard methods of food preparation in quant ty operat on of nst tu- t ona equ pment and menu plann ng for nst tut ons Exper ence n quant ty food serv ce 1 hour lecture 6 hours ab May requ re f e d tr ps Prerequ s tes FON 241 (or equ va ent) and 344 *or* instructor approva

FON 446 Human Nutrition Assessment Lecture/Laboratory. (3 S
C nica and biochem ca eva uat on of nutrit ona status 2 hours ec- ture 3 hours ab Prerequ s tes CHM 367; FON 440 (or 441).

FON 448 Community Nutrition. (3 F
Food re ated behav ors· commun ty organizat on and del very of nutri t on serv ces, program des gn mp ementat on and evaluat on strate g es nutrit ona assessment of popu at on groups PGS 100 and SOC 101 are recommended Prerequ s te FON 241 or equ valent *General Stud es L2*

FON 450 Nutrition in the Life Cycle I. (3) F
Emphasis on nutr t ona needs and prob ems during pregnancy, lacta- t on, infancy and chi dhood Prerequ s te· FON 241 or equ va ent

FON 451 Nutrition in the Life Cycle II. (3) S
The nutr t onal requ rements and nutr t on re ated d sorders of ado es cence m dd e adu thood, and later l fe Prerequ site· FON 241 or equ va ent.

FON 494 ST: Special Topics. (3) N
(a) Nutr t'on and Hea th Promot on

FON 531 Recent Developments in Nutrition. 3) N
Survey of research Prerequ s tes 1 course each n advanced nutrit on and b ochem stry.

FON 532 Current Research in Nutrition I. 3 S
V tam ns and m nerals Prerequ s tes 1 course each in advanced nutr't on and b ochem stry.

FON 533 Current Research in Nutrition II. (3) F
Carbohydrates p ds and prote ns Prerequ sites 1 course each n advanced nutr t on and b ochem stry

FON 538 Recent Developments in Foods. (3) N
D scuss on and crit que of current research Prerequ s te FON 142

FON 540 Advanced Micronutrient Metabolism. (3) F
The metabol sm of v'tam ns and minerals pr mar y as app ed to humans, w th research l terature emphas zed Prerequ s tes 1 course each n bas c nutr t on and b ochem stry

FON 541 Advanced Macronutrient Metabolism. (3 S
The metabo sm of protein fat and carbohydrate, pr mar ly as app ied to humans, w th research l terature emphas zed Prerequisites 1 course each n bas'c nutr t on and b ochem stry

FON 542 Experimental Foods. (3) F
Food product deve opment techn ques food eva uat on and test ng and nvest gat on of current research nto food compos t on 2 hours lecture 3 hours ab Prerequ s tes CHM 231, FON 142

FON 544 Therapeutic Nutrition. (3) S
Current theor es of the nutr tiona prevent on or treatment of various d seases. Prerequ s tes 1 course each n bas c nutr t'on and phys o - ogy

FON 545 Recent Developments in Institutional Feeding. (3) S
Current pract ces n nst tut'onal feed ng nc ud'ng superv sed pract - cum w th oca quant ty food operat on 1 hour lecture 6 hours ab Prerequ sites FON 142 and 344 *or* nstructor approva .

FON 548 Nutrition Program Development. (3 F
The p ann ng deve opment imp ementat on, and eva uat on of com- mun ty nutrit on programs includ ng the process of grant app cat ons Prerequ s tes. 1 course each n bas c nutr tion and soc o ogy

FON 550 Advanced Maternal and Child Nutrition. (3) F
Metabo c characterist cs and nutrit ona needs of the pregnant woman lactat ng woman nfant and child are rev ewed in depth. Pre- requ s tes 1 course each in bas c nutr t on, phys o ogy and b ochem istry

FON 551 Advanced Geriatric Nutrition. 3 S
Metabol c characterist cs and nutrit ona requ rements of the e der y are rev ewed in depth Prerequ s tes 1 course each n bas c nutr tion and physiology and b'ochem stry *or* instructor approva

FON 580 Dietetics Practicum. (3–9) F S SS
Structured pract cal experience n the Preprofess ona Pract ce Pro gram (AP4) superv sed by pract t oners with whom the student works close y. Pract cum Prerequ s te acceptance nto the AP4 program.

FAMILY RESOURCES AND HUMAN DEVELOPMENT (FRD)

FRD 451 Field Experience. 1 12) N
Supervised f e d p acement n the area of student s concentrat on w th a commun ty bus ness or agency Students must make arrangements w th nstructor 1 semester n advance of enro ment. Prerequ's tes: complet on of 60 hours nstructor approva

HOME ECONOMICS EDUCATION (HEE)

HEE 461 Presentations in Home Economics. (3) F
Presentation and demonstrat on techn ques in teaching home eco nomics. Deve opment of audiov sua mater als for home econom cs content areas Prerequ s tes jun or standing nstructor approva

HEE 480 Methods of Teaching Home Economics. (3–4) F
nstruct on, organizat on presentat on and eva uation of subject mat- ter n home econom cs HEE students reg ster for 4 semester hours Dietet c students register for 3 semester hours

HEE 481 Teaching Occupational Home Economics. 3 S
Career or entation re ated to home econom cs cooperat ve work re ated instruct on programs and youth c ub adv sement assoc ated w th secondary home economics programs May nc ude f e d tr ps Prerequ s te Fam y Resources and Human Development major or minor.

Department of Geography

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REGENTS' PROFESSOR
GRAF

PROFESSORS
ARREOLA, BALLING BRAZEL, BURNS COMEAUX, DORN, GOBER O hUALLACHÁ N, PASQUALETTI

ASSOCIATE PROFESSORS
ALDRICH CERVENY, FALL KUBY, McHUGH

ASSISTANT PROFESSORS
ELL S, SIERRA, WENTZ

LECTURER
HUMBECK

Geography is a discipline that brings together the physi cal and human dimensions of the world in the study of places, people, and environments The mission of the Department of Geography is the creation, dissemination, and application of geographic knowledge and scholarship in a liberal arts and sciences tradition.

Undergraduate students may choose from four Geogra phy program options. B.A. in Geography, B S. in Geogra- phy, B.A.E. in Secondary Education, or a minor in Geography. A grade of "C" or higher is necessary in all

required Geography program courses. Both B.A. and B.S. degrees in Geography consist of 45 semester hours. A minor consists of 18 semester hours

GEOGRAPHY—B.A.

A student choosing a B.A. degree in Geography may be interested in a liberal arts and sciences focus on the breadth of the field. A B.A. degree may also focus on a geographic region In either case, the student will craft an individual ized program of study in consultation with an advisor.

The 45–47 hours for a B.A degree consist of classes in Core Geographic Knowledge (9 11 hours), Geographic Skills (12 hours), a regional course (three hours), and elec tives (12 hours), for a minimum of 36 hours in Geography. At least 18 hours in Geography must be in upper-division courses. The remaining nine hours are to be made up of electives from Geography classes or related fields of study, chosen in consultation with an advisor

Core Geographic Skills

GCU 495 Quantitative Methods in Geography *N2* 3
GCU 496 Geographic Research Methods *L2* 3
GPH 371 Cartography 3
GPH 491 Geographic Field Methods 6

Total 15

Geographic Region

Choose one of the courses below, in consultation with an advisor 3

GCU 322 Geography of U.S. and Canada *SB,C* 3)
GCU 323 Geography of Latin America *SB G* 3)
GCU 325 Geography of Europe *SB,G* (3)
GCU 326 Geography of Asia *SB,G* (3
GCU 327 Geography of Africa *SB.G* (3
GCU 328 Geography of Middle East and North Africa *SB,G* 3)
GCU 332 Geography of Australia and Oceania *SB G* (3)
GCU 344 Geography of Hispanic Americans *SB C* 3)
GCU 421 Geography of Arizona and Southwestern United States *SB C* (3
GCU 423 Geography of South America *SB G* (3)
GCU 424 Geography of Mexico and Middle America *SB,G* 3)
GCU 425 Geography of the Mexican American Borderland *L2/SB G* (3
GCU 426 Geography of Russia and Surroundings *SB G* 3)
GCU 433 Geography of Southeast Asia (3)
GPH 433 Alpine and Arctic Environments *G* 3

A student can design, in consultation with an advisor, a General B.A. degree in Geography. In addition, there are three Cooperative Programs whereby a student receives a B.A. in Geography and an emphasis in Asian Studies, Southeast Asian Studies, or Latin American Studies.

Asian and Southeast Asian Emphasis. Students majoring in Geography may elect to pursue an Asian or Southeast Asian emphasis combining courses from the major with selected courses of wholly Asian or Southeast Asian con tent. The Asian program requires 30 semester hours of Asian content courses, selected from the list drawn up by the Center for Asian Studies. Also required is knowledge of an Asian language; this is deemed to be fulfilled by 20 semester hours or equivalent in Chinese, Indonesian, Japa nese, Thai, or Vietnamese. The Southeast Asian Studies Certificate is awarded to Geography students who empha size regional studies specialization in Geography and one year of Indonesian, Thai or Vietnamese. For more informa tion see "Asian Studies," page 331, and "Southeast Asian Studies," page 332

Latin American Studies Emphasis. Students majoring in Geography may elect to pursue a Latin American studies concentration combining courses from the major with selected outside courses of wholly Latin American content. At least 30 upper division semester hours of the program must be in Latin American content courses, including 15 hours in Geography (or in courses approved by the Geogra phy advisor) and 15 in other disciplines. A reading knowl edge of Spanish or Portuguese is required and a reading knowledge of the other language is suggested. The program must be approved by the Latin American Studies Center See "Latin American Studies," page 332, for more informa tion.

GEOGRAPHY—B.S.

The 45–47 hours for a B.S. degree consist of classes in Core Geographic Knowledge (9 11 hours), Core Geographic Skills (15 hours), and electives (12 hours) for a minimum of 36 hours in Geography. At least 18 hours in Geography must be in upper division courses. The remaining 9 12 hours are to be made up of electives from Geogra phy classes or related fields of study, chosen in consultation with an advisor.

Core Geographic Skills

GCU 495 Quantitative Methods n Geography *N2* 3
GCU 496 Geographic Research Methods *L2* 3
GPH 371 Cartography . . 3
GPH 491 Geographic Field Methods . 6

Total 15

One additional technique class, chosen in consultation with an advisor from·

Technique Class

Choose one of the courses below, in consultation with an advisor 3

GPH 372 Air Photo Interpretation 3
GPH 373 Cartographic Design 3)
GPH 471 Geographic Information Systems *N3* 3)

Students seeking the B.S. degree take the required core of eight courses The remaining four courses (12 hours) of geography electives and 9 12 hours of Geography or related fields of study vary among the options available for a B.S. degree in Geography. There are two specific departmental concentrations. Meteorology Climatology and Urban Stud ies. In addition, a student can design, in consultation with an advisor, an individualized B.S. degree emphasizing other areas within the major

Meteorology-Climatology Concentration. See the under graduate advisor in Geography for the latest National Weather Service certification requirements. The required

NOTE: For the General Studies requ rement courses, and codes such as L1 N3 C and H) see Genera Stud es " page 85 F r graduation requ'rements see 'Un vers ty Graduat on Requ rements " page 81 For an exp anat on of add t ona omn bus courses offered but not sted n this cata og see 'C assif cat on of Courses " page 58.

courses for the meteorology climatology concentration include a minimum of 39 semester hours in Geography plus 8 hours of related mathematics.

Core Courses

GCU 102	Introduction to Human Geography *SB*	3
GCU 121	World Geography *SB G*	4
GCU 495	Quantitative Methods in Geography *N2*	3
GCU 496	Geographic Research Methods *L2*	3
GPH	Introduction to Physical Geography *S1/S2* or GPH 411 Physical Geography	4
GPH 371	Cartography	3
GPH 471	Geographic Information Systems *N3* or another three hour techniques course if GPH 471 is taken to meet a core requirement	3
GPH 491	Geographic Field Methods	6
Total		28 29

Required Meteorology Courses

GPH 213	Introduction to Meteorology II	3
GPH 215	Introduction to Meteorology Laboratory II	1
GPH 413	Synoptic Meteorology I	4
GPH 414	Synoptic Meteorology II	4
Choose three of the courses below		3
GPH 412	Physical Climatology	3
GPH 413	Meteorological Instruments and Measurements	3
GPH 414	Climate Change	3
Total		15

Mathematics and Physics-Related Courses

MAT 271	Calculus with Analytic Geometry I *N1*	4
MAT 272	Calculus with Analytic Geometry II *N1*	4
MAT 273	Calculus with Analytic Geometry III *N1*	4
PHY 121	University Physics I: Mechanics *S1/S2*[2]	3
PHY 122	University Physics Laboratory I *S1/S2*[2]	1
PHY 131	University Physics II Electricity and Magnetism *S1 S2*[3]	3
PHY 132	University Physics Laboratory II *S1/S2*[3]	1
Total		20

Three semester hours in transfer courses can also fulfill this requirement

Both PHY 121 and 122 must be taken to secure S1 or S2 credit

Both PHY 131 and 132 must be taken to secure S1 or S2 credit

Urban Studies Concentration. The required courses for the urban studies concentration are as follows

Core Courses

GCU 102	Introduction to Human Geography *SB*	3
GCU 121	World Geography* *SB G*	4
GCU 495	Quantitative Methods in Geography *N2*	3
GCU 496	Geographic Research Methods *L2*	3
GPH 111	Introduction to Physical Geography *S1/S2* or GPH 411 Physical Geography	4
GPH 371	Cartography	3
GPH 471	Geographic Information Systems *N3* or another three hour techniques course if GPH 471 is taken to meet a core requirement	3
GPH 491	Geographic Field Methods	6
Total		28 29

Required Urban Geography

Choose two of the courses below		6
GCU 351	Population Geography *SB G*	3
GCU 355	Social Geography *SB*	3
GCU 364	Geography of Energy *G*	3
GCU 441	Economic Geography	3)
GCU 442	Geographical Analysis of Transportation *SB*	3
One upper division or graduate level GCU Geography course chosen in consultation with an advisor		3
Choose two of the courses below		6
GCU 359	Cities of the World I *G*	3
GCU 360	Cities of the World II *G*	3)
GCU 444	Geographic Studies in Urban Transportation	3
GCU 494 ST	Geography of Phoenix	3
GCU 361	Urban Geography *SB*	3
GCU 484	Internship	3
	or one upper division elective course outside the department in a related field of study chosen in consultation with an advisor	3)
Urban geography total		15

* Three semester hours in transfer courses can also fulfill this requirement

SECONDARY EDUCATION—B.A.E.

Geography, in conjunction with the College of Education, offers a Bachelor of Arts in Education Degree The B.A.E. degree consists of 45 semester hours, of which a minimum of 30 must be in geography and 15 in a related teaching field or fields. The following courses are required

GCU 102	Introduction to Human Geography *SB*	3
GCU 121	World Geography* *SB G*	4
GPH 111	Introduction to Physical Geography *S1/S2* or GPH 411 Physical Geography	4
Total		11

* Three semester hours in transfer courses can also fulfil this requirement.

In conjunction with an advisor, students choose remaining credits from three groups of human, physical, and regional courses.

MINOR IN GEOGRAPHY

A minor in Geography is awarded to students who complete a minimum of 18 hours in geography A letter grade of "C" or higher is required for all courses taken for the minor.

The following lower division courses are required:

GCU 102	Introduction to Human Geography *SB*	3
GPH 111	Introduction to Physical Geography S1 S2 or GPH 411 Physical Geography	4 3)
Total		6–7

The remaining courses are selected in conjunction with an advisor. At least one course should be a geographic skill, for example map reading (GPH 271), cartography (GPH 371), air photo interpretation GPH 372), geographic field methods (GPH 491), or a class in geographic information systems (for example, GPH 471) At least four courses should be upper division classes in human, physical, or regional geography

CULTURAL GEOGRAPHY (GCU)

GCU 102 Introduction to Human Geography. 3 F, S
Systematic study of human use of the earth Spatial organization of economic, social, political, and perceptual environments. *General Studies SB*

GCU 121 World Geography. 4 F S
Descr pt on and ana ys s of area variat ns n s c a econom c and po t ca phenomena n majo wor d reg ons *Genera Stud es SB G*

GCU 141 Introduction to Economic Geography. 3 N
Product on d str but on and consumpt on of var ous types of commod t es of the wor d and re at onsh ps t the act v t es of humans *Genera Stud es SB G*

GCU 240 Introduction to Southeast As a. 3 F
An nterd sc p nary ntroducti n to the cu tures re g ons p t ca sys tems geography and h story of Southeast As a Cross sted as ASB 240 H S 240 POS 240 REL 240 Cred t s a owed on y f r ASB 240 or GCU 240 or H S 240 r POS 240 r REL 240 *Genera Stud es G*

GCU 253 Introduction to Cultural and Historical Geography. 3 N
Cu tura patterns, nc ud ng such phenomena as language re g on and var ous aspects of mater a cu ture Or g ns and d ffus on and d v s on of the w r d nto cu tura areas *Genera Stud es SB, G*

GCU 294 ST: Special Topics. 4 A
Top cs nc ude g oba awareness

GCU 322 Geography of U.S. and Canada. 3 A
Spat a d str but on of re evant phys ca , econom c a d cu tura phe nomena n the Un ted States and Canada *Genera Stud es SB C*

GCU 323 Geography of Latin America 3 F
Spat a d str but on of re eva t phys ca econom c and cu tura phenomena in South M dd e and Car bbean Amer ca *Genera Stud es SB G*

GCU 325 Geography of Europe. (3 A
Broad and systemat c overv ew f Europe emphas z ng phy ca eco nom c and cu tura phenomena *Genera Stud es SB G*

GCU 326 Geography of Asia. 3 F
Spat a d str but on of relevant phys ca econom c and cu tura phe nomena n As a exc ud ng the former Sov et Un *Genera Stud es SB G*

GCU 327 Geography of Africa 3 N
Spat al d str but on of relevant phys ca econom c and cultura phe nomena n Afr ca *Genera Stud es SB G*

GCU 328 Geography of Midd e East and North Africa. 3 N
Spat a d str but on of re evant phys ca econom c and cu tura phe nomena n the M dd e East and North Afr ca Prerequ s te GCU 121 or nstructor approva *General Stud es SB G*

GCU 332 Geography of Austral'a and Oceania. 3 A
Spat a d str but n of re evant phys ca econom c and cu tura phe nomena n Austra a, New Zealand and Pac f c s ands *Genera Stud ies: SB G*

GCU 344 Geography of Hispanic Americans. 3 S
Exam nes the home ands, m grat ons, sett ements, andscape ro es and se ected cu tura trad t ons of H span c Amer cans *Genera Stud es SB C*

GCU 350 The Geography of World Crises. 3 F S
Contemporary wor d cr ses v ewed from a perspect ve of geograph c concepts and techn ques *Genera Stud es SB G*

GCU 351 Population Geography. 3 F
Demograph c patterns spat a tempora and structura nvest gat on of the re at onsh p of demograph c var ab es to cu tura econom c and env ronmenta factors *General Stud es SB G*

GCU 352 Political Geography. 3 N
Re at onsh p between the soc ophys ca env ronment and the state. *Genera Stud es. SB G*

GCU 357 Social Geography. 3 A
Env ronmenta percept on of nd v dua s and groups The spat a aspect of soc a and phys ca env r nments s stressed *Genera Stud es: SB*

GCU 359 Cities of the World I. 3 N
H st r ca evo ut on of urban patterns and structures n the M dd e East nd a Southeast As a Ch na Japan and Europe *Genera Stud es G*

GCU 360 Cities of the World II. 3) N
H stor ca evo ut on of urban patterns and structures n Lat n Amer ca North Amer ca S b Saharan Afr ca and A stra as a *Genera Stud es G*

GCU 361 Urban Geography. 3) F, S
Externa spat a re at ons of c t es nterna ty structure and spat a a pects f urban prob ems var ous parts of the wor d part cu ar y n the Un te States *Ge era Stud es SB*

GCU 364 Geography of Energy. 3 F
Product on, transportat on and consumpt on of energy, emphas z ng the e ectr c p wer ndustry and ts env ronmenta prob ems *General Stud es G*

GCU 421 Geography of Arizona and Southwestern United States. 3 F S
Geography of the Southwest w th an emphas s on Ar zona Div ded nt phys a geography h story peop e, and economy *Genera Stud es SB C*

GCU 423 Geography of South Amer ca. (3) S
Prerequ s te. GCU 323 or nstructor approva *Genera Studies SB, G.*

GCU 424 Geography of Mexico and Middle America. 3) A
Centra Amer ca and Mex co. Prerequ s te GCU 323 or nstructor app oval *Genera Stud es SB G*

GCU 425 Geography of the Mexican American Borderland. (3) S
Geography of a b nat ona and b cu tura reg on Exam nat on of sett e ment boundary ssues, ethn c subreg ons, popu at on change ndus tr a deve opment and rban growth *Genera Stud es· L2/SB G*

GCU 426 Geography of Russia and Surroundings. (3 N
Exam nes the geography of Russ a and other post Sov et states Pre requ s te GCU 121 or nstructor approva *Genera Stud es: SB, G*

GCU 433 Geography of Southeast Asia. 3) S
Exam nes the b ophys ca and soc a features of Southeast As an nat ons a d peop es Prerequ s te GCU 326 or nstructor approva

GCU 441 Economic Geography. 3 A
Spatia d str but on of pr mary sec ndary and tert ary econom c and product on act v t es Prerequ s te GCU 141 or nstructor approval

GCU 442 Geographical Analysis of Transportation. (3) S
Networks m des econom cs and f ows at the urban nat ona and nternat ona sca es Prerequ s te GCU 141 or 441 *General Studies SB*

GCU 444 Geographic Studies in Urban Transportation. (3) S
Current urban transp rtat on ssues n metropo tan Phoen x Lecture team project Pre equ s te GCU 361

GCU 453 Recreational Geography. (3) N
Exam nat on of prob ems sur ound ng the organ zat on and use of space for re reat n ntrod c ng geograph c f e d survey methods of data co ect n and ana ys s Saturday f e d tr ps may be requ red

GCU 455 Historical Geography of U.S. and Canada. (3) N
Ge graph ca perspect ve on the evo ut on of the Un ted States and Canada fr m pre Co umb an t mes to ear y 20th Century *Genera Stud es H*

GCU 474 Public Land Policy. 3 F
Geograph c aspects of federa pub c lands po cy management and ssues Emphas s n western w de ness and resource deve opment pr b ems

GCU 484 Internship. (3 N

GCU 494 ST: Special Topics. 3 N
a Geography of Phoen x

GCU 495 Quantitat've Methods in Geography. 3) F, S
Stat st ca techn ques app ed to the analys s of spat a d str but ons and e at onsh ps trod ct on to mode and theory n ge graphy Prerequ s te. MAT 119 *Genera Stud es N2*

GCU 496 Geographic Research Methods. 3 F, S
Sc ent f c techn ques used n geog aph c research Prerequ sites GCU 495 GPH 371 491 *Genera Stud es. L2*

GCU 515 Human Migration. 3 F
Econom c po t ca soc a and geograph c factors nder y ng popula t on movements M grat on se ect v ty streams and counter-streams abor m grat on and m grat n dec s on mak ng Lecture sem nar Pre requ s te GCU 351 or nstruct r approva

GCU 526 Spatial Land-Use Analys s. 3 N
Determ nat on c ass f cat on and ana ys s of spat a var at ons n and use patterns Exam nat on of the processes affect ng and use change Prerequ s te 15 hours of geography or nstructor approva .

NOTE: For the Genera Stud es requ rement courses and c des such as L1, N3 C, and H , see Genera St d es page 85 For graduat on requ rements see Un vers ty Graduat on Requ rements page 81 For an exp anat on of add t ona omn b s courses offered but not sted n th s cata og, see C ass f cat on of Courses, page 58

GCU 529 Contemporary Geographic Thought. 3 S
C mparat ve eva uat on of current ph osophy con ern ng the nature an trend f geog aphy Prerequ s tes 15 hours of geography str t app v

GCU 585 Advanced Research Methods 'n Geography. 3 F
Spe a z d re earch techn ques and method og es n econom c p t a or cu tu a geography

GCU 591 Seminar. 1 3 F S SS
Se cted t p cs n ec nom c po t ca r cu tura geography F e d tr ps ay be requ ed

GCU 596 History of Geographic Thought. 3 S
H st r eve opme t of ge graph c th ught from pre Greek days to the ear 2 th ce tury

PHYSICAL GEOGRAPHY (GPH)

GPH 111 Introduct on to Physical Geography. 4 F S
pat a and funct na re at onsh ps among c mates andforms so s water and p ants 3 ho rs ecture, 3 hours ab Fie d tr ps a e requ ed. *Genera Stud es S1 S2*

GPH 210 Soc ety and Env ronment. 3 F
Exam nes the nteract n between s c a processes key env ronmen ta s ues and nature s ro e as a resource at g oba and reg ona s a es *Gene a Stud e G*

GPH 211 Landform Processes. 3 S
Ge g aph c chara te st cs of andforms and earth surface processes emp as z ng er s n transportat on depos t n and mp cat ons f r human management f the e v ronment Prereq s te GPH 111 *Gen e a Stud es 1*

GPH 212 Introduct on to Meteorology I. 3 F
Fu damenta s f weather and c mate nc ud ng bas c atmospher c p e e and e ements Students whose curr cu a requ re a abora tory u e ust a so reg ter for GPH 214 Prerequ s te GPH 111 or str t r appr va *Genera Stud es S2 f cred t a so earned n GPH 214*

GPH 213 Introduction to Meteorology II. 3 S
F da enta s of eteoro og ca c mato og ca ana ys s nc ud ng ter m gy and sy bo ogy Recommended for meteoro gy c mato ogy pr gran st d nt Prereq s te GPH 212 or nstru tor approva

GPH 214 Introduction to Meteorology Laboratory I. 1 F
troduct n t bas c meteoro og ca c mato og ca data and measure· ment 3 ur ab S ggested concurrent enrol ment n GPH 212 *Ge era Stud es S2 f cred t a so earned n GPH 212*

GPH 215 Introduction to Meteorology Laboratory II. 1 S
F dan enta s f Mete r g ca c mato g ca map ana ys s and nte pretat n Reco mended for mete ro ogy cl mato ogy program t de ts May be taken concurrent y w th GPH 213 Prerequ s te GPH 214 str ct r app va

GPH 271 Maps and Map Reading. 3 S
Map typ es m tat ns and ev ut on Commun cat on v a paper a d d g ta med um Nav gat n, nterpretat on pro ect on sources symbo c as f at on ca e hand ng

GPH 314 Global Change. 3 F
e p n e f Eart natura systems atmosphere hydrosphere tho p ere phere t past env ronmenta change and effects of potent a futur c anges

GPH 371 Cartography. 3 F, S
Ph o phy and pract ca aspects of map product n commun cat ons sym sm data ma pu at n presentat n dec s mak ng gener a zat on newark etter ng d g ta med a emp oyed Prerequ s te GPH 111

GPH 372 Air Photo Interpretation. 3 S
Sub et te e s g nc udes photography f ms aer a geometry ma m o ents te eoscopy photogrammetry, g ound truth ng nterpret phy ca cu tu a econom c nte gence nformat on. Prereq u s te P 211 r any Cu tura Geography GCU course or nstructor appr va

GPH 373 Cartographic Design. 3 F
Advan ed des gn us ng desktop mapp g Cartograph c dec s on mak ng q a tat ve and quant tat ve symbo des gn project ons o or Pre req s tes GPH 371 or nstru tor approva

GPH 381 Geography of Natural Resources. 3 A
Nat re and d tr but o of natura resources and the prob ems and pr c p e a s c ated w th the r use

GPH 401 Topics in Physical Geography. 1 3 A
Open to students qua f ed to pursue ndependent stud es F e d tr ps may be requ red Prerequ s te nstructor approva

GPH 405 Energy and Environment. (3 S
Sources regu atory and techn ca contro s d str b t on, a d conse· quences of the supp y and human use of energy Prerequ s te courses n the phys ca or fe sc ences or nstructor appr va

GPH 409 Synoptic Meteorology I. (4) F 1999
D agnost c techn ques and synopt c forecast ng c udes techn ques of weather ana ys s map nterpretat on, and sate te and radar ana y s s Prerequ s tes· MAT 270 PHY 131 132.

GPH 410 Synopt'c Meteorology I . 4 S
D agnost c techn ques and synopt c forecast ng c udes techn ques of weather ana ys s map nterpretat n, and sate te and radar ana y s s Prerequ s te GPH 409

GPH 411 Physical Geography. 3 A
ntroduct on to phys ography and the phys ca e eme ts of the environ ment Open n y to students who have not taken GPH 111 F e d tr ps.

GPH 412 Physical Climatology. 3 A
Phys ca processes n the earth atmosphere system on reg ona and globa sca es concepts and ana ys s of energy momentum, and mass ba ances Prerequ s tes: GPH 212 and 213 r nstructor approva

GPH 413 Meteorological Instruments and Measurement. 3) A
Des gn and operat on of gr u d base and aero g ca weather mea· surement systems Col ect on, reduct on storage retr eva and ana y s s of data F e d tr ps are requ red Prerequ s tes GPH 212 and 213 *or* nstructor approva

GPH 414 Climate Change. 3 S
Survey of three c mate research areas. pa eoc mato ogy theor es e g greenhouse warm ng) umer cal mode ng Prerequ s te. GPH 212 or nstructor approva

GPH 418 Landforms of the Western United States. 3 A
Study andforms and ge morph c processes in the wester Un ted States nc ud ng ectu e topograph ca maps aer a photographs sat e te magery and f e d tr ps Lecture crit ca nqu ry aboratory, f e d work Prerequ s tes GPH 211 or equ va ent comp et on of L1 c ass *Genera Stud es L2*

GPH 422 Plant Geography. (3 N
P ant commun t es of the w r d and the r terpretat on emphas z ng North Amer can p ant assoc at o s Cross sted as PLB 422 Cred t s a owed on y for GPH 422 or PLB 422 Prerequ s te B O 182 or GPH 111

GPH 433 Alpine and Arctic Env ronments. 3 N
Reg a st dy of advantages and m tat ons f the natura env ron ment upon present and future prob ems nvo v ng resource d str bu t on human act v t es, and reg ona a d nterreg ona adjustments. F e d tr ps are requ red Prerequ s te GPH 111 or nstructor approva *Genera Stud es G.*

GPH 471 Geographic Information Systems. 3 F S
GIS as a bas s f r m crocomputer spat a analy s and synthes s nc udes d g t z ng database rgan zat on, spat a retr eva and graph cs Prerequ s te nstruct r approva *Genera Stud es N3*

GPH 474 Dynamic Meteorology I. 3 F
Large sca e atmospher c mot on k nemat c Newton s aws w nd equat on baroc n cs vort c ty and the m d at tude depress on Prereq u s tes. GPH 213 215 MAT 271 PHY 131 132

GPH 475 Dynamic Meteorology II. 3 S
Top cs n c mate dynam cs Genera rcu at on numer ca mode ng te econnect on phenomena and surface atmosphere nteract on Pre requ s te GPH 474 or nstructor approva

GPH 481 Environmenta Geography. 3 A
Pr b ems of env ronmenta qua ty nc ud ng use of spat a ana ys s research des gn, and f e d work n urban and rura systems F e d t ps are requ red Prerequ s te. nstr ctor approva

GPH 491 Geographic F eld Methods. 6 S SS
F e d techn ques nc ud ng use of aer a phot s arge sca e maps and fract na code system of mapp ng urban and rura f e d ana ys s to be done off campus Trave fees requ red Prerequ s tes GCU 102 121 GPH 111

GPH 511 F uv al Processes. 3 A
Geograph ca aspects of processes of r ver eros n, transportat on, sed mentat on emphas z ng spat a cha acter st cs of forces res s tance andforms sed ment nc udes computer app cat ons Prerequ · s tes GPH 111 (or GLG 101 and 211 r GLG 362 *or* nstructor approva

GPH 533 Snow and Ice. 3 S
Processes d str but on cl mat c nteract ons of snow ce emphas z ng mass ba ance snow strat graphy metam rph sm and g ac er snow pack c mato ogy Lecture f e d w rk Prerequ s te structor approva

GPH 571 Computer Mapping and Graphics. (3) N
Ut zat on of the d g ta computer n ana ys s and mapp ng of geo graph c data nc udes p ott ng, surf c a d sp ay comp s t ng and graph cs F e d tr ps. Prerequ s tes GPH 371 nstructor app ova

GPH 575 Geographic Applications of Remote Sensing. 3 N
Use of mag ng and non mag ng methods of remote acqu s t on f data nc ud ng sate ite sensors a rb rne radar mu t band scann ng, convent'ona photograph c sensors and ground ba ed equ pment F'eld tr ps are requ red Prerequ s tes GCU 585 or GPH 491 GPH 372

GPH 591 Seminar. 1 3) F S
Se ected top cs n phys ca geography F e d tr ps may be requ red

Department of Geology

Simon Peacock
Interim Chair
(PS F686) 480/965-5081
geology.asu.edu

REGENTS' PROFESSORS
BUSECK GREELEY, MOORE

PROFESSORS
BURT CHRISTENSEN, FARMER FINK, HOLLOWAY KNAUTH, LARIMER PEACOCK, REYNOLDS STUMP, TYBURCZY, WILLIAMS

ASSISTANT PROFESSORS
ARROWSMITH, GARNERO LESHIN O DAY SHARP TANG

GEOLOGY—B.S.

The B.S degree in Ge ology requires 39 semester hours including the follow ing core courses or their equivalents

GLG 101	Introduct on to Geo ogy I Physical *S1/S2*	3
GLG 102	Introduct on to Geo gy II H storical S2	3
GLG 103	Introduct on to Geo c gy I Laboratory *S1/S2*	1
GLG 104	Introduction to Geolo y II Laboratory *S2*[1]	1
GLG 310	Structural Ge logy	3
GLG 321	Mineralogy	3
GLG 400	Geo ogy Co oquiu	1
GLG 424	Petrology	3
GLG 435	Sedimento ogy	3
GLG 450	Geology F eld Camp *L2*	6
Total		27

[1] Both GLG 1)1 and 103 must be t ken to secure S1 or S2 credit.

[2] Both GLG 1)2 and 1)4 must be t ken to secure S2 credit

In addition two of the follow ing four branch courses must be taken:

GLG 335	Paleontology	3
GLG 418	Geophysics	3
GLG 470	Hydrogeo ogy	3
GLG 481	Geochemistry	3

To complete the total required hours, other upp r divis on courses in geology (excluding GLG 300, 302, and 3)4 or courses in related fields listed as approved by the depart ment may be taken See "College Degree Requirements" page 324.

Supporting courses required in related fields include:

CHM 113	General Chemistry *S1 S2*	4
CHM 116	General Chemistry *S1/S2*	4
MAT 270	Ca culus with Ana ytic Geometry I *N1*	4
MAT 271	Calculus with Ana ytic Geometry II *N1*	4
MAT 272	Calculus with Analytic Geometry III *N1* or MAT 274 Elementary D fferent a Equations *N1* 3	4
PHY 121	University Physics I Mechanics *S1 S2*	3
PHY 122	University Physics Laboratory I *S1 S2*	
PHY 131	University Physics II: Electricity and Magnetism *S1/S2*[1]	3
PHY 132	University Physics Laboratory II *S1 S2*	
Total		28

Both PHY 121 and 122 must be taken to secure S or S2 credit.

[2] Both PHY 131 and 132 must be taken to secure S1 S2 credit

MAT 290 Calculus I and MAT 291 Calculus II may be substituted for MAT 270, 271, and 272.

MINOR IN GEOLOGY

A minor in Geology is awarded to students who complete a minimum of 21 hours of geology courses Required courses are as follows:

GLG 101	Introduction to Geology I Physical *S1 S2*	3
GLG 102	Introduction to Geology II Historical *S2*	3
GLG 103	Introduction to Geology I Laboratory *S1 S2*	
GLG 104	Introduction to Geolo y II Laboratory *S2*	1
GLG 310	Structural Geology	3
GLG 321	Mineralogy	3
GLG 400	Geology Co loqu um	1
Total		9

Both GLG 101 and 103 must be taken to secur S1 r S2 credit

[2] Both GLG 102 and 104 must be taken to secure S2 cred t.

The remaining six semester hours may be chosen an ng other upper-division geology courses, except GLG 300 and 400, after consultation with a departmental advisor.

GRADUATE PROGRAMS

The faculty in the Department of Geology offer programs leading to the degrees of Master of Natural Science, M S., and Ph D Consult the *Graduate Catalog* for requirements

NOTE: For the Genera Stud es req ement courses and odes such as L1 N3 C and H) see General Stud es page 85 For graduat req rements see Un vers ty Graduat on Req reme ts page 81 For an exp anat on of add t ona omn b s cour es offered but not sted th s cata og see C ass f cat on of Co rses page 58

GEOLOGY (GLG)

GLG 101 Introduction to Geology I (Physical). 3 F S SS
Bas c pr nc p es of geo ogy geochem stry, and geophys cs Rocks m nera s weather ng earthquakes mounta n bu d ng, vo ca oes water and glaciers Poss b e weekend f e d tr ps *Genera Stud es S1 S2 f c ed t a so earned n GLG 103) G*

GLG 102 Introduction to Geology II (Historical). (3 S
Bas c pr nc p es of app ed geo ogy and the use of these pr c p es n the nterpretat on of geo og c h story P ss b e weekend f e d tr ps Pre requ s te GLG 101 *Genera Stud es S2 f cred t a so earned in GLG 104 H*

GLG 103 Introduction to Geology I—Laboratory. 1 F S SS
Three ho rs ab some f e d tr ps Corequ s te GLG 101 *Genera Stud es S1 S2 (f cred t a so earned n GLG 101*

GLG 104 Introduction to Geology II Laboratory. (1 S
Laboratory techn ques nvo v ng map nterpretat cr ss sect ons and foss s 3 hours ab poss b e f e d tr ps Prerequ s te GLG 103 or equ va ent Corequ s te· GLG 102. *Genera Stud es S2 (f cred t also earned n GLG 102*

GLG 105 Introduction to Planetary Science. 4) S
So ar system objects and the r geo og c evolut n, surfa es ter ors and atmospheres week y aborato y for data ana ys s and exper ments weekend f e d tr p Lecture ab *Genera Stud es S2*

GLG 110 Environmental Geology. 3) F
Geo og ca stud es as they app y to nteract ons between humans and earth. Inc udes geo og ca processes and hazards resources and g oba change *Genera Stud es S2 f cred t a so earned n GLG 111 G*

GLG 111 Environmental Geology Laboratory. 1 F
Bas c geo og ca processes and c ncepts Emphas s on ge ogy re ated environmenta prob ems concern ng Ar zona Case h stor es and f e d stud es Lab Corequ s te· GLG 11 *Genera Stud es S2 f cred t a so earned n GLG 110)*

GLG 300 Geology of Arizona. (3) A
Bas c and h stor cal geo ogy foss s, m n ng ene gy resources env ronmenta prob ems andscape deve opment and meteor tes cast n examp es from Ar zona Majors who have taken GLG 101 f r cred t may not enro

GLG 302 Man and Geologic Environment. 3 N
Ge og c hazards prob ems of waste d sposa and and-use p ann ng and e v ronmenta prob ems re ated to so id earth

GLG 304 Geo ogy of the Grand Canyon. 2 N
Rev ew of the d scovery h st ry or g n and geo ogy of the Grand Can yo of the Colorad R ver n Ar zona S x day f e d tr p down the r ver f rst 6 days after commencement n May required at st de t s expense F e d research and term paper on tr p a so requ red

GLG 305 Geology of the Earth, Moon, and Planets 3 S
Geo og ca stud es of the p anets and sate tes through the ana ys s of spacecraft data and f e d stud es Weekend f e d tr ps Prerequ s tes GLG 101 and 105 and 300 *or* equ va e ts

GLG 310 Structural Geology. 3 S
Geo og c structures and the mechan ca processes nvo ved n the r format on 2 hours lecture 3 hours ab Poss b e f e d tr ps Pre equ sites GLG 101 MAT 270 or 290

GLG 321 M neralogy. 3 F
Crysta chem stry crysta ography m nera dent f cat n or g n and occurrence of m nera s systemat c m nera ogy 2 hours ecture, 3 hours ab poss b e f e d tr ps Prerequ s tes. CHM 113 MAT 270 or 290 Pre or corequ s te CHM 116

GLG 335 Paleontology. 3 F
nt oduct on to concepts and ana yt ca techn q es n b geo ogy, pa e ob o ogy pa eoeco ogy and pa eoe v ronmenta reconstruct on from the foss record 2 hours lecture 3 hours lab P erequ s tes GLG 102 and MAT 270 or 290 *or* nstructor approva

GLG 336 Invertebrate Paleontology. 3) N
B o ogy ske eta morpho ogy, and systemat cs of foss nvertebrates One or two projects emphas z g popu ation ana ys s a d techn ques n pa eonto ogy ecture 6 hou s ab poss b e f e d tr ps Prerequ s te. GLG 102 or instructor app ova Pre or c requ s te for Geo ogy ma ors. GLG 335

GLG 362 Geomorpho ogy. 3 N
Land forms and processes wh ch create and mod fy them aboratory and f e d study of phys ograph c features 2 hours ecture 3 hours ab, poss b e weekend f e d tr ps Prerequ s te GLG 101 Pre or corequ s te GLG 310

GLG 400 Geology Colloquium. 1 F, S
Presentation of recent research by facu ty and guests Wr tten ass gn ments requ red 1 semester hour requ red for Geo ogy majors may be repeated for a tota f 2 semester hou s Prerequ s te 2 courses n the department or nstructor approva .

GLG 405 Geology of the Moon. 3 N
Current theor es of the or g n and ev ut on of the moon through pho togeo og ca ana yses and cons derat on of geochem cal and geophys- ca constra nts Poss b e weekend f e d tr p Prerequ s te GLG 105 or 305 or nstruct r approva

GLG 406 Geology of Mars. 3 N
Geo og ca evo ut on of Mars through analyses of spacecraft data, the oretica mode ng and study of terrestr al ana ogs emphas s on cur rent work Poss b e weekend f e d tr p to Northern Ar zona Prerequ s te GLG 105 or 305 or nstructor approva

GLG 410 Computers in Geology. 3 F
Geo og ca c mputer sk nc ud ng data process ng v sual zat on p esentat on numer ca ana ys s, software and hardware app cat ons 2 hours ecture, 3 hours ab. Prerequ s tes: GLG 101 and one upper d v s on geo ogy course *or* nstr uctor appr va

GLG 412 Geotectonics. 3 F
Earthquakes earth s nter or format on of ocean c and cont nenta crust, and p ate tecton s Emphas s on current work Prerequ site· GLG 310

GLG 416 Field Geophysics. 3 S
Methods of app ed geophys ca exp orat on se sm c refract on grav ty e ectr ca res st v ty geomagnet cs ncludes survey plann ng, data acqu s t on process ng analys s and nterpretat on. Lecture, f e d exerc ses. Prerequ s te one course n geo ogy or nstructor approva

GLG 418 Geophysics. (3) F
So d earth geophys cs geomagnet sm grav ty se smology, heat flow Emphas s on crust and upper mant e Prerequ s tes· GLG 310 and MAT 272 and PHY 131 *or* structor approva

GLG 419 Thermal-Mechanical Processes in the Earth. 3) F
Emphas s on app ed mathemat ca techn ques heat conduct on prob- ems in geology therma c nvect on, stresses in the thosphere and v scoe ast c processes n the Earth. Prerequ s te PHY 131

GLG 420 Volcanology. 3 A
D str but on of past and present vo can sm types of vo can c activity mechan sm f erupt on form and str cture of vo canoes and geochem stry of vo can c act v ty Poss b e weekend f e d tr ps. Prereq u s te GLG 424

GLG 424 Petrology. 3 F
Or g n of gneous and metamorph c rocks Optica m nera ogy hand spec men dent f cat on and th n sect on analys s. 2 hours ecture 3 hours ab poss b e weekend field tr ps Prerequ s te GLG 321

GLG 435 Sedimentology. 3 S
Or g n transport depo t on and d agenes s of sed ments and sed mentary rocks Phys ca ana ys s hand spec men exam at on and nterpretat on of rocks and sed ments 2 ho rs ecture 3 hours ab poss b e weekend f e d t ps Prerequ s tes GLG 102 321

GLG 436 Principles of Stratigraphy. (3 N
Pr nc p es f nterpret ng thostrat graph c magnetostrat graph c b os trat graph c se sm strat graph c, and chronostrat graph c un ts corre at on and facies re at onsh ps n strat f ed rocks. App ed strat graphy project s Lecture, poss b e f eld tr ps Prerequ s tes GLG 102 nstructor approva .

GLG 441 Ore Deposits. 3 N
Or g n occurrence structure and m nera ogy of ore depos ts Possi b e weekend f e d tr ps P erequ s te GLG 424 or nstructor approval

GLG 450 Geo ogy Field Camp. 6 SS
Geo og ca mapp ng techn ques on aer a photos and topograph c maps F e d based w th excurs ns Prerequ s tes GLG 310 321 *Genera Stud es L2*

GLG 455 Advanced Field Geology. 3–4 F, S
Geo og c mapp ng n gneous sed mentary and metamorph c terra ns of the Bas n and Range prov nce of Ar zona Weekend f eld tr ps. May be repeated for cred t Prerequ s te GLG 450 or nstructor approva

GLG 456 Cordilleran Regional Geology. 3 F
Systemat c coverage th rough space and t me of the geolog ca deve opment f western N rth Ame ca, emphas z ng the western Un ted States Prerequ s te sen or ma o o graduate student n Geo ogy or nstructor approva

GLG 470 Hydrogeology. 3 S
Geo ogy of groundwater occurrence aqu fer and we l hydrau cs water chemistry and qua ty contam ant transport, remed at on Emphas s on quant tat ve methods Prerequ s tes GLG 101 or 103 MAT 270; PHY 121

GLG 481 Geochemistry. 3) F
Or gin and d str but on of the chem ca e ements Geochem ca cyc es operat'ng n the earth's atmosphere hydrosphere and thosphere Cross l sted as CHM 481 Cred t s a owed on y for CHM 481 or GLG 481 Prerequis te. CHM 341 (or 441 or GLG 321

GLG 485 Meteorites and Cosmochemistry. 3 N
Chem stry of meteor tes and the r re at onsh p to the orig n of the earth so ar system, and universe Cross sted as CHM 485 Credit s a owed only for CHM 485 or GLG 485

GLG 490 Topics in Geology. 1 3) F S SS
Spec al top cs in a range of f e ds in geo ogy May be repeated for cred t Prerequisite. nstructor approva

GLG 500 Geology Colloquium. (1 F S
Presentat on of recent research by faculty and nv ted guests 1 semester requ red for a geo ogy graduate students May be repeated for tota of 2 semesters Research paper requ red Prerequ s te. nstructor approva

GLG 501 Geology of Arizona. (3 A
Basic and h stor ca geology foss s m n ng energy resources envi ronmenta prob ems andscape deve opment, and meteor tes cast n examples from Ar zona Research paper requ red

GLG 504 Geology of the Grand Canyon. (2) S
Review of the d scovery, h story r g n and geo ogy of the Grand Can yon of the Co orado R ver n Ar zona. 6-day f e d trip down the r ver (first 6 days after commencement n May requ red at student s expense F e d research and term paper on tr p a so requ red

GLG 510 Advanced Structural Geology. 3 N
Mechan cs of rock deformat on, emphas z ng relat onship between f e d observat on theory and experiment Stress stra n s mp e consti tut ve re ationsh ps fa lure cr ter a and the bas s of continuum meth ods Possib e f eld tr ps Prerequ s tes GLG 310 and 424 *or* instructor approva .

GLG 520 Advanced Phys'ca Volcanology. 2 3 A
Se ected volcano g c top cs nclud ng exp s ve erupt on processes lava f ow mechanics, and ntrus ve mechan sms. F e d tr ps poss b e. Prerequisite: GLG 420 or nstructor approva

GLG 524 Advanced Igneous Petrology. 3 N
Theoretica and pract ca aspects of the genes s of gneous rocks. Study of se ected s tes Modern aboratory techn ques 2 hours ec ture 3 hours lab poss b e weekend f e d tr ps Prerequ s te GLG 424

GLG 525 Advanced Metamorphic Petrology. 3 N
Theoret'ca and aboratory study of metamorph c rocks Processes of contact and reg ona metamorph sm Advanced methods and nstru mentat ons 2 hours ecture, 3 hours ab poss b e weekend fie d tr ps Prerequis te· GLG 424

GLG 562 Quaternary Geology. 3 N
Geo ogy of the Quaternary Per od n both g ac ated and ung ac ated areas Strat graphy corre at on and env ronmenta app cat on of Qua ternary depos ts Spec a reference to the Southwest. 2 hours ecture 3 hours lab some f e d tr ps dur ng lab possib e weekend f e d trips. Prerequ s te· GLG 362 or nstructor approva

GLG 581 Isotope Geochemistry. 3 N
Geochem stry and cosmochem stry of stable and rad act ve sotopes, geochrono ogy, sotope equ br a Prerequ s te nstruct r approva

GLG 582 Physical Geochemistry. 3 N
Appl cat on of thermodynam c and k net c pr nc p es to geochem cal processes Prerequ s te CHM 341 or 441 or GLG 321

GLG 583 Phase Equilibria and Geochem cal Systems. (3) N
Natura react ons at h gh temperatures and pressures s cate su f de and ox de equ br a Cross sted as CHM 583 Cred t s a owed on y for CHM 583 or GLG 583 Prerequ s tes· GLG 582 nstructor approva

GLG 591 Seminar. (1 3 F S SS
Top cs n a range of f e ds n geo ogy May be repeated for cred t Pre requ s te nstructor approva

GLG 598 ST· Special Topics. (1 3 F, S, SS
Spec a topics n geology May be repeated for cred t Prerequis te instructor approva

Department of History

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PROFESSORS
ADELSON, BATALDEN, BURG, DAVIS DELLHE M, FUCHS G FFIN, GRATTON, VERSON KLEINFELD, LAVRIN, LUCKINGHAM, MacKINNON PYNE, ROSALES, ROTHSCH LD RUIZ SIMPSON STOWE, TAMBS, TILLMAN, TRENNERT, WARNICKE

ASSOCIATE PROFESSORS
BARNES, CARROLL, GRAY, HENDRICKS KAHN, LONGLEY RUSH L. SMITH, R. SMITH SOERGEL, STONER, VANDERMEER WARREN FINDLEY

ASSISTANT PROFESSORS
GULLETT, McKEE, RAMEY, THORNTON

SENIOR INSTRUCTIONAL PROFESSIONAL
LUEY

CHICANA AND CHICANO STUDIES
ESCOBAR

HISTORY—B.A.

The B.A. degree in History consists of 30 semester hours in history and 15 hours in close y related fields, as approved by the undergraduate adv isor in consultation with the stu dent. HIS 300 Historical Inquiry and HIS 498 PS. Pro-Sem inar are required for all degree candidates HIS 300 is a prerequisite for HIS 498 Honors students may substitute HIS 493 Honors Thesis for HIS 498 Courses in related fields may also be used to satisfy university General Studies and college distribution requirements. At least 18 hours in history courses and nine hours in the related fields must be in the upper division. At least six hours in history must be taken in a third area. Subject areas include Asia, Europe, Great Britain, Latin America, and the United States A mini mum GPA of 2 25 in the 30 hours of history courses is required.

HISTORY—B.S.

The B.S degree in History consists of 36 semester hours in history including HIS 381 and 382 and 18 hours in closely related fields and quantitative studies, as approved by the program directors in consultation with the student HIS 381 Quantification in History and HIS 382 Historical Statistics are required for all degree candidates and should be completed in sequence by the end of the junior year. Courses in related fields may also be used to satisfy univer sity General Studies and college distribution requirements.

NOTE: For the Genera Stud es requ rement courses, and codes such as L1 N3, C, and H , see Genera Stud es " page 85. For g aduat on requ rements see Un vers ty Graduat n Requ rements " page 81 For an exp anat on of add t ona omn bus courses offered but not sted n th s cata og, see 'C ass f cat'on of Courses,' page 58

At least 21 hours in history courses and nine hours in related fields must be in the upper division. At least six hours in history must be taken in any two of the following subject areas and three hours must be taken in a third area. Subject areas include Asia, Europe, Great Britain, Latin America, and the United States. A minimum GPA of 2.25 in the 36 hours of history courses is required.

Asian Studies Certificate. Students majoring in History may elect to pursue an Asian Studies certificate combining courses from the major with selected outside courses of wholly Asian content. See "Asian Studies," page 331, for more information

Jewish Studies Certificate. Students majoring in History may elect to pursue the Jewish Studies Certificate combining courses from the major with selected outside courses of wholly Jewish content. See "Jewish Studies," page 331, for more information.

Latin American Studies Certificate. Students majoring in History may elect to pursue a Latin American Studies certificate combining courses from the major with selected outside courses of wholly Latin American content. See "Latin American Studies," page 332, for more information.

Medieval and Renaissance Studies Certificate. Students majoring in History may elect to pursue the Medieval and Renaissance Studies Certificate by successfully completing the requirements. See "Medieval and Renaissance Studies," page 332, for more information.

Russian and East European Studies Certificate. Students majoring in History may elect to pursue the Russian and East European Studies Certificate combining courses from the major with selected outside courses of wholly Russian and East European content. See "Russian and East European Studies," page 332, for more information.

Southeast Asian Studies Certificate. Students majoring in History may elect to pursue the Southeast Asian Studies Certificate combining courses from the major with selected outside courses of wholly Southeast Asian content. See "Southeast Asian Studies," page 332, for more information.

Women's Studies Certificate. Students majoring in History may elect to pursue a Women's Studies certificate by successfully completing the requirements. See "Women's Studies," page 333, for more information.

MINOR IN HISTORY

The History minor consists of 18 semester hours of course work, at least 12 hours of which are in the upper division.

SECONDARY EDUCATION—B.A.E.

History. The major teaching field consists of 42 semester hours, of which at least 30 must be in history courses. At least 18 of the history hours must be in upper division courses. At least 15 semester hours must be taken in U.S. history. The remaining history and related area courses must be selected in consultation with an advisor from the Department of History. A minimum GPA of 2.50 in history courses is required for admission to student teaching and for graduation. HIS 495 Methods of Teaching History may not be counted as part of the 42 hour requirement for the academic specialization

GRADUATE PROGRAMS

The faculty in the Department of History offer programs leading to the M.A and Ph D degrees. A Certificate in Scholarly Publishing is also available. Consult the *Graduate Catalog* for requirements.

HISTORY (HIS)

HIS 100 Western Civilization. (3 F S
Traces or gin and deve opment of Western soc et es and nst tut ons from the anc ent wor d through the M ddle Ages *General Stud es SB, H*

HIS 101 Western Civilization. 3) F S
Traces or g n and development of Western soc et es and nst tut ons from the Renaissance and Reformat on through Age of En ghten ment *General Stud es SB H*

HIS 102 Western Civilization. 3) F S
Traces or g n and development of Western soc et es and nst tut ons from the French Revo ution to the present *General Stud'es· SB, G, H*

HIS 103 The United States. 3) F S
Growth of the Repub c from co on a t mes through the C v i War period *General Stud es· SB H*

HIS 104 The United States. (3) F S
Growth of the Republ c from the C v War per od to the present day *General Stud es· SB H*

HIS 107 Introduction to Japan. (3) F
H stor ca survey of the peop e cu ture po t cs and economy of Japan, supplemented by aud'ov sua presentat ons ntended for non-majors. *General Stud es SB G, H.*

HIS 111 Global History Since 1500. (3) F, S
Survey of Afr ca, the Amer cas, and Euras a changes n commun ca tion communit es demography econom cs env ronment, po t cs rel - g on, techno ogy, warfare, and women. Lecture CD ROM e ectron c forum d scuss on *General Stud es G H*

HIS 201 Introduction to Slavic Civilization. (3) F, S SS
Deve opment of S avic cu tures and soc et es from med eval Byzan tium to the present· troduct on to modern Euras a Lecture d scus s on, electron c forum. Pre- or corequ site: ENG 101 *Genera Studies· L1 SB H*

HIS 230 American Social History. 3 N
American soc ety from the co on a per od to the present Ethn c ty race age, and sex as factors n h stor cal exper ence Lecture d scus sion *General Stud es· L1 H*

HIS 240 Introduction to Southeast Asia. (3) F
An nterdisc p inary introduct on to the cu tures, re g ons po t ca sys-tems geography, and h story of Southeast As a Cross sted as ASB 240/GCU 240 POS 240 REL 240 Cred t s al owed on y for ASB 240 or GCU 240 or H S 240 or POS 240 or REL 240 *General Studies G*

HIS 270 Judaism in American History. 3 N
A chronologica analys s of Jews and Juda sm n Amer can h story and etters *General Stud es SB H*

HIS 273 American Military History. 3 N
A study of the ro e of the m tary n Amer can fe dur ng war and peace from colon al t mes to the present day 3 hours ecture confer ence *General Stud es SB H*

HIS 294 ST: Selected Topics in History. 3) N
A fu descr pt on of top cs for any semester s ava ab e n the Depart ment of History office. May be repeated for cred t

HIS 300 Historical Inquiry. 3 F, S
Historica methods and cr t ca nqu ry re ated to part cu ar events and processes Top cs vary Requ'red course for majors Prerequ s te for H S 498 D scuss on sem nar ecture Prerequ s tes ENG 102· H s tory major *Genera Stud es L1 SB H*

HIS 302 Film as History. 3 A
Survey of mov ng mage med a as recorder, object and wr ter of h s tory *General Stud es· HU*

HIS 303 American Cultural History. (3 F S
Culture in a broad connotation nc ud ng deas dea s the arts and socia and econom c standards from the nat on s co onia background and early nat onal per od *General Stud es SB H*

HIS 304 American Cultural History. 3 F S
Cu ture n a broad c nnotat on c ud ng dea dea s the arts, and soc a and econom c standa ds fr m the age of ndustr a sm and mod ern Amer ca. *Ge e a Stud es SB H*

HIS 305 Asian C vil zat ons. 3 A
The c v l zat ns of Ch na Japan and nd a to m d 17th century *Gen era Stud es SB G H*

HIS 306 Asian Civil'zations. 3 S
The c v zat ons of Ch na Japan and nd a fr m the m d 17th century to present May a so nc ude Southeast As a *Genera Stud es SB, G H*

HIS 308 Modern Southeast Asia. 3 S
V etnam Laos Cambod a, Tha and Burma Ma ays a, S ngapore Brune Indones a and Ph pp nes s nce 1750 mper a sm revo ution and ndependence Lecture d scuss on *Genera Stud es SB G H*

HIS 309 History of Chinese Science. 3 N
Exp ores deve opment of trad t ona Ch nese science n the context of Ch nese thought and soc ety and n compar son w th deve opments e sewhere Lecture d scu s on Cross sted as HPS 325 Cred t s a owed on y for H S 309 r HPS 325

HIS 312 Interpret'ng China's Class cs. 3 N
Study of se ected Confuc an and or Tao st c ass cs and ways they have been read n b th As an a d Western scho arsh p Cross sted as HUM 312 Cred t s a owed on y for H S 312 or HUM 312 *Genera Stud es L2/HU H*

HIS 315 Japan in the Age of the Samurai. 3 N
H story of the warr r c ass of Japan 700 1868

HIS 320 Ancient Greece. 3 F
H story and c v zat n f the Greek wor d from the Bronze Age to the Roman c nq est of the He len st c k ngdoms *Genera Stud es SB, H*

HIS 321 Rome. (3 S
H story and c v zat on of Rome from the beg nning of the Repub c to the end of the Emp re *Genera Stud es SB H*

HIS 322 The Middle Ages. 3 F
Pol t ca , soc oecon m c, and cu tura deve opments of Western Europe dur ng the Early M dd e Ages Prerequ te HIS 100 or nstruc tor approva *Genera Stud es SB H*

HIS 323 The Midd e Ages. 3 S
Pol t ca soc oeconom c, and cu tura deve opments of Western Europe dur ng the H gh M dd e Ages Prerequ s te H S 100 or nstruc tor approva *Genera Stud es SB H*

HIS 324 Renaissance. 3 F
Antecedents and deve pment of the Rena ssance n ta y and ts spread to the rest of E rope *Genera Studies. L2/SB, H*

HIS 325 Reformation. 3) S
The Protestant and Catho c Reformat on n the 16th century *Genera Stud es L2/SB. H*

HIS 326 Early Modern Europe. 3 F
Soc a econom c cu tura and p t a changes n 17th cent ry Europe *Genera Stud es SB H*

HIS 327 Early Modern Europe. 3) S
Soc a econom c cu tura and po t ca changes n 18th-century Europe *Genera Stud es SB H*

HIS 329 19th-Century Europe. 3 F
Po t ca soc a econ m c and te ectua currents n Europe from Napo eon to 1866 *Genera Stud es SB H*

HIS 330 19th-Century Europe. 3 S
Po t ca s c a econom c and nte ectua currents n Europe from 1866–1918 *Genera Stud es SB H*

HIS 331 20th Century Europe. 3 F
Europe n ts wor d sett ng s nce Wor d War emphas z ng major po t ca and soc a ssues 1914–1945 *Genera Stud es SB G H*

HIS 332 Europe Since 1945. 3 N
Europe n ts wor d sett ng s nce W r d War I emphas z ng major pol t ca and soc a ssues from 1945 t the present *General Stud es SB G, H.*

HIS 340 Witchcraft and Heresy in Europe. 3 N
Background, or g ns and deve opment at the nquisit on Ana ys s of marg a g ups and the r suppress on Cr ss sted as REL 374 Cred t s a owed on y for H S 340 r REL 374 Prerequ s te upper d v on stand g or nstructor approval *Genera Stud es L2 H*

HIS 343 Sex and Soc ety In Modern Europe. 3 N
Fam y fe sex ro es, and marr age and the r re at onsh p to po t ca , econom c and s c a changes n M dern Europe Prerequ s te upper d v s on stand g or nstructor approva Lecture, d scuss on *Genera Stud es L2/SB H*

HIS 344 Women and Society in Europe. 3) N
W men s ro e status and ach evements n Europe 1750–1950 Changes n everyday fe, sex es fam y patterns work and cu ture *Genera Stud es L2 HU SB H*

HIS 351 England. 3 F
P t ca econ m c a d soc a deve opme t of the Eng sh peop e to the 17th centu y *Genera Stud es SB H*

HIS 352 England. 3 S
Po t ca econom c and s c a deve opment of the Eng sh peop e from 17th century to the present *Genera Stud es SB H*

HIS 357 19th-Century West. 3 F S
Soc a , po t ca and eco om c deve opment f trans M s ss pp West begnn ng with L u s a a Purchase and end ng n 1900 *Genera Stud ies SB H*

HIS 358 The West in the 20th Century. 3 F S
Ro e of the western states Amer an h tory s nce 1890 w th emphas s on po t cs the env r nment ndu try and abor and the cha g ng pos t o of ethn c m nor t es *Genera Stud es SB, H*

HIS 360 American Indian History to 1900. 3 F S
Cu tura econom c p t a , a d soc a cont nu ty and change of Amer can nd an commun t es to 1900 Lecture d scuss n *Genera Stud es. SB, C H*

HIS 361 American Ind an History Since 1900. 3 F S
Cu tu a econom c p t ca a d soc a cont u ty and change of Amer ca nd a commun t es from 1900 to the present Lecture, d s cuss on. *Genera Stud es. SB C H*

HIS 363 African Amer can History I. 3 F
The Afr can Amer an n Amer a h story thought and cu ture from s avery to 1865 Cross sted as AFS 363 Cred t s a owed only for AFS 363 or H S 363 *Genera Stud es. SB C H*

HIS 364 African American History II. 3 S
The Afr can Ame can n Amer can h st ry thought and cu ture from 1865 to the present Cr ss sted as AFS 364 Cred t s a owed on y for AFS 364 or H S 364 *Genera Stud es· SB C H*

HIS 365 Islamic C vil zation. 3 F
G oba h stor ca survey of s am c cu tures and s c et es up to the modern per od Lecture, d scuss n Cross sted as REL 365 Cred t s a owed on y for H S 365 r REL 365 *Genera Stud es HU H*

HIS 366 The Modern Middle East. 3 N
mpact f the Western wor d upon M dd e Easter governments re · g on and soc ety n the 19th a d 20th centur es, prob ems of modern zat on and the r e of the M dd e East n wor d affa rs *Genera Stud es SB G H*

HIS 369 Exp orat on and Empire. 3 N
An nterd sc p ary s rvey f exp orat on by Western C v zat on over the past 500 years Lecture d scuss on *General Stud es L2 H*

HIS 370 Women in U.S. History, 1600–1880. 3 F
Exam nat on of Amer an w me f d verse rac a re g ous ethn c groups and c asses focus s on chang ng def n t ons of women s ro es *Genera Stud es SB C H*

HIS 371 Women in U.S. H story, 1880–1980. 3) F S
Exam nat on of Amer can women of d verse rac a re g ous, ethnic groups and c asses focus s on chang ng def n t ons of w men s ro es *Genera Stud es. SB C H*

HIS 373 Women in 20th-Century West. 3) A
Exam nes how women of var ous cu tures have co tended for and shaped the Amer can We t nc ud ng the West of the mag nat on Lecture d scuss n *Genera Stud es· C H*

HIS 380 H'story of the Mexican American. 3) N
Ro e of the Mex can Amer can n U S h story *Genera Stud es· SB H*

NOTE: For the Genera Stud es requ rement courses and codes such as L1 N3 C and H see Genera Stud es " page 85 For graduat on ·equ rements, see Un vers ty Graduat on Requ rements " page 81 F r an exp anat on of add t na omn bu courses ffered but not isted n th s cata g see C ass f cat on of Cou ses, page 58

HIS 381 Quantification In History. (3) F
Quantitat ve techniques nc ud ng po t cal analys s new econom c theory demography and soc a h story Research methods n soc a sc ence nclud ng des gn data co ection and computer sk s Prereq u s te· MAT 117 or a course for wh ch MAT 117 s a prerequ s te

HIS 382 Historical Statistics. 3 S
H stor ca data ana ys s nc ud ng samp ng d str but ons tests of hypotheses, t tests to mu t p e regress on and nonparametr c tech- n ques Prerequ s te: H S 381 *Genera Stud es N2*

HIS 383 Lat n America. 3) F S
Ancient c v zat on exp orers and conquerors and colon al nst tu tions. *Genera Stud es SB H*

HIS 384 Latin America. 3 F S
Nationa st c deve opment of the ndependent repub cs s nce 1825 *Genera Stud es· SB H*

HIS 385 Women in Colonial Latin America. 3) F
H story of women n co on a Lat n Amer ca cross exam n ng c ass race, and gender re at ons n depth Lecture, d scuss on *General Stud es· H*

HIS 394 ST: Selected Topics in History. 3) F S
A fu descr pt on of top cs f r any semester s ava ab e in the Depart- ment of H story off ce May be repeated for cred t

HIS 401 American Colonial History. (3) F
Po t ca econom c soc a and cu tura h story of the colon al era. Concentrates on Eng sh co on es w th some cons derat on of Span sh, French, and other co on a reg ons n North Amer ca *General Stud es SB, H*

HIS 403 Revolution and Constitution. (3) N
The causes, course and consequences of the Amer can Revo ut on cu m nat ng n the rat f cat on of the Const tut on Prerequ s'te· H S 103 or nstructor approva

HIS 404 The Early Republic, 1789–1850. 3) A
Po t ca soc a econom c, and cu tura deve opment of the Un ted States from the Revo ut on to 1850. Prerequ s te HIS 103 or nstructor approva . *Genera Stud es L2/SB H*

HIS 406 Civil War and Reconstruction. 3) A
Exp ores the causes, conduct and consequences of the American C v War concentrat ng on the years 1848 to 1877 Prerequ s te. H S 103 or nstructor approva *General Stud es L2/SB H*

HIS 407 The Emergence of the Modern United States, 1877 to 1918. (3 A
The tr umph of modern po t ca , soc a and econom c structures and va ues 1877 1918; ro e of reg on re g on race and ethn c ty *Gen era Stud es SB H*

HIS 408 The Modern United States, 1918 to 1945. 3) A
1920 s boom and the crash the Depression and the New Dea response The Second Wor d War at home and abroad Prerequ s te H S 104 or equ va ent *Gene a Stud es· SB H*

HIS 409 The Postwar United States. 3 A
The Un ted States from 1945 to 1973 *Genera Stud es SB H*

HIS 410 The Contemporary United States. 3 A
The Un ted States from 1973 to the present *Genera Stud es SB, H*

HIS 414 The Modern American Economy. (3) N
Or g ns of 19th-century s avery and ndustr a zat on 20th century cr sis and regu at n po t ca ecor omy of an advanced cap ta st democ racy Prerequ s te ECN 111 or 112) or H S 103 or 104) *Genera Stud es SB, H*

HIS 415 American Diplomatic History. (3) F
Amer can re at ons w th fore gn powers 1776 1898 Prerequisite H S 103 or nstruct r approva *General Stud es· SB H*

HIS 416 American Diplomatic History. (3) S
Amer can re at ons with fore gn powers from 1898 to the present Pre- requ s te H S 104 or nstructor approva *Genera Stud es SB, G, H*

HIS 417 Constitutional History of the United States. 3 F
Or g n and deve opment of the American const tut onal system from Co on a or g'ns through Reconstruct on Prerequisite. HIS 103 or nst uctor approva *Genera Stud es SB H*

HIS 418 Constitutional History of the United States. (3 S
Orig n and deve opment of the Amer can const tut ona system from Reconstruct on to the present Prerequ s te· H S 104 or nstructor approva *Genera Stud es SB H*

HIS 419 American Urban History. 3) F
The history of the city in Amer can l fe from co on a t mes to the late 19th century *General Stud es SB H*

HIS 420 American Urban History. (3) S
The h story of the city n Amer can fe from the 19th century to the prese t *General Stud es SB, H.*

HIS 421 History of American Labor. 3) N
Amer can workers from the c n a per od to the present nc ud ng farmers s aves housew'ves the sk ed and unsk ed, un on zed and nonun on zed Prerequ s te H S 103 or 104) or MGT 301 *General Stud es SB H*

HIS 422 Rebellious Women. (3) F S
Exam nat on of the ro es of rebe ous women n h story through the study of autobiography biography and theory *Genera Stud es L2/ SB C H*

HIS 424 The Hispanic Southwest. 3) N
Deve opment of the Southwest n the Span sh and Mexican per ods to 1848 *General Studies SB H*

HIS 425 The American Southwest. (3 F
Deve opment of the Southwest from 1848 to the present. *Genera Stud es. L2/SB H*

HIS 426 Indian History of the Southwest. (3 F, S
Comprehens ve rev ew of h stor cal events from preh stor c peoples, the Span sh and Mex can periods, and the American per od after 1846 to the present Prereq s te. upper d v s on stand ng or nstructor approva *Genera Stud es SB C H*

HIS 428 Arizona. 3 F S
Emergence of the state from ear y t mes to the present Prerequ s te upper-d v sion stand ng or nstructor approval *General Stud es SB, H*

HIS 430 20th Century Chicano History. 3 S
H'stor ca deve opment of the Ch cano commun ty n the 20th century *General Stud es SB H*

HIS 431 The French Revolution and the Napoleonic Era. 3 N
Cond t ons n France before 1789, the Revolut onary decade from 1789 to 1799 the organ zat on of France under Napo eon, and the mpact of changes n France on European soc ety Prerequ s te upper-d v s on stand ng or nstructor approva *Genera Stud es· SB H*

HIS 433 Modern France. 3 N
Soc a , po t ca econom c, and cu tura transformat ons of French society 1815–present Impact of ndustr a zat on war and revo ut on on peop e's ves. Prereq s te. pper d v s on stand ng or nstructor approval *General Stud es SB, G, H*

HIS 434 Hitler: Man and Legend. 3) F
A biograph ca approach to the German Th rd Re ch emphas z ng nature of Naz reg me, Wor d War , and h stor ography *General Stud- es· SB, H*

HIS 435 Modern Germany. (3 S
Germany s nce 1840 *General Stud es. SB, G, H*

HIS 437 Eastern Europe and the Balkans. (3) N
Peop es and countr es of eastern and southeastern Europe n the 19th and 20th centur es from 1800 to 1914 emphas z ng the Hapsburg and Ottoman Emp res *Genera Stud es SB H*

HIS 438 Eastern Europe and the Balkans. 3) N
Peop es and countr es of eastern and southeastern Europe n the 19th and 20th centur es emphas zing the successor states from 1914 to the present *Genera Stud es. SB G H*

HIS 441 The Russian Empire. 3 F
Deve opment of modern Euras a from the ate seventeenth century to 1917 nc ud ng analys s of Russ an soc ety nst tut ons and cu tura tradit ons Lecture d scuss on *Genera Stud es SB H*

HIS 442 The Soviet Union. 3 S
An exam nat on of Sov et and post-Soviet po it cs econom c deve op ment and fore gn re at ns from the 1917 Revo ut on to the present. *Genera Stud es SB G, H*

HIS 443 Russia and the United States. (3 S
Officia and unoff c a re at ons between Russ a and the Un ted States from the late 18th century to the present emphas z ng per od fo low ng the Bo shev k Revo ut on *General Studies SB, G H*

HIS 445 Tudor England. (3 A
Po t ca soc a econ m c and cu tura deve opments 'n 16th century Eng and *General Stud es SB, H*

HIS 446 Stuart England. 3 A
Po it ca soc a , econom c and cultura deve opments n 17th century Eng and *Genera Stud es SB, H*

HIS 449 Modern Britain. (3 N
Factors contr but ng to Br ta n s pos t on as the wor d s ead ng power n the 19th century and ts dec ne from that pos t on n the 20th cen tury. *General Stud es SB, G, H*

HIS 450 British Constitutional History. (3) N
H storica deve opment of the constitutiona system of Great Br ta n from the Midd e Ages to the present emphasiz ng the growth of democracy *General Studies SB, H*

HIS 451 The British Empire. (3) A
Brit sh mper a sm and colon'al sm 'n Afr'ca, the Amer'cas As a and the South Pac fic Prerequis te: upper d v s on stand ng or 'nstructor approva . *General Studies. SB, H*

HIS 455 Intellectual History of Modern Europe. (3) A
Major developments n European thought from Karl Marx to the present. Prerequ s te: upper d v s on standing or nstructor approva *General Stud'es. HU, H.*

HIS 456 History of Spain. (3) F
Cultura economic, pol tical and socia development of Spain from ear iest days to 1700 *General Stud es HU SB H*

HIS 457 History of Spain. (3) S
Cultura econom c, pol tical and socia development of Spain from 1700 to the present *General Studies HU SB G H.*

HIS 460 Spanish South America. (3) N
Pol tical economic and soc a deve opment of the Span sh speaking nat ons of South Amer ca s nce ndependence 19th-century deve opments *General Stud es· SB, H*

HIS 461 Spanish South America. (3) A
Pol tical, econom'c and soc al deve opment of the Span sh-speaking nat ons of South Amer ca. 20th century deve opments. *General Stud ies SB, H*

HIS 463 Intellectual and Cultural History of Latin America. (3) A
Ma n currents of thought the outstand ng th nkers, and their mpact on 19th and 20th-century Lat n America. Cu tural and institutiona bas's of Latin American l fe *General Studies. SB, H.*

HIS 464 The United States and Latin America. 3) A
The Lat n Amer can strugg e for d p omatic recogn tion attempts at po itical union partic pat on n nternat ona organizations s'nce 1810 and re ations between the United States and Latin Amer ca. *General Studies: SB, G, H.*

HIS 466 Mexico. (3) F
Pol t cal, economic social, and cu tura developments from earl est t mes to 1810 *General Stud es SB H*

HIS 467 Mexico. (3) S
Pol tical econom c soc a and cu tura developments from 1810 to the present *General Stud es SB, H.*

HIS 468 Brazil. (3) N
D scovery, conquest, and sett ement by the Portuguese, ach evement of independence r se and fa of the emp re· problems and growth of the republ c to the present. *General Studies· SB H*

HIS 469 Chinese Thought and Way. (3) F
Ch na's class'cs in trans ation studied both for their ntr nsic deas and for the or gins of Ch nese thought *General Studies· SB H*

HIS 470 Chinese Thought and Way. (3) S
Evo ution of Confuc an Tao (Way) ts synthes s of Tao sm and Bud-dhism and 20th-century reactions to that Tao. *General Studies· SB, G, H*

HIS 471 The United States and Japan. (3) F
Cu tural, po it ca , and econom c re at ons in the 19th and 20th centu ries. Emphas s on post World War I period *General Studies SB, G, H.*

HIS 473 China. (3) F
Pol t cal, econom c social, and cu tura h story of the Ch nese people from early t mes to the ate 17th century *General Studies SB H*

HIS 474 China. (3) S
Pol t cal, econom c social, and cultura h'story of the Ch'nese people from mid-17th century to the present. *General Studies: SB G H*

HIS 475 The American Experience in Vietnam, 1945–1975. (3) F
Intersection of Amer can and As an h stor es n Vietnam, viewed from as many s des as poss b e *General Studies SB, G, H*

HIS 477 Japan. (3) F
Po t cal, econom c, soc al, and cu tural h story of the Japanese peop e from early times to the 19th century *General Stud es. L2/SB, H.*

HIS 478 Japan. (3) S
Po t ca , econom c, social, and cu tural history of the Japanese peop e from 19th century to the present. *General Studies: SB G H.*

HIS 481 The People's Republic of China. (3) N
Analysis of major po t ca , soc a econom c, and nte lectua trends in Ch na s nce the found ng of the Peop e's Republ c n 1949. *General Studies SB, G, H.*

HIS 488 History of Fire. (3) F
A g oba survey of the natural and cu tura h story of f re Lecture, d s-cussion *General Studies L2, H*

HIS 493 Honors Thesis. (3) N

HIS 495 Methods of Teaching History. (3) F
Methods in nstruct on, organization and presentat on of the subject matter of history and close y al ed f e ds

HIS 498 PS: History Pro-Seminar. (3) F S
Requ red course for majors on top c se ected by instructor wr ting-ntensive course related to the deve opment of research sk l s and wr t-ing too s used by h stor ans. Prerequis'tes: HIS 300; History major. *General Studies. L2*

HIS 502 Public History Methodology. (3) F
ntroduct on to h'stor ca research methodo og es techn ques, and strateg es used by pub ic h storians. Read ngs short papers, and guest speakers Requ red for students n the pub 'c history concentra t on.

HIS 512 Historians of Early Europe. (3) N
A study of the h story of European historica wr t ng from the Greeks to the 18th century

HIS 513 Historians of Modern Europe. (3) N
A study of 19th and 20th-century European h stor ca writ ng.

HIS 514 Historians of the United States. (3) N
A study of the history of Amer can h stor cal writ ng from the early co on a days to the 20th century

HIS 515 Studies in Historiography. (3) F S
Methods and theor es of writers of h story. May be repeated for credit.

HIS 525 Historical Resource Management. (3) F
dent fical'on documentat on, and interpretation of h stor c per od bu d ngs s tes, and d stricts. Emphasis on nterdisc p inary efforts among h stor ans arch tects, and anthropo og sts

HIS 526 Historians and Preservation. (3) S
Preparation of historians for pub ic and pr vate h storic preservation programs Prerequis te HIS 525 or nstructor approva

HIS 527 Historical Administration. (3) F
Preparat on of historians in adm n strat on of archives h storical s tes, historica museums h stor ca soc eties, and h stor ca off ces n gov-ernment agencies

HIS 532 Community History. (3) N
Techn ques and methods of community h story emphasizing local resources Required for commun ty h story opt on Sem nar

HIS 551 Comparative Histories of War and Revolution. (3) A
A comparative fie d course of the themes of war and revolut on

HIS 552 Comparative History of Family and Community. (3) N
A comparative course w th a focus on fam ly nc ud ng minor ty and ethnic groups in soc ety

HIS 553 Comparative History of State and Institutions. (3) N
A comparative course that explores the chang ng nature of centra inst tut ons and government

HIS 554 Comparative Historical Population Studies: Ethnicity, Economy, and Migration. (3) N
A comparative course that explores the impact of soc a , cultura or economic changes in the popu ation

HIS 555 Comparative Historical Topics. (3) N
This course analyzes a var ety of spec fic socia , po it cal, cu tural, and inte ectua topics

HIS 591 Seminar. (3) N
May be repeated for cred t.

NOTE: For the Genera Stud es requirement courses, and codes (such as L1 N3 C and H), see "Genera Studies," page 85 For graduation requ rements, see "Un vers ty Graduat on Requirements " page 81 For an exp anation of add t onal omn bus courses offered but not l sted in this catalog see C ass fication of Courses," page 58

HIS 598 ST: Special Topics. 3 N
Read ng courses des gned t ncrease students fam ar ty w th a particu ar top c and the mportant wr t ng concern ng t The fo ow'ng areas may be nc uded
(a As an H st ry
b) Eng sh and Br t sh H story
(c) European H story
d) Lat n Amer can H story
(e U S H story
May be repeated for cred t

SCHOLARLY PUBLISHING (PUB)

See the *Graduate Catalog* for the PUB courses

Interdisciplinary Humanities Program

Charles J. Dellheim
Director
(LL B605) 480/965-6747
www.asu.edu/clas/humanities

LANGUAGES AND LITERATURES

Regents' Professor: Foster

HUMANITIES

Professors: Del he m Kuge mass;
Associate Professor: Pr vateer;
Ass stant Professors Baker, Ballew López Lázaro, Lund, Romeyn Taylor, Wr ght;
Academic Profess ona : Lynch

The humanities are those learned bodies of knowledge that are used to express ideas, to understand the meaning of words, and to explore the values and beliefs that underlie our culture and the cultures of others. As defined by the U.S Congress, the humanities include archaeology, comparative religion, ethics, history, jurisprudence, literature, linguistics, philosophy, the history and criticism of the arts, and those aspects of the social sciences that employ a philosophical or historical rather than quantitative approach to knowledge.

HUMANITIES—B.A.

The major in Humanities is interdisciplinary and may be intercollegiate. In consultation with an advisor, the student takes a minimum of 44 semester hours of interdisciplinary *humanities courses from two components: (1) an interdisci* plinary core of 23 hours and (2 an area of concentration of 21 hours.

Depending on the concentration chosen, under certain circumstances students may opt to take up to 29 hours in the interdisciplinary core and 15 hours in the area of concentra tion

Interdisciplinary Core
Issues, Methods, and Theory 6
HUM 2 0) Encountering the Humanities *HU* 3
HUM 498 PS Pro Seminar in the Humanities 3
Cultures in Context 11
HUM 301 Humanities in the Western World *L1/HU H* 4)
HUM 302 Humanities in the Western World *L1 HU H* 4
One approved upper division course on the cultures and traditions of Latin America, Asia or Africa 3)
Ethnicity, Race, and Gender 3
Art, Science and Technology 3

Total 23

Area of Concentration
Required courses from l st obtained from advisor. 21

Courses must be selected from an approved list or be approved in advance by the undergraduate advisor. Areas of concentration currently include architecture; architecture, culture, and society; business; design, film studies, humani ties; liberal arts, justice studies; and planning.

The courses within the area of concentration are to be selected from architecture, art history, English, film studies, history, humanities (HUM , languages and literatures, phi losophy, religious studies, and other approved disciplines. These courses may be credited toward the General Studies requirement.

MINOR IN HUMANITIES

The following courses are required for the minor:

HUM 110 Contemporary Issues in the Humanities *HU* 3
HUM 301 Humanities in the Western World *L1/HU H* . . .4
HUM 302 Human ties in the Western World *L1/HU H*. . . .4
Approved upper division HUM courses.. 9

Total 20

GRADUATE PROGRAM

The faculty in the program also offer the M A. degree in Humanities through the Graduate Committee on Humanities. Consult the *Graduate Catalog* for requirements.

HUMANITIES (HUM)

HUM 110 Contemporary Issues in Humanities. (3) F S
Responses of terature art h story h story ph osophy, re g: n and other d sc p nes to common prob ems affect ng modern Amer can fe *General Stud es HU*

HUM 194 ST: Special Topics n the Humanities. (3) N
Open to a students Top cs nc ude
(a Amer can F ne Arts
(b Comparat ve F ne and Perform ng Arts
(c) Cu tures of Ethn c M nor t es
(d) Non Western Cu tures
(e) Western H stor ca or Contemporary Cu tures

HUM 200 Encountering the Humanities. (3) F, S
Introduct on to the anguages, methods and object ves of the study of the nterd scipl nary human t es Intersect ons of deas, va ues, and cultura nst tut ons Lecture studio workshop. Prerequ s te Human - ties ma or *Genera Stud es. HU.*

HUM 294 ST: Special Topics in the Humanities. (3 N
Open to al students Top cs nc ude
(a) Amer can F ne Arts
b) Comparat ve F ne and Perform ng Arts
c) Cu tures of Ethn c M nor t es
d Non Western Cu tures
(e) Western H stor ca or Contemp rary Cu tures

NOTE: For the Genera Stud es requ rement courses, and codes such as L1 N3 C and H see 'Genera Stud es, page 85 For graduation requ rements see Un vers ty Graduat on Requ rements " page 81 For an exp anat'on of add t ona omn bus courses offered but not sted n th s cata g see C ass f cat on of Courses page 58

HUM 301 Human ties in the Western World. 4 F
nterre at on of arts and deas n Western C v zat n He en c through med eva 3 hours ecture 1 d scuss n meet ng per week *Genera Stud es L1 HU H*

HUM 302 Humanit es in the Western World. 4 S
nter elat n of arts and deas n Western C v zat on Rena ssa ce to the present 3 hours ecture 1 d scuss'on meet ng per week *Genera Stud es L1 HU H*

HUM 310 Japanese Cities and Cultures to 1800. 3 S
Re at ons am ng deas and terary v sua a d perform ng arts f the anc ent ar stocracy med eva samura and ear y modern t wn pe p e Cross sted as REL 355 Cred t s a owed on y for HUM 310 or REL 355 *Genera Stud es L1 HU H*

HUM 312 Interpreting Ch na's Classics. 3 N
Study of se ect C fuc an and r Tao st c as cs a d ways they have been read n both As an and Western scho arsh p Cross sted as H S 312 Cred t s a owed on y fo H S 312 or HUM 312 *Genera Stud es L2/HU H*

HUM 320 Hispanic Cultures: Europe and the Americas. 3 F
Exam nat n of European expans on nto the Amer cas fr m 15th to 20th centur es w th f cus on cu tura co tact conf ct and c mpro m ses *Genera Stud es 1 HU H*

HUM 321 Imagining Spain: From Land of Three Faiths to Nation State. 3 A
Cu tura fe of Spa n as med eva and of three fa ths Juda sm, Chr s tian ty, s am and ts transformat on nto a nat n state Lecture d s cuss on.

HUM 340 Contemporary American Fi m and Popular Culture. (3 F
Study of Amer can f m te ev s on and popu ar mus c of past three decades as cu tura d cuments *Ge era Stud es HU*

HUM 394 ST: Specıal Topics n the Humanit'es. 3 N
Open to a students Top cs nc de
a Art and P t cs
b) Cu ture and S c ety of Contemporary Ch na
(c mm grat on and Ethn c ty n Amer can Cu ture
(d) The Ho caust and Soc a Theory

HUM 401 The Culture and Legacy of the European En ightenment. (3 S
Hıstor'ca survey f e ghteenth century European en ghtenme t and ts status w'th n contemp rary te ectua u ture Lecture d sc ss n. *Genera Stud es HU H*

HUM 409 Or'ental sm and Occidental sm: Invent ng the West and the East. (3 N
Exam nes s gn f cant cu tura nteract ons between West and East' w th reference to re g o s v s ons from the med eva t modern per ods Lecture, d scuss on

HUM 420 Interpreting Latin America. 3 S
ntroduct on to protoc s and methodo g es f r cu t ra nterpretat on of Lat n Amer ca w th emphas s on four pr nc pa c t es as cu tura space *Genera Stud es HU G H*

HUM 440 Los Angeles and Cu tura Theory. 3 S
Ana ys s of representat o s f Los Ange es n terary f m and mus cal texts and broader mp at s for contemp rary Amer can soc ety *Genera Stud es L1 HU C*

HUM 450 Technology and Culture. 3 S
Exp ores so ocu tura deo og ca postmodern mp cat ons of tech no ogy and the ro e tech o ogy p ays n soc a construct ons a we as the spaces t creates Sem nar d scuss on *Genera Stud es. L1 HU*

HUM 451 Vırtua Reality: The Culture of Cyberspace. 3 A
Soc econom c cu tura aesthet c postmodern theoret ca and human mp cat ons of v rtua rea ty technolog es. Themes: cu tura deo g ca product ons of cyberspace Co laborat ve and research based

HUM 460 Postmodern Culture and Interpretation. (3 N
Cu rents and nterpretat ons of postmodern cu ture nternat onal comparat ve perspect ve on the cu ture and trad t ns of contemporary Eur pes and Amer cas " Sem nar d scuss on *Genera Stud es· L2*

HUM 462 Psychoana ysis and Culture. 3 F
ntroduct n t te ectua h story of psychoana ytic movement of twent eth century and ts contr but on to human t es d sc p nes *Genera Stud es L2/HU SB*

HUM 465 Narrative in the Human Sciences. 3) F
Theor es of arrat ve and narrat v ty n the Human t es concentrat ng on the prob ems of spe f c d sc p nes and nterdisc p nary so utions *Genera Stud es L2/HU*

HUM 494 ST: Special Topics in the Humanities. (3) N
Open t a students Top cs ınc ude.
a Amer can Jewry through F m and TV
b Comedy and Cu ture
c G oba Med a Stud es
d) Orıenta sm and Occ denta sm
e Sc ence as a S c a Weapon

HUM 498 PS: Pro-Seminar in the Humanities. (3 F, S
Meth do og es and comparat ve theor es for the study of re at onships between var ous aspects of cu ture the h story of deas and the arts For students w th a major n human t es w th upper d v s on stand ng May be repeated for a tota of 6 semester hours, when topics vary
(a) Theory and Cu ture
Genera Stud es L2/HU

HUM 511 Structures of Knowledge. (3 F
Theor es and examp es of structures of know edge, nclud ng such top cs as metaphor sem ot cs and know edge of the other "

HUM 512 Writ'ng Cultures. 3 S
Theories and methods of represent ng Western and non Western cu - tures n l terature h story ethnography and pictor'a med a

HUM 513 Interpretation of Cultures. 3 A
Methodo g es and comparat ve theor'es for the study of re ationsh ps between var us aspects of cu ture, the h story of deas, and the arts May be repeated for a tota of 6 semester hours when top cs vary

HUM 549 Contemporary Critical Theory. 3 A
An advanced survey of maj r schoo s of 20th-century l terary and cr t ca theory Le tu e, d scuss on Cross sted as ENG 502 Cred t s a owed on y for ENG 502 or HUM 549

HUM 591 Seminar. 3 A
Top cs nc ude
a Comedy Mean ng and Form
b Theory and Cu ture
c Tragedy Mean ng and Form

HUM 598 ST: Spec'al Topics in the Humanities. (3 N
Open to a students Top cs nc ude·
a Amer can F ne Arts
b Comparat ve F ne a d Perform ng Arts
c Cu tures of Ethn c M n r t es
d Non Western Cu tures
e Western H stor ca or Co temporary Cu tures

Department of Languages and Literatures

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FOSTER, KELLER

PROFESSORS
ALEXANDER BALDINI, BALLON AGUIRRE, CHAMBERS, COUCH CROFT, CURRAN EKMANIS FLYS, GUNTERMANN, HORWATH LOSSE VALD VIESO, VOLEK, WETSEL, W XTED, WONG

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INSTRUCTORS
HABERMAN KORET LE, TU

LECTURERS
BERN ER, CRISTO, FOARD S HENDR CKSON, LIONTAS, McM LLAN, PETERSEN, SCOTT, SONANDRES, ST FTEL

ASSISTANT RESEARCH PROFESSIONAL
ORLICH

BACHELOR OF ARTS DEGREE

The faculty in the department offer majors in Asian Languages (Chinese/Japanese), French, German, Italian, Russian, and Spanish Each major consists of 45 semester hours, of which 30 must be in one language and 15 in a second language or in closely related fields to be approved by the advisor in consultation with the student. Of the 30 hours required for the major, a minimum of 24 hours must be taken at the 300 or 400 level and must include at least nine hours at the 400 level. Specific required courses for each major area are listed below and in a brochure available in the department See "College Degree Requirements," page 324.

MAJORS

Asian Languages (Chinese/Japanese)

Students majoring in Asian Languages (Chinese Japanese) may select a course of study that focuses on either language

Chinese. The major requires 45 semester hours. At least nine semester hours must be at the 400 level. In addition to the courses shown below, the student must meet with an advisor and choose at least six semester hours of Japanese language or literature courses (JPN), and appropriate courses in art, humanities, social and behavioral science, and business.

Required

CHI	313	Advanced Chinese *G*	3
CHI	314	Advanced Chinese *G*	3
CHI	321	Chinese Literature *LI/HU*	3
CHI	322	Chinese Literature *LI/HU G* or FLA 420 Foreign Literature in Translation *HU G* 3)	3
CHI	413	Introduction to Classical Chinese *HU*	3
CHI	414	Introduction to Class cal Chinese *HU*	3
Total			18

Electives

Choose six semester hours from the courses below 6

CHI	309	Chinese Conversation 2)
CHI	310	Chinese Conversation 2)
CHI	311	Chinese Conversation 2)
CHI	312	Chinese Conversation 2
CHI	494 ST	Special Topics* 1–4
CHI	499	Individualized Instruction* (1 3)

Total 6

Recommended

Choose six semester hours from the courses below 6

CHI	101	Elementary Chinese (5
CHI	102	Elementary Chinese (5
CHI	201	Intermediate Chinese *G* 5
CHI	202	Intermediate Chinese *G* (5)
CHI	205	Chinese Calligraphy 1)

* See the *Schedule of Classes* for course titles.

Japanese. The major requires 45 semester hours. At least nine semester hours must be taken from JPN 321, 414 and FLA 421. No more than eight semester hours may be selected from JPN 309, 310, 311, 312.

Required

FLA	421	Japanese Literature in Translation *L2/HU, G*	3
JPN	313	Advanced Japanese *G*	3
JPN	314	Advanced Japanese *G*	3
JPN	321	Japanese Literature[1] *L2/HU G*	3
JPN	414	Introduction to Classical Japanese	3
Total			15

Electives

Choose six semester hours from the courses below 6

JPN	309	Intermediate Japanese Conversation (2)
JPN	310	Intermediate Japanese Conversation 2)
JPN	311	Japanese Conversation and Composition *G* (3
JPN	312	Japanese Conversation and Composition *G* 3)
JPN	494	ST: Special Topics[2] 1–4
JPN	499	Individualized Instruction (1 3)

Total 6

Recommended

Choose six semester hours from the courses below 6

JPN	101	Elementary Japanese 5)
JPN	102	Elementary Japanese 5)
JPN	201	Intermediate Japanese *G* 5
JPN	202	Intermediate Japanese *G* (5
JPN	206	Calligraphy 1)

[1] May be repeated for credit

[2] See the *Schedule of Classes* for course titles

In addition to the courses, the student must meet with an advisor and choose at least six semester hours of Chinese language or literature courses (CHI), and appropriate courses in art, humanities, social and behavioral science, and business courses.

French

Required

FRE	311	French Conversation *G*	3
FRE	312	French Composition *G*	3
FRE	321	French Literature *L2/HU, H*	3
FRE	322	French Literature *L2/HU*	3
French 200 level courses			6
Total			18

Select 12 semester hours from the following list including at least nine semester hours from the 400 level:

FRE	315	French Phonetics.	3
FRE	319	Business Correspondence and Communication *G*	3
FRE	411	Advanced Spoken French *G*	3
FRE	412	Advanced Written French *G*	3
FRE	415	French Civilization I *HU*	3
FRE	416	French Civilization II *HU, G*	3
FRE	422	Applied French Linguistics.	3
FRE	423	French Syntax	3
FRE	441	French Literature of the 17th Century *HU*	3
FRE	442	French Literature of the 17th Century *HU, H*	3
FRE	445	French Literature of the 18th Century *L2/HU*	3
FRE	451	French Poetry of the 19th Century	3
FRE	452	French Novel of the 19th Century *HU*	3
FRE	453	Theater of the 19th Century *L2/HU*	3
FRE	461	Preatomic Literature *HU*	3
FRE	462	Postatomic Literature *HU*	3
FRE	471	The Literature of Francophone Africa and the Caribbean *L2/HU*	3
FRE	472	Franco Canadian Civilization	3
FRE	494	ST. Special Topics	1–4
FRE	499	Individualized Instruction	1–3

In addition to the courses, the student must meet with an advisor and choose at least 15 semester hours of courses from appropriate social and behavioral science, humanities, business courses, and other language courses.

German

Required

GER	311	German Conversation *G*	3
		or GER 312 German Conversation *G* (3	
GER	313	German Composition *G*	3
GER	411	Advanced Grammar and Conversation *G*	3
GER	412	Advanced Grammar and Conversation *G*	3
GER	421	German Literature *HU*	3
GER	422	German Literature *L2/HU*	3
Choose six semester hours from the courses below			6
	GER	415 German Civilization *HU, H* (3)	
	GER	416 German Civilization *HU, H* (3)	
	GER	445 German Literature Enlightenment to Classicism 3	
	GER	451 German Literature Biedermeier to Naturalism 3)	
	GER	494 ST Special Topics (1–4	
German 200 level courses			6
Total			30

Electives

Choose six semester hours from the courses below			6
	GER	303 Scientific German 3	
	GER	304 Scientific German 3	
	GER	314 Introduction to German Literature 3)	
	GER	319 Business Correspondence and Communication *G* 3	
	GER	394 ST: Special Topics (1–4	
	GER	494 ST: Special Topics 1–4	
Total			6

In addition to the courses, the student must meet with an advisor and choose at least 15 semester hours of courses from appropriate social and behavioral science, humanities, business courses, and other language courses

Italian

Required

ITA	311	Italian Composition and Conversation *G*	3
ITA	312	Italian Composition and Conversat on *G*	3
ITA	325	Introduction to Ital an Literature *HU*	3
Italian 200 level courses			6
Total			15

Fifteen semester hours are required from the following list including at least nine semester hours from the 400 level.

ITA	314	Advanced Italian *G*	3
ITA	394	ST Special Topics	1–4
ITA	415	Italian Civilization *L2/HU G*	3
ITA	420	Italian Cinema	3
ITA	430	Italian Literature of the Middle Ages *HU*	3
ITA	441	Dante: *Divina Commedia L2/HU*	3
ITA	443	Italian Literature of the Renaissance *HU, H*	3
ITA	446	Italian Literature of the 18th and 9th Centuries *HU*	3
ITA	449	20th Century Italian Literature *HU, G*	3
ITA	494	ST Special Topics	1–4
ITA	499	Individualized Instruction	1–3

In addition to the courses shown above, the student must meet with an advisor and choose at least 15 semester hours of courses from appropriate social and behavioral science, humanities, business courses, and other language courses

Russian

Required

RUS	2	Basic Russian Conversation *G*	3
RUS	2 2	Basic Russian Conversation *G*	3
RUS	311	Russian Composition and Conversation *G*	3
RUS	312	Russian Composition and Conversation *G*	3
RUS	411	Advanced Composition and Conversation I *G*	3
		or RUS 412 Advanced Composition and Conversation II *G* (3	
Total			15

NOTE: For the General Studies requirement courses and codes (such as L1 N3, C and H), see "General Studies" page 85 For graduation requirements see "University Graduation Requirements" page 81 For an explanation of additional common business courses offered but not listed in this catalog, see "Classification of Courses," page 58

Fifteen semester hours are required from the following list including at least six semester hours from the 400 level:

RUS 303 Scientific Russian . . . 3
RUS 304 Scientific Russian . . . 3
RUS 321 Survey of Russian Literature *L2/HU, H* . . . 3
RUS 322 Survey of Russian Literature *L2/HU* 3
RUS 323 Survey of Literature of the Soviet Era *L2/HU, G* . . . 3
RUS 411 Advanced Composition and Conversation I *G* . . . 3
RUS 412 Advanced Composition and Conversation II *G* . 3
RUS 417 Applied Russian Phonetics . . . 2
RUS 420 Russian Poetry *L2/HU* 3
RUS 421 Pushkin *L2/HU* . . . 3
RUS 423 Dostoyevsky *L2/HU* . . . 3
RUS 424 Tolstoy *L2/HU* . . . 3
RUS 425 Chekhov *L2/HU* . . . 3
RUS 426 Literatures of the Nationalities of the Former Soviet Union *L2/HU, G* . . . 3
RUS 430 Russian Short Story *L2 HU* . . . 3
RUS 440 History of the Russian Language . . . 3
RUS 441 Survey of Russian Culture *L2/HU, G, H* . . . 3
RUS 494 ST: Special Topics . . . 1–4
RUS 499 Individualized Instruction . . . 1 3

In addition to the courses shown above, the student must meet with an advisor and choose at least 15 semester hours of courses from appropriate social and behavioral science, humanities, business courses, and other language courses.

Spanish

Required

SPA 313 Spanish Conversation and Composition *G* . . . 3
or SPA 315 Spanish Conversation and Composition for Bilinguals 3)
SPA 314 Spanish Conversation and Composition *G* . . . 3
or SPA 316 Spanish Conversation and Composition for Bilinguals 3)
SPA 325 Introduction to Hispanic Literature *HU* . . . 3
SPA 412 Advanced Conversation and Composition *G* . . 3
SPA 425 Spanish Literature *HU* . . . 3
Choose two courses below . 6
SPA 426 Spanish Literature *HU* (3
SPA 427 Spanish American Literature *L2* (3)
SPA 428 Spanish American Literature *L2 G* 3)
Choose one course below . . . 3
SPA 471 Civilization of the Spanish Southwest *HU* (3
SPA 472 Spanish American Civilization *HU, G H* (3)
SPA 473 Spanish Civilization *HU/SB G* (3)

Total . . . 24

Electives

Spanish courses in upper division 300–400 level) . . . 6

Total 6

Related Fields

POR 101 Elementary Portuguese . . . 5
POR 201 Intermediate Portuguese *G* . . . 5

Total . . . 10

In addition to these courses, the student must meet with an advisor and choose at least six semester hours of courses from appropriate social and behavioral science, humanities, business courses, and other language courses.

MINORS

Each minor in Asian Languages (Chinese/Japanese), French, German, Italian, and Russian consists of 18 hours, of which 12 hours must be in the upper division. In addition, specific required courses for each area follow and are in a brochure in the department.

Chinese

CHI 313 Advanced Chinese *G* . . . 3
CHI 314 Advanced Chinese *G* . . . 3

Consult with an advisor for other courses.

French

FRE 311 French Conversation *G* . . . 3
FRE 312 French Composition *G* . . . 3
FRE 321 French Literature *L2/HU H* . . . 3
FRE 322 French Literature *L2/HU* . . . 3

Twelve hours must be at the 300 level or above.

German

GER 311 German Conversation *G* . . . 3
or GER 312 German Conversation *G* (3
GER 313 German Composition *G* . . . 3
One 400 level German course . . . 3
Upper division German course . . . 3

Consultation with an advisor is recommended.

Italian

ITA 311 Italian Composition and Conversation. . . . 3
or ITA 312 Italian Composition and Conversation (3
ITA 325 Introduction to Italian Literature . . . 3
One 400 level ITA course . . . 3

Students are encouraged to meet with a department advisor.

Japanese

JPN 313 Advanced Japanese *G* . . . 3
JPN 314 Advanced Japanese *G* . . . 3

Consult with an advisor for other courses.

Russian

RUS 303 Scientific Russian . . . 3
RUS 304 Scientific Russian . . . 3
RUS 311 Russian Composition and Conversation *G* . . . 3
RUS 312 Russian Composition and Conversation *G* . . . 3
RUS 411 Advanced Composition and Conversation I *G* . . . 3
RUS 412 Advanced Composition and Conversation II *G* . . 3
RUS 420 Russian Poetry *L2/HU* . . . 3

Students must complete two years of language or equivalent.

NOTE: For the General Studies requirement courses and codes (such as L1, N3 C, and H) see "General Studies" page 85 For graduation requirements, see University Graduation Requirements" page 81 For an explanation of additional omnibus courses offered but not listed in this catalog, see Classification of Courses page 58

Spanish—Non-Teaching Minor

The non-teaching minor in Spanish requires a minimum of 18 upper-division semester hours. The required courses are as follows:

SPA 313 Spanish Conversation and Composition *G* . . . 3
or SPA 315 Spanish Conversation and Composition for Bilinguals (3)
SPA 314 Spanish Conversation and Composition *G* 3
or SPA 316 Spanish Conversation and Composition for Bilinguals (3
SPA 325 Introduction to Hispanic Literature *HU* 3
SPA 413 Advanced Spanish Grammar *G* 3
SPA 471 Civilization of Spanish Southwest *HU* 3
or SPA 472 Spanish American Civilization *HU, G, H* 3)
or SPA 473 Spanish Civilization *HU/SB, G* (3

Students are required to meet with a departmental advisor.

CERTIFICATES AND EMPHASES

The following are certificate programs or emphases offered in the Department of Languages and Literatures. For more information, see "Certificate Programs and Areas of Emphasis," page 331.

Asian Studies Certificate. Foreign language students majoring in Asian Languages (Chinese/Japanese) may elect to pursue an Asian Studies certificate combining courses from the major with selected outside courses of wholly Asian content.

Latin American Studies Certificate. Foreign language students majoring in Spanish may elect to pursue a Latin American Studies certificate combining courses from the major with selected outside courses of wholly Latin American content.

Russian and East European Studies. Any undergraduate major can earn a Certificate in Russian and East European Studies by successfully completing one of the options mentioned in the section on "Russian and East European Studies," page 332.

Scandinavian Studies. Any undergraduate major can earn a certificate in Scandinavian Studies.

Southeast Asian Studies Certificate. To earn a certificate in Southeast Asian Studies, a student must complete a minimum of 40 semester hours of course work related to Southeast Asia, including two years (20 semester hours) of a Southeast Asian language.

SECONDARY EDUCATION—B.A.E.

Chinese, French, German, Japanese, Russian, and Spanish. Each of the major teaching fields in Chinese, French, German, Japanese, Russian, and Spanish consists of 45 semester hours, of which 30 must be in one language and 15 in a second language or in closely related fields to be approved by the advisor in consultation with the student. Of the 30 hours required for the academic specialization, a minimum of 24 hours must be taken at the 300 or 400 level and must include at least nine hours at the 400 level. Specific required courses for each major area are listed in curriculum check sheets of the individual language areas and are available in the department

The minor teaching field consists of a minimum of 24 semester hours in one foreign language, of which at least 18 hours must be taken at the 300 or 400 level. See individual language area curriculum check sheets for required courses in each minor area.

Spanish—Teaching Minor

The teaching minor in Spanish requires a minimum of 24 upper division semester hours The required courses are as follows:

SPA 313 Spanish Conversation and Composition *G* 3
or SPA 315 Spanish Conversation and Composition for Bilinguals 3)
SPA 314 Spanish Conversation and Composition *G* 3
or SPA 316 Spanish Conversation and Composition for B linguals 3
SPA 325 Introduction to Hispanic Literature *HU* 3
SPA 412 Advanced Conversation and Composition *G* 3
SPA 413 Advanced Spanish Grammar *G* . 3
SPA 420 Applied Spanish Linguistics *L2* 3
check with advisor)
FLA 480 Methods of Teaching Foreign Languages* 3

* Prerequisite is SPA 412

Students are required to meet with departmental advisor.

GRADUATE PROGRAMS

The faculty in the Department of Languages and Literatures offer programs leading to the M.A. degree in French, German, and Spanish and the Ph D degree in Spanish. Consult the *Graduate Catalog* for requirements.

FOREIGN LANGUAGES FOR INTERNATIONAL PROFESSIONS

The sequence of two semesters, listed under numbers 107 and 207 in two languages French and Spanish), integrates an accelerated study, a functional approach to course design, and preparation for international professions (e.g , business, diplomacy, international political economy). It is parallel to the traditional sequence of 101 through 202 and also satisfies the college's foreign language requirement. The sequence differs from traditional basic language programs in that all aspects of the language vocabulary, grammar, and skill development are practiced within the context of authentic communication for social and professional purposes in the target culture. Classes meet eight hours weekly, for eight semester hours in each of two semesters.

Students who have had success in learning one foreign language are encouraged to join this program in a second language. Students should contact the Department of Languages and Literatures before registration.

CERTIFICATE PROGRAM IN TRANSLATION

The Certificate Program in Translation is designed to provide the advanced training required for professional translation in both public and private sectors, preparation for the rigorous examinations required by national and international agencies, and training as an ancillary skill for professional fields, such as international business, public health and medicine, and law, in accordance with guidelines recommended by the American Translators' Association. The certificate is a nondegree program consisting of 12 semester

hours of course work and two hours of in service practicum primarily into the receptor language of English from the source language of Spanish. It may be taken simultaneously with course work leading to an undergraduate or graduate degree, as a related area sequence, or as the sole program of study for members of the community who meet the admis sion requirements of the certificate program and are enrolled in the university. A complete brochure is available at the Department of Languages and Literatures, LL B404.

While the certificate program is not yet available in French, FRE translation courses may be available. See the *Schedule of Classes* for course offerings.

Admission Requirements. Since entrance to professional translation is through work, cultural experience, and exami nation, the two entrance requirements to this certificate pro gram are (1) written proficiency examination in the source and the receptor languages at the level of completion of the fourth year or most advanced composition course in Span ish, which at ASU is SPA 412 and (2) either an academic year at a university in a Spanish speaking country, an exten sive work experience using Spanish, or demonstrated bilin gual facility, both written and oral, in English and Spanish.

Certificate Requirements. The certificate program consists of the following requirements:

Prerequisites

FLA	400	Linguistics *SB* . . . . . 3 or SPA 494 ST: Introduction to Hispanic Linguistics (3) or equivalent	
SPA	413	Advanced Spanish Grammar *G* .	3
SPA	494	ST Lexicography	3

Required

FLA	401	Translation Theory and Practice	3

In-Service Practicum

FLA	484	Internship	2

Also required are nine hours of applied translation elec tives in specialized areas chosen from the following courses

FLA	481	Technical and Scientific Translation	3
FLA	482	Business and Financial Translation	3
FLA	483	Medical and Legal Translation .	3
FLA	485	Problems of Literary Translation	3

FOREIGN LANGUAGE REQUIREMENT

The College of Liberal Arts and Sciences requires knowl edge of one foreign language equivalent to the completion of two years' study at the college level This normally includes a sequence of courses numbered 101 and 102 and 201 and 202 *or* 107 and 207. For important exceptions in Greek, Latin, and Portuguese, see the statement at the head of respective course descriptions.

FOREIGN LANGUAGE PLACEMENT

Students who transfer from other postsecondary institu tions with foreign language credits below the 202 level are placed in a course at the level directly above the work com pleted.

Students who have completed their secondary education at a school in which the language of instruction was not English are considered to have satisfied the foreign lan guage requirement. Certification of this status is made at the time of admission to ASU. Questions should be addressed to the foreign credentials evaluator at Undergraduate Admis sions

The foreign language requirement can be met in lan guages not taught at ASU either by transferring credit from another institution or by passing a proficiency examination. When possible, the Department of Languages and Litera tures recommends to the college an appropriate source for such examinations and proctors them. Grading is done by the institution that provides the examination, and the student pays any costs incurred. The examination can be used only to demonstrate proficiency; it does not produce semester hours of credit.

Students desiring placement above the 101 level course in French, German, or Spanish should take the placement exam for that language in the Computer Language Labora tory, LL A33.

Ordinarily, no placement or proficiency examination is administered to students who wish to continue studying lan guages for which high school credits have been earned. Stu dents should be guided by the following principles of equivalency

1. One unit (one academic year) of high school level study is considered, for placement purposes only, to equal one semester of study of the same language at the university level. Thus, students with one year of high school study would enroll in the second semester course (102); stu dents with two years of high school study, in the third semester course (201 , and so on
2. Students who feel that their high school language prep aration was inadequate may choose to place themselves on a lower level, but not lower than 111 with two or three years of high school study and 201 with four years of high school study.

Students with prior knowledge of a language may meet the college foreign language requirement in any one of the following ways:

1. by satisfactory results in a nonrepeatable college approved proficiency examination;
2. by achieving a grade of at least "C" in the last course of the required sequence; or
3. by achieving a grade of at least "C" in a course at the next higher level

Students are expected to follow the progressive sequence of 100, 200, and 300. Once a grade of "C" or higher is earned in a 300 level class in a language, students may not earn lower division credit in that language.

First year foreign language courses taught by the Depart ment of Languages and Literatures are not open to students who have spent one or more years in a country where that language is the predominant language. Individual language areas may have different policies. Students with questions about this policy should check with the appropriate lan guage coordinator in the department.

If transfer students are uncertain about course equivalen cies, they should contact the Department of Languages and Literatures.

LANGUAGE LABORATORY REQUIREMENT

All students enrolled in 101, 102, 201, and 202 language courses are expected to spend a minimum of one hour per

week in the language laboratory or in other assigned audio lingual tape exercises in addition to the regular class periods.

FOREIGN LANGUAGES (FLA)

FLA 150 Introduction to East Asian Culture. 3 S
An ntroduct on to the cu tures of Ch na Japan, and Korea *Genera Studies HU, G*

FLA 323 Survey of Literature of the Soviet Era in Translation. (3) F S
Survey ma n terary movements prom nent authors most s'gn f cant works of prose, poetry and drama of the S viet per od, 1917 1991 *Genera Stud es' L2/HU G*

FLA 400 Linguistics. (3) S
ntroduction to the analys s of anguage and ts use n socia contexts Top cs. morpho ogy phono ogy pragmat cs semant cs syntax and var at on Open to jun ors w th nstructor approval *General Studies SB.*

FLA 401 Translation Theory and Practice. 3) N
Trans at on theor es and profess ona pract ces and eth cs, bib 'ogra phy, computer techno ogy and samp e texts for natura and soc al sc ences and human t es Prerequ s te 4th year compos t on or nstructor approva in respect ve language area

FLA 415 Bilingualism and Languages in Contact. (3) F
Ana ys s of ngu st c aspects of b ngua sm e.g , p dg ns and creoles, code switching and other contact phenomena s mu taneous sequen t a b ingua language acqu s t on Prerequ s te FLA 400 (or equ va ent) or instructor approva .

FLA 420 Foreign Literature in Translation. (3 F S
Top cs may be chosen from the fo ow ng·
a) Braz an
b Ch nese
(c French
(d) German
(e) Greek
(f) Ital an
(g) Lat n
(h) Portuguese
( ) Russ an
(j) Sov et
(k) Span sh
) Span sh American
Not for anguage majors except n As an anguages and Russ an) open to anguage ma ors as a re ated area course Graduate students by perm ss on *Genera Stud es HU G*

FLA 421 Japanese Literature in Translation. (3 F S
Read ngs se ected by theme or genre or per od from var ous works of Japanese iterature n Eng sh trans at on May be repeated as top c changes. Graduate students by perm ss on Prerequ s te a course that sat sf es the L1 genera stud es requ rement. *General Stud es. L2/ HU G*

FLA 480 Methods of Teaching Foreign Languages. 3 F
Teach ng fore gn anguages and teratures at secondary and co ege eve s Th s course does not meet the L bera Arts and Sc ences gen era stud es requ rement for human t es and f ne arts Required for adm ss on to SED 478 Prerequis te: 12 hours of upper d vision courses n 1 fore gn anguage

FLA 481 Technical and Scientific Translation. (3 N
Resources, pract ces, strateg es and exicon for trans at on of profes s ona texts n subjects such as engineer ng, architecture, agr cu ture computer techno ogy e ectron cs, and phys ca and b o og ca sc ences. Prerequ s te FLA 401

FLA 482 Business and Financial Translation. (3 N
Resources pract ces strateg es, and ex con for translat on of profes s ona texts n subjects such as econom cs, f nance, nsurance man agement marketing account ng advert s ng and rea estate Prerequ s te FLA 401

FLA 483 Medical and Legal Translation. 3) N
Resources and strateg es for trans at on of professiona texts in sub jects such as med c ne nurs ng, pub ic hea th cr m nal just ce, and nternat ona aw. May be repeated for a tota of 6 semeste hours Pre requ s te FLA 401

FLA 484 Internship. 1 12 N

FLA 485 Problems of Literary Translation. 3 N
Theory and pract ce w th emphas s on appl cat on through ind v dua trans at on projects May be repeated for a tota of 6 semester hours Prerequ s te FLA 401 or nstructor approva n the respect ve an guage area

FLA 494 ST: Special Topics. (3) F
Major trends of Ita an c nema from the post war period to the present

FLA 515 Second Language Acquisition. 3 S
D scuss on and app cat on of theor es of second anguage acqu s t on Prerequ's te. FLA 400 or equ va ent

FLA 525 Trends and Issues in Foreign Language Teaching. (3) N
Advanced methods sem nar, des gned for exper enced teachers

ARABIC (ARB)

ARB 101 Elementary Arabic. 4) F
Read ng writ ng speak ng, and understand ng bas c Arab c 4 hours ecture 1 hour ab

ARB 102 Elementary Arabic. 4 S
Read ng wr t ng speak ng and understand ng basic Arab c 4 hours ecture, 1 hour ab Prerequ s te ARB 101 or equ valent

ARB 201 Intermediate Arabic. (4 F
Rev ew of Arab c grammar w th emphas s on the deve opment of the ski s of sten ng comprehens on reading speak ng, and wr t ng. 4 hours ecture, 1 hour lab Prerequ s te. ARB 102 or equ va ent *Gen era Stud es G*

ARB 202 Intermed ate Arabic. 4 S
Rev ew of Arab c grammar w th emphas s on the deve opment of the sk ls of l sten ng comprehens on read ng speak ng and wr t ng 4 hours lecture 1 hour ab Prerequ s te ARB 201 or equ valent *Gen era Stud es G.*

CHINESE (CHI)

CHI 101 Elementary Ch nese. (5 F
Pronunc ation grammar e ementary conversat on and deve opment of bas c read ng and wr t ng sk s Standard d a ect 5 c ass hours

CHI 102 Elementary Chinese. 5) S
See CHI 101 Prerequ s te CH 101 or equ va ent

CHI 107 Chinese for International Professions I. 10) F
Acce erated program a ternative to CHI 101 102 sequence Func tional approach to needs of nternat ona profess ons 10 class hours

CHI 201 Intermediate Chinese. 5 F
Systemat c rev ew of grammar Deve opment of vocabu ary through read ng and wr t ng Dr n aura oral sk s 5 class hours. Prerequi s te CH 102 or equ valent *Genera Stud es. G*

CHI 202 Intermediate Chinese. 5 S
See CH 201 Prerequ s te CH 201 r eq va ent *Genera Studies G.*

CHI 205 Chinese Calligraphy. (1 F S
An nt oduction t sty es and techn ques of Ch nese writing Know edge of Ch nese or Japanese s not requ red

CHI 207 Chinese for International Professions II. (10) S
Cont nuat on of CHI 107, a ternat ve to CH 201, 202 sequence Expans on of commun cat ve prof c ency n spec fic areas of nterna tiona profess ons 10 c ass hours Prerequ s te. CH 107 or nstructor approval. *General Stud es G*

CHI 309 Chinese Conversation. 2) F
Aural ora dr s us ng contemporary st r es art cles and essays. For students w th ower eve prof ciency Prerequ s te CH 202

CHI 310 Chinese Conversation. (2 S
See CH 309 Prerequ s te CH 202

NOTE: For the Ge era Stud es requ rement courses and codes (such as L1, N3 C and H , see Genera Stud e page 85 F r graduat on requ rements see Un vers ty Graduat'on Requ rements ' page 81. For an exp anat on of add t ona omn bus courses offered but not isted n th s cata og see 'C ass f cat on of C urses page 58

CHI 311 Chinese Conversat on. (2) F
ntens ve aura ora pract ce n Modern Ch nese For students who have ved n Ch na or a Ch nese-speak ng env ronment D scuss on dr Prereq s te. CHI 202

CHI 312 Chinese Conversat on. (2) S
See CH 311 D scuss on, dr Prerequ s te CH 202

CHI 313 Advanced Chinese. 3 F
The modern anguage n genera or spec f c areas depend ng on the student s needs or nterests 3 hours ecture arranged ab Prerequ s'te· CH 202 or equ va ent *Genera Stud es· G*

CHI 314 Advanced Chinese. 3 S
Cont nuat on of CH 313 Prerequ s te CH 313 *General Stud es G*

CHI 321 Chinese Literature. 3) F
Masterworks of the trad t on from the 6th century B.C.E through the 13th century Read ngs ectures and exam nat s are n Eng sh *Genera Stud es L1 HU*

CHI 322 Chinese Literature. 3 S
Masterp eces from the later trad t on and its trans t on to modern t mes Read ngs, ectures and exam nat ons are n Eng sh *Genera Stud es L1 HU G*

CHI 413 Introduction to Classical Ch nese. 3 F
Read ng n var ous genres of pre 20th century terature (wen yen) w th ana ys s of the structure of the class ca wr t ngs Prerequ s te CH 314 or nstructor approva *Genera Stud es HU*

CHI 414 Introduction to Classical Chinese. 3) S
Cont nuat on of CH 413 Prerequ s te· CH 413 *General Stud es. HU.*

CHI 494 ST: Special Topics. 1–4 N

CHI 499 Individualized Instruction. 1 3 N

CHI 500 Bibliography and Research Methods. 3) N
ntroduct on to research mater a s on Ch na in Ch nese, Japanese, and Western anguages Overv ew of research methods Lecture, d s cuss on

CHI 514 Advanced Classical Chinese. (3) N
C ose read ngs n se ected premodern texts w th focus on spec a grammat ca featu es, and ncreased vocabu ary Lecture d scuss on.

CHI 520 Teaching of Chinese as a Second Language. 3 N
Theory and pract ce of teach ng Ch nese nc uding presentat on, inter act on a d eva uat n with cons derat on g ven to cu tura factors. Lecture d scuss on

CHI 535 Advanced Read ngs. (3) N
Read ngs in pr mary and secondary sources n h story art, re g ous stud es econom cs or other f e ds Lecture d scuss on

CHI 543 Chinese Language and Linguistics. 3) F
Ana ys s and d scuss on, w th n the framework of ngu st c theory of se ected prob ems in Ch nese phonet cs m rpho ogy and syntax Lecture d scuss on.

CHI 585 Problems of Translation. 3 N
Theor es and pract ce of trans at on. strateg es for hand ng a variety of Ch nese texts Lecture d scuss on

CHI 591 Seminar. 3) N
Top cs n terary ngu st c or cultura stud es.

FRENCH (FRE)

FRE 101 Elementary French. 4 F S SS
ntens ve aura ora dr n c ass and laboratory· bas c grammar sup plemented by s mp e prose read ngs 4 hours ecture 1 hour ab Not open to students w th cred t n FRE 111

FRE 102 Elementary French. 4 F, S SS
See FRE 101 Prerequ s te FRE 101 or equ va ent

FRE 107 French for International Profess'ons I. (8) F
Acce erated a ternat ve to FRE 101, 102 Functiona approach Emphas s on speak ng understand ng wr t'ng and read ng for com mun cat ve competence for nternationa profess ons

FRE 111 Fundamentals of French. (4) F S
Pr mar y for students w th two years of h gh schoo French who need rev ew to enter second year study Not open to students w th cred t n FRE 101 or 102 4 hours ecture 1 hour ab.

FRE 201 Intermediate French I. (4 F S, SS
Grammar rev ew w th emphas s on deve opment of sk s of speak ng read ng wr ting and sten ng comprehens on F ur hours ecture 1 hour ab Prerequ s te FRE 102 or 111 or equ va ent *Genera Stud es G*

FRE 202 Intermediate French II. (4 F S, SS
Continuat on of grammar rev ew w th emphas s on deve opment of sk ls n speak ng, read ng wr t ng and sten ng comprehens on 4 hours lecture 1 hour lab Prerequ s te FRE 201 or equ va ent *Gen era Stud es. G*

FRE 205 Readings in French Literature. 3 F, S SS
Des gned to teach read ng w th fac ty and comprehens on Vocabu ary bu ding and textua ana ys s of terary genres are major ele ments Prerequ s te FRE 202 or equ va ent *Genera Stud es G.*

FRE 207 French for International Professions II. (8) S
Cont nuat'on of FRE 107 a ternat ve to FRE 201 202 sequence Expans on of commun cat ve prof c ency n spec f c areas of nterna- t ona profess ons Prerequ s te FRE 107 or nstructor approva *Gen era Stud es· G*

FRE 311 French Conversation. 3 F S
Further pract ce n speak ng French emphas z ng current usage and promot ng fac ty n the express on f deas. Prerequ s te· 8 hours of 200 eve French or equ va ent *General Stud es. G.*

FRE 312 French Composition. 3 F S
Further pract ce in wr ting French emphas z ng current usage and promot ng fac 'ty n the express on of deas Prerequ s te 8 hours of 200 eve French or equ va ent *Genera Stud es G*

FRE 315 French Phonetics. (3 F
Pract ce and theory of French pronunciat on Emphas s on standard French a though an overv ew of reg ona var et es is offered Lecture and ab Prerequ site FRE 311 or equ va ent

FRE 319 Business Correspondence and Communication. (3) S
Organ zat on and presentat on of c ear effective bus ness communica- tions, vocabulary app cab e to modern bus ness usage. Prerequisite FRE 312 or nstructor approva *General Stud es G*

FRE 321 French Literature. (3) F S
Representat ve masterp eces and s gn f cant movements of French l t erature of the m dd e ages through the 18th century Prerequis te FRE 205 or equ va ent *Genera Stud es. L2/HU H*

FRE 322 French Literature. 3 F S
L terature of the 19th and 20th centur es Prerequisite. FRE 205 or equ va ent. *Genera Stud es. L2/HU.*

FRE 411 Advanced Spoken French. (3) F, S
mprovement of spoken French Prerequ s tes 9 hours of 300 eve French, nclud ng FRE 311 *or* equ valents. *Genera Stud es G*

FRE 412 Advanced Written French. (3) F, S
mprovement of composit on sk ls. Prerequ s tes. 9 hours of 300- eve French, inc ud ng FRE 312 *or* equ va ents *Genera Stud es G*

FRE 415 French Civilization I. 3) F
Po t ca nte ectua soc al, econom c and art st c deve opment of France from ts or g ns to the end of the 17th century Prerequ s te 6 hours of upper d v s on French *Genera Stud es HU*

FRE 416 French Civilization II. 3) S
Po it ca nte ectua soc a , econom c and art st c deve opment of France from the 18th century to present Prerequ s te. 6 hours of upper d v s on French *Genera Stud es HU G*

FRE 421 Structure of French. 3) F
Phono ogy morpho ogy syntax semant cs, and variet es of French Prerequisites· FRE 311 and 312 *or* nstructor approva

FRE 422 Applied French Lingu stics. 3 S
App cation of nguist c theory and second language acqu s t on the- ory to teach'ng of French. Prerequ s te. ASB 480 or ENG 213 or FLA 400

FRE 423 French Syntax. (3 F
The ana ys s of French syntact c structure by contemporary theoret ca mode s Prerequ s te ASB 480 or ENG 213 or FLA 400

FRE 424 French Phonology. 3) S
ntroduct on to phono og ca theory and ts app cat on to French Pre- requis tes FRE 311 and 312 *or* nstructor approva

FRE 441 French L'terature of the 17th Century. (3 N
From 1600 to 1660. Prerequ s te· 9 hours of 300 evel French inc ud ng FRE 321 *or* nstructor approva *Genera Stud es HU*

FRE 442 French Literature of the 17th Century. 3) N
From 1660 to 1700 Prerequ s te 9 hours of 300 leve French nclud ng FRE 321 *or* nstructor approva *General Stud es HU H*

FRE 445 French Literature of the 18th Century. 3 N
Contr but ons of the ph osophers and the deve opment of the novel and drama Prerequis te· 9 hours of 300 evel French, inc ud ng FRE 321 *or* nstructor approva *Genera Stud es L2/HU*

FRE 451 French Poetry of the 19th Century. 3 N
From Romant c sm to Parnassian poetry t Symbo sm Prerequ s te 9 hours of 300 evel French, nc ud ng FRE 322 *or* nstructor approva

FRE 452 French Novel of the 19th Century. (3) N
From Constant Hugo Ba zac Stendha , and Sand to F aubert and Zo a w th emphas s on major terary movements Prerequ s te· 9 hours of 300- eve French, nc ud ng FRE 322 *or* nstructor approva *General Stud es. HU.*

FRE 453 Theater of the 19th Century. 3 N
From Romant c drama to the Symbo st Theater Representat ve p ays of Hugo, Musset V gny, Dumas, Becque Rostand Feydeau and M r beau. Prerequ s te 9 hours of 300 eve French nc ud ng FRE 322 *or* nstructor approva *General Stud es L2/HU*

FRE 461 Preatomic Literature. 3) F
Representat ve authors from Proust and Ma raux to Sartre from 1900 to 1945. Prerequ s te 9 hours of 300 eve French nc ud ng FRE 322 *or* nstructor approva *Genera Stud es HU*

FRE 462 Postatomic Literature. (3) S
Representat've authors nc ud ng Camus Duras, and Robbe-Gr et from 1945 to present Prerequ s te 9 hours of 300- eve French ncluding FRE 322 *or* instructor approva . *Genera Stud es· HU*

FRE 471 The Literature of Francophone Africa and the Caribbean. (3) N
Selected prose, poetry and drama of b ack authors from Afr ca and the Car bbean. Prerequ s te 9 hours of 300- eve French nc ud ng FRE 322 *or* 'nstructor approva *General Stud es L2/HU*

FRE 472 Franco-Canadian Civ lization. 3) S
A study of the c v l zat on of Quebec n part cu ar through 'ts h story anguage, terature mus c and customs Prerequ s te: 9 hours of 300 eve French or nstructor approva

FRE 494 ST: Special Topics. 1–4) N

FRE 499 Individualized Instruction. (1 3) N

FRE 500 Bibliography and Research Methods. 3) F
Requ red of a l graduate students

FRE 510 Explication de Textes. 3) N
Deta ed ana ys s of l terary texts

FRE 515 Intellectual Currents in France, from the Middle Ages to the 18th Century. 3 N
S gn f cant soc a aesthet c, ph osoph c and sc ent f c deas as pre sented by major wr ters of f ction and nonf ct on.

FRE 516 Intellectual Currents in France, from the 19th Century to the 20th Century. 3) N
See FRE 515.

FRE 521 History of the French Language. 3) N
Pr nc pa phonologica morpho og ca , and semant c deve opments of French from Lat n to present w th emphas's on o d and m dd e French. Some fam ar ty w th Lat n is recommended

FRE 531 Medieval French Literature. 3) F
Read ngs n the ep cs ear y drama roman courto s and other repre sentat ve terary genres of the M dd e Ages

FRE 535 French Literature of the 16th Century. (3 S
Read ngs n French Rena ssance l terature w th spec a attent on to the humanist movement and to Rabe a s Monta gne, and the P e ade

FRE 591 Seminar. (3) N
Top cs may be se ected from the fo ow ng.
(a) Advanced Prob ems n French L terature
(b) Balzac
(c) Corne l e, Mo ère, and Rac ne
(d) D derot Volta re and Rousseau
(e) Flaubert
(f) French Existent a ist L terature
(j) French L'terary Cr t c sm
(h) Proust
(Real sm and Natura sm
(j) Romant c sm
(k) Stendha and Zo a

GERMAN (GER)

GER 101 Elementary German. 4 F, S SS
Read ng wr t g speak ng, and understand ng of bas c German, w th emphas s n pronunc at on and grammar 4 hours ecture 1 hour lab Not open to students w th cred t n GER 111.

GER 102 Elementary German. 4 F, S SS
See GER 101 Prerequ s te GER 101 or equ va ent

GER 111 Fundamentals of German. 4) F S
Pr'mar y for students w th two years of high schoo German who need rev ew to enter second year study 4 hours lecture 1 hour ab Not open to students w th cred t n GER 101 or 102.

GER 201 Intermediate German. 4 F S, SS
Intens ve rev'ew of grammar, w th emphas s on the deve opment of the sk s of speak g, sten ng c mprehens on read ng, and wr t ng. 4 hours ecture 1 hour ab Prerequ s te GER 102 or 111 or equ'va ent. *Genera Stud es G*

GER 202 Intermediate German. 4 F, S SS
See GER 201 Prerequ s te GER 201 or equ va ent *Genera Stud es· G*

GER 303 Scientific German. 3 N
Acqu s t on of a spec a zed vocabulary through the read ng of German sc ent f c pub cat ons Prerequ s te GER 202 or equ valent.

GER 304 Scientific German. 3 N
See GER 303 Prerequ s te GER 202 or equ va ent.

GER 311 German Conversation. 3 F
Expans on of d om through ora pract ce dea ng w th contemporary art c es, essays and stories 3 semester hours l m t for majors Pre requ s te GER 202 r equ va ent *Genera Stud es G*

GER 312 German Conversation. (3 S
See GER 311 Prerequ s te GER 202 or equ va ent *General Studies G*

GER 313 German Composition. 3 S
ntens ve pract ce n wr t ng, emphas z ng sty e and grammar Prereq· u s te GER 202 or equ va ent *Genera Stud es. G*

GER 314 Introduct on to German Literature. (3 F
Beg nn ng study of Germa poetry drama the nove and the *Novelle* Prerequ site. GER 202 or equ va ent

GER 319 Business Correspondence and Communication. 3) N
Organ zat on and presentat on of c ear effect ve bus ess communica t ons vocabu ary app cable to modern bus ness usage Prerequis te· GER 313 or instructor approva *General Stud es. G*

GER 394 ST: Special Top cs. (1–4 N

GER 411 Advanced Grammar and Conversation. 3) F
Improvement of d ct on and d om through ntens ve ora rev ew Pre· requ s te GER 311 r 312 or equ va e t *Genera Stud es G*

GER 412 Advanced Grammar and Composition. 3 S
Improvement of wr't ng ab ty Prerequ s te GER 313 or equ va ent *Genera Stud es G.*

GER 415 German Civilization. 3 S
Aspects of po t ca soc a and cu tura fe of the German speaking wor d from the beg nn ng through 1600 Prerequ s te any 300- eve course n German or nstructor approva *Genera Stud es HU H*

GER 416 German C vilization. 3 F
From 1600 through 1945 Prerequ s te any 300- eve course n Ger man or nstructor approva *Genera Stud es. HU, H*

GER 421 German L terature. (3 F
From the beg nn ng to c ass cism Prerequ s te· 6 hours of 300- eve German *General Stud es HU*

GER 422 German Literature. 3 S
From Romant c sm to the present Prerequ s te 6 hours of 300 evel German *Genera Stud es L2/HU.*

GER 445 German Literature: Enlightenment to Classicism. (3 N
Major works of the terary epochs in the century Prerequ s te GER 421 or nstructor approva

GER 451 German Literature: Biedermeier to Naturalism. 3 N
Representat ve works of prose and poetry from 1820 to 1890 Prereq u s te GER 422 or nstructor approval.

NOTE: For the Genera Stud es requ rement courses and codes such as L1 N3 C and H see 'Genera Stud es " page 85. For graduat on requ rements, see ' Un vers ty Graduat on Requ rements ' page 81. For an exp anat on of add t ona omn bus courses offered but not sted n th s cata og see 'C ass f cat on of Courses," page 58

GER 453 German Literary Masterpieces on Film. (3) F S, SS
F lm and iterature n the r correlat on to each other and to cu tura , po it ca , and soc a trends n German-speak ng countr es Special arrangements for graduate students and those w thout a know edge of German. Lecture d scuss on *General Studies HU G H*

GER 461 Contemporary German Literature. (3) S, SS
German wr ters s nce 1945. Prerequ s te GER 422 or nstructor approva .

GER 494 ST: Special Topics. (1–4) N

GER 500 Bibliography and Research Methods. (3) N
Requ red of a graduate students

GER 511 German Stylistics. (3) N
Art of wr t'ng terary German comparat ve styl st cs

GER 521 History of German Language. (3) N
L ngu stic deve opment of German from the ear iest records to the present

GER 523 German Drama. (3) N
Drama of the 19th and 20th centuries

GER 525 German Novel. (3) N
Spec a studies 'n the German nove

GER 527 The *Novelle.* (3) N
Spec al stud es n the German short story.

GER 531 Middle High German Language and Literature. (3) N
Reading and discuss on of spec mens of the Middle H gh German ep cs, romances, and other terary genres.

GER 551 Romanticism. (3) N
Treatment of early and ate Romanticism.

GER 555 Modern German Literature. (3) N
Major works from the per od of Express on sm to 1945

GER 591 Seminar. (3) N
Special top cs are concerned with a f gure theme, or work n German l terature or Germanic studies. Topics may be selected from the fo ow ing:
(a) Faust
(b) German'c Stud es
(c) Goethe
(d) Grass and Böl
(e) Hesse
(f) Kafka
(g) K eist
(h) Sch ler

ANCIENT GREEK (GRK)

To satisfy the foreign language requirement students must take GRK 301 and 302.

GRK 101 Elementary Ancient Greek. (4) F
Ancient Greek grammar and vocabu ary w th an emphas s on develop ng reading sk ls. For begnn ng students on y

GRK 201 Intermediate Ancient Greek. (4) S
Continuat on of GRK 101. ncreased emphas s on reading texts adapted from Ar stophanes Demosthenes and P ato Prerequ s te: GRK 101 or nstructor approva .

GRK 301 Ancient Greek Literature. (3) F
Read ngs n the masterp eces of ancient Greek l terature; advanced grammar. Authors read are changed each year in accordance w th needs of the c ass. May be repeated for cred t. Prerequisite: GRK 201 or instructor approva . *General Studies: HU.*

GRK 302 Ancient Greek Literature. (3) S
Continuation of GRK 301. Prerequ s te GRK 201 or nstructor approva *General Studies HU*

HEBREW (HEB)

HEB 101 Elementary Modern Hebrew. (4) F
Read ng, wrt ng, speaking and understand ng of bas'c modern Hebrew, w th emphasis on pronunc ation and grammar. 4 hours ec ture, 1 hour ab.

HEB 102 Elementary Modern Hebrew. (4) S
Read ng writing speak ng, and understanding of bas c modern Hebrew, w th emphas s on pronunc at on and grammar. 4 hours ec ture, 1 hour ab Prerequisite: HEB 101 or equiva ent

HEB 201 Intermediate Modern Hebrew. (4) F
Intens ve rev ew of grammar w th emphas s on the deve opment of the sk l s of speaking stening comprehension read ng and writ ng. 4 hours ecture 1 hour ab. Prerequ s te HEB 102 or equ valent. *General Studies G.*

HEB 202 Intermediate Modern Hebrew. (4) S
Intens ve rev ew of grammar with emphasis on the deve opment of the ski s of speak ng, l sten ng comprehens on read ng, and wrt ng 4 hours ecture, 1 hour ab Prerequ s te HEB 201 or equ va ent. *Gen eral Stud es G*

HEB 313 Advanced Modern Hebrew. (4) F
Cont nued deve opment of ab ity to commun cate ora y and in wr ting Reading of se ected iterary works Prerequ'site: HEB 202 or equ va- lent

HEB 314 Advanced Modern Hebrew. (4) S
Cont nued development of ab ty to commun cate ora ly and in wr ting Read ng of se ected terary works Prerequ site HEB 313 or equ va- lent

HEB 375 Contemporary Culture of Israel. (3) F S
ntense study of aspects of histor ca soc al, po it ca and cu tura modern fe n Israe Beg nn ng of Z on sm to present day Lecture dis cuss on *General Studies: HU G.*

INDONESIAN (IDN)

IDN 101 Elementary Indonesian I. (5) F
Bas c commun cat on, read ng and writ ng sk s ntens ve oral/aural classroom dr l supplemented by prose read ng 4 hours lecture 1 hour ab.

IDN 102 Elementary Indonesian II. 5 S
Basic commun cat on, reading and writ ng sk s Intens ve oral/aura classroom dr l supplemented by prose read ng. 4 hours ecture 1 hour ab Prerequ s te DN 101 or equ va ent

IDN 201 Intermediate Indonesian I. (5) F
Systemat c review of grammar Cont nued deve opment of commun - cation ski s with increased emphas s on read ng and writing. 4 lec tures, 1 hour ab. Prerequ s te IDN 102 or equ va ent *General Studies. G*

IDN 202 Intermediate Indonesian II. (5) S
Systemat c review of grammar Cont nued deve opment of commun - cat on sk s w th increased emphas s on read ng and wr t ng 4 lec- tures, 1 hour ab Prerequ s te DN 201 or equ va ent *General Studies G*

ITALIAN (ITA)

ITA 101 Elementary Italian. (4) F, S
Aural/ora dr l 'n c ass and laboratory, and bas c grammar supple- mented by simp e prose read ngs. 4 hours ecture 1 hour ab

ITA 102 Elementary Italian. (4) F, S
See TA 101 Prerequ s te ITA 101 or equ va ent

ITA 201 Intermediate Italian. 4) F S
ntensive review of the fundamenta s of Ita ian grammat ca structure to ncrease the student s ab ty n composit on, trans at on, and id om- atic expression. 4 hours ecture 1 hour ab Prerequ s te TA 102 or equ va ent *General Stud es G*

ITA 202 Intermediate Italian. (4) F S
See ITA 201. Prerequ s te ITA 201 or equ valent *General Studies· G*

ITA 311 Italian Composition and Conversation. (3) F, S
Deve opment of wr ting ab l ty and ora express on. Prerequ s te: ITA 202 or equiva ent. *General Studies. G.*

ITA 312 Italian Composition and Conversation. (3) F S
See ITA 311. Prerequ s te TA 202 or equ valent *General Studies· G*

ITA 314 Advanced Italian. (3) N
An advanced grammar and compos t on course with read ngs of selected l terary works. Prerequisite. ITA 202 or instructor approva . *General Studies: G.*

ITA 325 Introduction to Italian Literature. (3) F
ta an terature through the interpretation of representative works in drama, poetry and nove . Prerequ s te. ITA 202 or nstructor approva *General Stud es HU*

ITA 394 ST: Special Topics. (1–4) N

ITA 415 Italian Civilization. (3) N
A general survey of the history iterature, art, and mus c, emphasiz ng ta y s cu tural contribution to Western civ zat on Prerequ s tes· ITA

311 312 (or 314). *General Studies L2/HU G*

ITA 420 Italian Cinema. (3) F
Major trends of ta an c nema from the post war per od to the present

ITA 430 Italian Literature of the Middle Ages. (3) N
Emphasis on "St Novo ' Dante s m nor works, Petrarch and Boccac- c o Prerequ s te TA 325 or instructor approva *General Stud es. HU.*

ITA 441 Dante: *Divina Commedia.* (3) N
Critical read ng of the three Cant che (nferno Purgator o and Parad so). Prerequ s te· TA 325 Genera Studies: L2/HU

ITA 443 Italian Literature of the Renaissance. (3) N
Emphas s on Lorenzo de'Med c Po z ano Cast gl one, Machiave l , Ariosto, and Tasso Prerequ site: ITA 325 or instructor approval. *Gen eral Studies HU H*

ITA 446 Italian Literature of the 18th and 19th Centuries. (3) N
Goldon Par ni, Alf er the poetry of Foscolo and Leopard and the soc ohistor ca nove s of Fosco o Manzon and Verga Prerequis te. TA 325 or instructor approval *General Studies HU*

ITA 449 20th-Century Italian Literature. (3) N
Major works, f gures, and movements of contemporary Ital an iterature Prerequis te· ITA 325 *General Stud es HU, G*

ITA 494 ST: Special Topics. (1–4) N

ITA 499 Individualized Instruction. (1 3) N

JAPANESE (JPN)

JPN 101 Elementary Japanese. (5) F
Communicat on sk ls and bas c sk ls n grammar, reading and wr t ng, including h ragana katakana, and about 75 kanji. 5 hours/week.

JPN 102 Elementary Japanese. (5) S
Cont nuat on of JPN 101 Add tional 99 kanji. Continued development of commun cat on sk ls n speak ng sten ng read ng, wrt ng and culture. Prerequ s te JPN 101 or equ va ent

JPN 107 Japanese for International Professions I. (10) F
Acce erated program a ternative to JPN 101 102 sequence. Func- t ona approach to needs of nternat onal profess ons 10 c ass hours a week.

JPN 201 Intermediate Japanese. (5) F
Cont nued development of commun cat on ski s ncreased emphas s on reading and writ ng Rev ew of fundamenta s of structure to increase student s ab l t es n composit on and translat on. 5 class hours a week Prerequ s te JPN 102 or equ va ent *General Stud es G.*

JPN 202 Intermediate Japanese. (5) S
Continuation of JPN 201. Prerequ s te· JPN 201 or equ valent. *Gen eral Stud es: G.*

JPN 206 Calligraphy. (1) N
Introduction to the pract ce of cal graphy n Japan with emphasis on the der vation of Japanese kana sy abar es from Ch nese characters. Prerequ's te. CHI 205 or JPN 101

JPN 207 Japanese for International Professions II. (10) S
Cont nuat on of JPN 107 a ternat ve to JPN 201 202 sequence. Expans on of commun cative profic ency in spec f c areas of nterna t ona profess ons 10 c ass hours a week Prerequ site JPN 107 or nstructor approva *General Studies G*

JPN 309 Intermediate Japanese Conversation. (2) F
Pract ce n current usage in express on of deas Recommended espe- cially for those who have not had the opportun'ty to pract ce Japanese in Japan. Prerequ s te JPN 202

JPN 310 Intermediate Japanese Conversation. 2) S
Continuation of JPN 309 Prerequ s te JPN 309

JPN 311 Japanese Conversation and Composition. (3) F
ntens ve aural/oral pract ce lead ng toward conversat'ona f uency Practice in wr t ng Japanese, emphas z ng current usage Prerequi- s te JPN 202. *General Stud es G*

JPN 312 Japanese Conversation and Composition. (3) S
See JPN 311 Prerequ s te JPN 202 *General Stud es. G.*

JPN 313 Advanced Japanese. (3) F
Cont nued development of ab ty to commun cate ora y and n writ ng Exposure to the variety of Japanese wr tten sty es Prerequisite· JPN 202 or equ valent *General Studies G*

JPN 314 Advanced Japanese. (3) S
See JPN 313 Prerequisite· JPN 313 or instructor approva *General Studies· G.*

JPN 321 Japanese Literature. (3) N
Read ngs 'n representative masterp eces of modern Japanese tera ture. Authors read change each year n accordance w th the needs of the class May be repeated for cred t Prerequ s te JPN 313 or nstruc- tor approva . *General Studies L2/HU G.*

JPN 414 Introduction to Classical Japanese. (3) S
Read ngs from var ous genres of pre-20th-century terature with ana ys s of the structure of the class ca language. Prerequ s te JPN 313 or nstructor approva

JPN 435 Advanced Readings. (3) N
Read ngs in h story, art rel g ous stud es econom'cs or other f elds. Lecture, discussion Prerequ site: JPN 314 or equiva ent.

JPN 485 Problems of Translation. 3) N
Theor es and practice of translat on· strateg es for handling a var ety of Japanese texts Lecture, discussion Prerequ's te: JPN 314 or equiva- ent

JPN 494 ST: Special Topics. (1–4) N

JPN 499 Individualized Instruction. (1 3) N

JPN 500 Bibliography and Research Methods. (3) N
Introduction to research mater als on Japan both n Japanese and in Western languages. Overview of research methods Lecture discus sion

JPN 514 Advanced Premodern Japanese. (3) N
Close readings of se ected premodern texts, w th focus on grammat - ca and styl st c features. Lecture d scuss on Prerequisite: JPN 414 or equiva ent

JPN 520 Teaching of Japanese as a Second Language. (3) N
Theory and practice of teach ng Japanese, ncluding presentation interact on, and evaluation, w th considerat on given to cultura factors Lecture, discussion

JPN 535 Advanced Readings. (3) N
Readings in pr mary and secondary sources n history art, rel g ous stud es iterature or other f e ds Lecture, discussion Prerequ s te JPN 414 or equ valent

JPN 543 Japanese Language and Linguistics. (3) N
Analysis and d scuss on of ngu st c theories app ed to Japanese phono ogy, morpho ogy and syntax nc ud ng psychological, sociolog ca , and historical aspects

JPN 585 Advanced Problems of Translation. (3) N
Theor es and pract ce of trans at on; strateg es for hand ng a variety of Japanese texts Lecture d scuss on Prerequ s te JPN 435 or equ va ent.

JPN 591 Seminar. (3) N
Top cs n terary, 'ngu stic, or cu tura stud es

KOREAN (KOR)

KOR 101 Elementary Korean I. (5) F
Pronunc at on, grammar e ementary conversation and deve opment of basic read ng and writ'ng sk i s nc ud ng Han gu Lecture rec ta- t on.

KOR 102 Elementary Korean II. (5) S
Cont'nuat on of KOR 101. Lecture rec tat on Prerequ s te KOR 101 or equivalent.

KOR 201 Intermediate Korean I. (5) F
Cont nua development of commun cat on sk ls Increased emphas s on read ng and wr ting vocabu ary bu d ng, and rev ew of fundamen tals. Lecture rec tat on Prerequ s te KOR 102 or equ va ent *General Studies: G.*

KOR 202 Intermediate Korean II. (5) S
Cont nuat on of KOR 201. Lecture, rec tat on Prerequ s te KOR 201 or equ valent *General Studies. G.*

NOTE: For the Genera Stud es requ rement courses, and codes (such as L1 N3, C and H) see 'General Stud es " page 85 For graduat on requ rements, see ' Univers ty Graduat on Requirements " page 81. For an explanation of addit ona omn bus courses offered but not sted n th s cata og see C ass f'cat on of Courses," page 58.

LATIN (LAT)

Students enter'ng LAT 202 d rect y from LAT 102 must comp ete LAT 201 to sat sfy the Co ege of L beral Arts and Sc ences anguage requ rements

LAT 101 Elementary Latin. 4 F, S
Bas c Lat n grammar w th an emphas s on deve op ng read ng sk s For beg nn ng students only

LAT 102 Elementary Latin. (4) F S
Cont nuat on of LAT 101. Prerequis te. LAT 101 or equ va ent.

LAT 201 Intermediate Latin. 4) F
Se ected Lat n terature both c ass ca and p stclass ca V rgi s *Aene d* advanced grammar. Prerequ s te LAT 102 or nstructor approva *Genera Studies HU.*

LAT 202 Intermediate Latin. (4) S
See LAT 201 Prerequ s te: LAT 102 or nstructor approva *Genera Stud es HU*

LAT 421 Roman Literature. (3 F
Read ngs n the Lat n masterp eces Authors read change each year 'n accordance w'th needs of the c ass May be repeated for cred t Prerequ s te. LAT 202 or nstructor approval *Genera Stud es· HU*

LAT 422 Roman Literature. 3 S
See LAT 421. Prerequ site. LAT 202 or nstructor approva *Genera Studies. HU.*

NORWEGIAN (NOR)

NOR 101 Elementary Norwegian. (4 F
Read ng wr t ng, speak ng and understand ng of bas c Norweg an 4 hours ecture 1 hour ab

NOR 102 Elementary Norwegian. (4) S
Read ng wr t ng speak ng and understand ng of bas c Norweg an 4 hours ecture 1 hour ab Prerequ s te NOR 101 or equ va ent

NOR 201 Intermed ate Norweg an. (4 F
Rev ew of Norweg an grammar w th emphas s on the deve opment of the sk ! s of speak ng, sten ng comprehens on, read ng and wr t ng 4 hours lecture 1 hour ab Prerequ s te· NOR 102 or equ valent.

NOR 202 Intermediate Norwegian. 4 S
Rev ew of Norweg an grammar w th emphas s on the deve opment of the sk ! s of speak ng stening comprehens on read ng and wr't ng 4 hours ecture 1 hour ab Prerequ s te NOR 201 or equ va ent

PORTUGUESE (POR)

To sat sfy the fore gn anguage requ rement students must take POR 314 or a h gher numbered POR course.

POR 101 Elementary Portuguese. 5 F
Bas c grammar with ntens ve dr s n c ass and aboratory d rected toward conversat o a f uency 5 hours ectu e 1 hour ab Prerequ s te 1 year of Span sh or French or ta an or structor approva

POR 201 Intermed ate Portuguese. 5 S
Cont'nuat on of POR 101 ntens ve dr of fundamenta s n c ass and laboratory d rected toward conversat ona f uency 5 hours ecture, 1 hour ab. Prerequ s te POR 101 or nstructor approva . *Genera Stud 'es G*

POR 313 Portuguese Composition and Conversation. (3) F
Des gned to deve op sk n wr tten Portuguese and corrected ora express on Must be taken n sequence Prerequ s te POR 201 or nstructor approva *Genera Stud es G*

POR 314 Portuguese Composition and Conversation. (3 S
Cont nuat on of POR 313 Prerequ s te POR 313 or nstructor approva *Genera Stud es· G.*

POR 321 Luso-Brazil an Literature. 3 N
Representat ve masterp eces of Portuguese and Braz an 'terature from the beg nn ng to the present Prerequ s te POR 313 or 'nstructor approva *Genera Stud es HU*

POR 472 Luso Brazilian Civilization. 3 N
Lectures read ngs and d scuss on of mportant aspects of Luso Bra z an civi zat on Top cs from mus c art, fo k ore terature h story, and po t cs Prerequ s te POR 313 o nstructor approva *General Stud es HU G*

RUSSIAN (RUS)

RUS 101 Elementary Russian. 4 F, S, SS
Structura grammar and bas c vocabu ary ntroduct on and re nforcement of aural/ora read ng and wr t ng sk s 4 hours ecture 1 hour ab

RUS 102 Elementary Russian. 4) S, SS
See RUS 101 Prerequ s te RUS 101 or equ valent.

RUS 201 Intermediate Russian. (4) F, SS
Systemat c rev ew f grammar Deve opment of vocabulary through read ng and wr t ng Dr n aural/ora ski s 4 hours ecture, 1 hour ab Prerequ s te RUS 102 or equ va ent. *General Stud'es. G*

RUS 202 Intermediate Russian. 4 S SS
See RUS 201. Prerequ s te· RUS 201 or equ va ent *Genera Stud es· G*

RUS 211 Basic Russian Conversation. 3) F
ntens ve aural/ora dr to supp ement read ng and grammat cal ski s acqu red n RUS 101, 102 201 and 202. Requ red of Russ an majors. Prerequ's te· RUS 102 *Genera Stud es G*

RUS 212 Basic Russian Conversation. (3) S
See RUS 211 Prerequ s te: RUS 102 *General Studies G*

RUS 303 Scientific Russian. (3 F
Acqu s t on of scient fic vocabu ary through read'ng from current Rus s an sc ent f c pub cat ons. Does not satisfy the L bera Arts and Sci ences anguage requ rement for B A. degree Prerequis te· RUS 102

RUS 304 Scientific Russian. (3) S
See RUS 303 Prerequ s te: RUS 102

RUS 311 Russian Composition and Conversation. (3) F
Deve opment of wr t ng ab ty a d ora expression Prerequ s te RUS 202 *General Stud es G*

RUS 312 Russian Composition and Conversation. (3) S
See RUS 311 Prerequ s te RUS 202. *General Stud es. G.*

RUS 321 Survey of Russian Literature. 3) A
Ma n terary movements, authors and s gn'f cant works of prose poetry and drama from the beg nn ng to the m d 19th century n trans at'on Prerequ s te RUS 202 or equ va ent *General Stud es: L2/HU, H*

RUS 322 Survey of Russian Literature. (3) A
An ins ght nto the 19th and ear y 20th ce tury Russ an thought, l fe and culture by read ng trans at ons of works of major writers Prerequ s te RUS 202 or equ va ent *General Studies: L2/HU.*

RUS 323 Survey of Literature of the Soviet Era. (3) A
Ma n terary movements prom nent authors and the most s gn f cant w rks of prose, poetry and drama of the sov et per od from 1917 1991 Prerequ s te RUS 202 or equ va ent. *General Stud es. L2/HU G*

RUS 411 Advanced Composition and Conversation I. 3 F
Des gned to 'mprove aura d scrim nat on and se f express on n oral and wr tten ski s, emphas'z ng vocabulary bu d ng Subject mater a s drawn from current post Soviet Russ'an pub cat ons Prerequ s te RUS 312 *General Stud es G*

RUS 412 Advanced Composition and Conversation II. (3) S
See RUS 411 Prerequ s te RUS 312 *General Stud es· G*

RUS 417 Applied Russian Phonetics . (2) N
Genera mprovement n the student's anguage sk' s through aural/ ora tra'n ng n Russian phonology and an ana ys s of Russ an orthog raphy Prerequ s te RUS 102

RUS 420 Russian Poetry. (3) N
Deve opment of Russ an poetry from ts beg nnings to the present, nc ud ng both nat ve and ém gré poets Top cs n cr t c sm and the study of poet cs Prerequ s te RUS 312 or nstructor approval *General Stud es L2/HU*

RUS 421 Pushkin. 3) N
Pushk n s poetry p ays and prose f ct on 'nc ud ng *Eugene Oneg n The L ttle Traged es Tales of Be k n Queen of Spades* and *The Cap ta n's Daughter* Taught n Eng sh Does not sat sfy the L bera Arts and Sc ences anguage requ rement for B A degree. *General Studies: L2/HU*

RUS 423 Dostoyevsky. 3) N
Dostoyevsky's major works of f ct on nc ud ng *Cr me and Pun shment* and *Brothers Karamazov* Taught n Eng sh. Does not sat sfy the Lib era Arts and Sc ences anguage requ rement for B.A degree. *General Studies L2/HU*

RUS 424 Tolstoy. (3) N
Tolstoy s major works ncluding *War and Peace* and *Anna Karen na.* Taught n Eng sh Does not sat sfy the L beral Arts and Sc ences anguage requ rement for B A degree *Genera Stud es L2/HU*

RUS 425 Chekhov. 3 N
Chekhov's major works representat ve short stor es and major p ays, nc ud ng *The Cherry Or hard* and *Three S sters* Taught n Engl sh Does not sat sfy the L bera Arts and Sc ences anguage requ rement for B A degree. *General Stud es· L2/HU*

RUS 426 Literatures of the Nationalities of the Former Soviet Union. 3) N
Including such a thors as Be sev ca, Kross, Venc ova Kupa a, Khvy ovy, Sevak, Nasr A tmatov, Charents Cholpan Prerequ s te RUS 312 or nstructor approva *Genera Stud es· L2/HU G*

RUS 430 Russian Short Story. 3 N
Detai ed study of representat ve works of the Russ an short story genre Authors inc uded are from both Imper a and Sov et Russ a Prerequisite RUS 312 or nstructor approva *Genera Stud es L2/HU*

RUS 440 History of the Russian Language. 3 N
Pr nc p es of histor cal ngu st cs presented through the evo ut on of the Russ an anguage from Proto- ndo European to the present Read ngs of h stor ca documents n O d Russ an and Old Church S avic Prerequisite· RUS 312 or nstructor approva .

RUS 441 Survey of Russian Culture. 3) N
Interp ay of art st c soc al and po t ca forces n the deve opment of Russ an cu ture from the K evan per od to the present Exc us ve use of Russ an anguage source mater a s Prerequ s te RUS 312 or nstructor approva . *Genera Stud es· L2/HU, G, H.*

RUS 494 ST: Special Topics. 1–4 N

RUS 499 Individualized Instruction. 1 3 N

RUS 591 Seminar. 3) N
Top'cs may be se ected from the fo ow ng
(a) Ba tic L teratures
(b) L terature from 1956 to August 1991
(c) Literature L terary Zhdanov sm
(d) 19th Century Russian
(e) Post Sov et L terature
(f) Pre 19th Century Russ an L terature
(g Russ an L terary Cr t cism
(h Russ an Poetry to 1890
(i) Russ an Poetry 1890 to Present

SCANDINAVIAN (SCA)

SCA 250 Introduction to Scandinavian Culture. 3 S
Scand nav an dent ty from an nterd sc p nary perspect ve with an h storic overview. Lecture d scuss on

SCA 314 Medieval Scandinavia. (3 F S
Study in Eng sh trans at on of the Sagas Edda and Ska d c poetry, h story and mytho ogy of the V k ngs

SCA 315 Old Norse. 3 F S
Read ngs and study of grammat ca structures of Med eva Scandina v an w'th emphas's on the Sagas and Edda poetry and h stor ca wr t ngs

SCA 316 Scandinavian Cinema. 3) F S
Presentat on of Dan sh Norweg an Ice and c and Swed sh f m with Engl sh subt t es as representat ves of contemporary h stor ca cul ture

SCA 450 Masterp eces of Scandinavian Literature. (3 S
Scand nav an terature n trans at on n ts cultura and histor ca con texts

SPANISH (SPA)

Students who have comp eted the r secondary educat on in a schoo where Span sh was the off c a anguage of nstruct on shou d beg n their stud es at the 325 leve or above For the courses SPA 313 and 314 certain restr ct ons app y: no student who has completed more than two years of high schoo n a Spanish speaking country where Span sh is the med um of nstruct on n the schoo s a owed to reg ster n a Span sh c ass be ow the 400 eve

SPA 101 Elementary Spanish. 4 F S SS
Fundamentals of the anguage Emphas s on sten ng, speak ng read ng, and wr t ng 4 hours ecture, 1 hour ab Not open to students w th cred t n SPA 111

SPA 102 Elementary Spanish. 4) F S SS
See SPA 101 Not open to students w th cred t n SPA 111 Prerequ s te SPA 101 or equ va ent

SPA 107 Spanish for International Professions I. (8 F
Acce erated program a ternat ve to SPA 101, 102 sequence Func t ona approach to needs of nternat ona profess ons

SPA 111 Fundamentals of Spanish. 4) F S
Primari y for students w th tw years of h gh scho Span sh who need rev ew to e ter sec nd year study 4 hours ecture, 1 hour ab. Not open to students w th cred t in SPA 101 or 102.

SPA 201 Intermediate Spanish. 4 F S SS
Cont nuat on of fundamenta s Emphas s on the development of the sk ls of read ng sten ng comprehens on speak ng, writ ng, and cu ture 4 hours lecture 1 hour ab Prerequ s te SPA 102 or 111 *Gen era Stud es. G*

SPA 202 Intermed ate Spanish. 4 F, S SS
See SPA 201 Prerequ s te SPA 201 or equ va ent *Genera Stud es. G*

SPA 203 Intermediate Spanish for Bilinguals. 4) F
For Span sh speak ng students n eu of SPA 201 Compos t on ter ature, conversat on, grammar fundamenta s 4 hours ecture 1 hour ab Prerequ s te SPA 102 or 111 or p acement *Genera Stud es G*

SPA 204 Intermediate Span sh for Bilinguals. 4 S
For Span sh speak ng students n eu of SPA 202 Composit on ter ature conversat on grammar fundamenta s 4 hours ecture 1 hour ab Prerequ s te. SPA 203 or equ va ent *Genera Stud es G*

SPA 207 Spanish for International Professions II. (8 S
Continuat'on of SPA 107 a ternat ve to SPA 201 202 sequence Expans on of commun cat ve prof c ency n spec f c areas of nterna t ona profess ons Prerequ s te· SPA 107 or nstructor approva *Gen era Stud es G*

SPA 311 Spanish Conversation. (3) F S
Des gned pr mar y for n nmajors to promote vocabu ary bu d ng and commun cat ve express on n Span sh through d scuss ons based on cu tura read ngs Prerequ s te SPA 202 or equ va ent.

SPA 312 Spanish Conversation. 3 F, S
See SPA 311 Prerequ s te· SPA 311 or equiva ent

SPA 313 Spanish Conversation and Composition. 3 F, S SS
Designed to deve op sk l and accuracy n spoken and wr tten Span sh Requ red of majors; SPA 313 and 314 must be taken n sequence. Prerequ s te SPA 202 or equiva ent *Genera Stud es G*

SPA 314 Spanish Conversation and Composition. 3 F S, SS
See SPA 313 Prerequ s te SPA 313 or equ va ent *General Stud es G.*

SPA 315 Spanish Conversation and Composition for Bilinguals. 3 F
Emphas s on compar ng standard Span sh w th reg ona Southwest Span sh May be taken n eu of SPA 313 and 314. Prerequ s te SPA 202 or 204 or nstructor approva

SPA 316 Spanish Conversation and Composition for Bilinguals. 3) S
See SPA 315 Prerequ site. SPA 315 or equ va ent

SPA 319 Business Correspondence and Communication. (3) N
Organ zat'on and presentat on of clear, effective bus ness commun ca t ons; vocabulary app cab e to modern bus ness usage Prerequ s te SPA 314 or 316 or nstructor approva *Genera Stud es G*

SPA 325 Introduction to Hispanic Literature. 3 F S
A crit ca approach to and ana ys s of terary types nc ud ng poetry drama short story and nove Requ red of a majors Prerequ s te· SPA 313 *Genera Stud es· HU*

SPA 412 Advanced Conversat on and Composition. (3 F S
Ora and wr tten Span sh commun cat on sk s with part'cu ar atten t on g ven to deve op ng f uen y and fac ty. Requ red of ma ors. Prerequ s te SPA 314 or 316 or instructor approva . *Genera Stud es G*

NOTE: For the General Stud es requ rement, courses and codes such as L1 N3, C, and H) see Genera Stud es page 85. For graduat on requ rements see Un vers ty Graduat on Requ rements, page 81. For an exp anat on of add t onal omn bus courses offered but not l sted n this cata og see 'C ass f cat on of Courses " page 58

SPA 413 Advanced Spanish Grammar. (3 F
ntens ve ana ys s of the Span sh language Requ red of teach ng majors. Prerequ s te SPA 314 or 316 or nstructor approval *General Stud es. G.*

SPA 417 Spanish Phonetics and Phonology. (3) F
ntroduction to the theory and pract'ce of Spanish phonet cs and pho no ogy. Prerequ s te SPA 412

SPA 420 Applied Spanish Linguistics. (3 S
App cation of 'ngu st c pr nc p es to the teach ng of Span sh. Prereq u s tes FLA 400 (or equ va ent) SPA 412 *General Stud es L2*

SPA 421 Spanish in the Southwest. (3 F
D scussion and ngu stic analys's of Southwest Span sh Prerequ's'te: SPA 412. *General Studies L2/SB, C.*

SPA 425 Spanish Literature. (3) F S
Survey of Span sh terature from ts beg nn ng to 1700. Prerequ s te SPA 325 *Genera Studies. HU.*

SPA 426 Spanish Literature. (3) F S
Survey of Span sh l terature from 1700 to the present Prerequ s te· SPA 325 *General Studies HU.*

SPA 427 Spanish American Literature. (3 F S
Survey of major works f gures and movements from Co on a per od to 1880. Prerequ's te SPA 325. *General Stud es L2*

SPA 428 Spanish American Literature. (3) F S
Survey of major works, f gures and movements from 1880 to the present Prerequ s te SPA 325 *Genera Stud es· L2 G*

SPA 429 Mexican Literature. 3 N
Selected read ngs from pre Co umb an wr ters/poets e g Macu xó- ch t through the nove of the Revolut on to the present Prerequ s te SPA 325.

SPA 434 Drama of the Golden Age. 3) S
Dramat c works of Lope de Vega Ca derón de a Barca and the r con temporar es. Prerequ s te SPA 325

SPA 435 Cervantes—*Don Quijote.* 3 F
Don Quijote and the deve opment of the nove . Prerequ s te SPA 325

SPA 454 19th-Century Spanish American Narrative. (3) F
Pr ncipa works n the nove short story narrat ve f ct on, and narrat ve (Gauchesque) poetry Prerequ s te. SPA 325

SPA 456 20th-Century Spanish American Fiction. 3 S
Major works and movements Prerequ s te SPA 325

SPA 464 Mexican American Literature. (3) F
Representat ve terature n Span sh and Eng sh by Mex can Amer- cans, emphas z ng soc ocu tura as we as terary va ues. Prerequ s te. SPA 325 *General Studies: HU*

SPA 471 Civilization of the Spanish Southwest. 3 S
The po it ca nte ectual, soc a econom c, and art st c deve opment of the Span sh-speak'ng peop e of the Southwest. Prerequ s te SPA 314 or 316 or nstructor approval *General Stud es HU.*

SPA 472 Spanish American Civilization. 3 F
Growth of the nstitut ons and cultures of Span sh American people Prerequ s te· SPA 314 or 316 or nstructor approva *General Studies. HU G H*

SPA 473 Spanish Civilization. (3 S
Po t ca , nte ectua , soc a econom c and art st c development of the Span sh nat on from its or g n to the present Prerequ s te SPA 314 or 316 or nstructor approva *Genera Stud es HU SB G*

SPA 485 Mexican American Short Story. 3 N
Cr t ca study of contemporary short stor es by Mex can Amer can authors w th emphas s on the r Span sh- anguage wr t ngs Prerequ s te. SPA 325 or nstructor approval

SPA 486 Mexican American Novel. (3) N
Soc a and terary contexts of representat ve nove sts emphasiz ng their Span sh anguage wr t ngs Prerequ s te SPA 325 or nstructor approva .

SPA 487 Mexican American Drama. (3) N
Representat ve dramat c works, w th emphas s on the h story and development of th s genre from ts reg ona or g ns to the present Pre requ s te· SPA 325 or nstructor approva

SPA 494 ST: Special Topics. (3 N
(a) ntroduct on to H span c Lingu st cs
(b) Lex cography

SPA 500 Bibliography and Research Methods. 3 F
Requ red of al graduate students.

SPA 536 Generat on of 1898. (3 N
Works of Unamuno Baroja Azor n and the r contemporar es stud'ed against the ideo og ca background of the turn of century n Spa n Prerequ s te SPA 325

SPA 540 History of the Spanish Language. 3 S
Ana ys s and discuss on of the development of Spanish from Vu gar Latin to the present day Prerequ's te FLA 400 or equ va ent

SPA 541 Spanish Language in America. 3) F
D'scuss on and ana ys s of var ous reg ona and social var et es of Span sh n the Americas Prerequisite FLA 400 or equ va ent

SPA 542 Studies in the Spanish of the Southwest. (3) S
Exam nat on of b l ngua sm and the soc al and reg ona d a ects of Span sh 'n the Southwest Prerequ s te FLA 400 or equ va ent

SPA 543 Structure of Spanish. (3) S
Analys s and d scuss on of data on se ected top cs in Span sh mor phology semant cs and syntax Prerequisite FLA 400 or equ valent

SPA 545 Concepts of Literary Criticism. (3) S
A ms and methods of modern terary scho arship D scuss on of major theor es of terary ana ys s

SPA 555 Spanish American Modernism. (3) N
Pr nc pa works and f gures of l terary Modern sm, 1880–1920 w th emphas's on nternat onal iterary context of the movement. Prerequ s te: SPA 325

SPA 557 Contemporary Spanish American Poetry. (3) N
Major works and prob ems n contemporary poetry and poet cs w th emphas s on Paz, Parra, Cardena and new poetry s nce 1960 Pre requ's te SPA 325

SPA 560 Medieval Spanish Literature. 3 N
Major f gures and works of the M dd e Ages n Spa n

SPA 561 Golden Age Spanish Prose Fiction. (3 N
Major f gures and works of the 16th and 17th centuries w th emphas s on the p caresque nove .

SPA 562 Golden Age Spanish Poetry. (3) N
Major f gures and works of the 16th and 17th centur es with emphasis on lyr c poetry.

SPA 563 Spanish Romanticism. 3 N
Pr nc pa f gures and works of the Span sh Romant c sm w th empha s s on nternat onal terary context of the movement.

SPA 564 19th-Century Spanish Prose Fiction. 3 N
Pr nc pa f gures and works of Rea sm n the 19th century nove , w th emphas s on Ga dós

SPA 565 20th-Century Spanish Drama. 3) N
Princ'pa f gures and works of Span sh dramat c terature from the Generat on of 1898 to the present.

SPA 566 Generation of 1927. (3) N
Major poets of the Generation of 1927 w th emphas s on works of Lorca Gu i én, Sa nas and A e xandre

SPA 567 Contemporary Spanish Novel. (3) N
Major works of post C v War Span sh f ct on

SPA 568 Cervantes. 3) N
An extens ve ana ys s of the prose and theater of Cervantes as a key f gure of the Spanish Golden Age. Lecture, sem ar.

SPA 570 Indigenous Literatures of Spanish America. 3 N
The nd genous terary tradit'ons w'th emphas s on Nahuat Mayan and Quechua l teratures through read ngs n Spanish translat ons

SPA 571 Colonial Spanish American Literature. 3 N
The major f gures and works from Conquest to Independence

SPA 572 Spanish American Drama. (3 N
Major contr but ons of Span sh American drama w th emphas s on contemporary dramatists

SPA 573 Spanish American Essay. 3 N
Major works of the essay w th n the framework of ntel ectua h story and terary movements

SPA 574 Spanish American Vanguard Poetry (3) N
Exam nat on of poet c deve opments 1920–1940 w th emphas s on Hu dobro Val ejo Neruda, and the nternat onal context of the r works

SPA 575 Contemporary Spanish American Novel. (3 N
Pr nc pa nove s of the *Nueva Narrat va H spanoamer'cana* w thin the context of contemporary theor es of the narrat ve

SPA 576 Contemporary Spanish American Short Story. (3 N
Pr'nc'pa short stor es of the *Nueva Narrat va H spanoamericana,* w thin the context of contemporary theor es of the narrat ve.

SPA 577 Regional Spanish American Literature. (3 N
The f gures and works of major nat onal Peru Argent na, Ch e, and Mex co and reg'ona Car bbean teratures Top cs offered on a rotat ng bas s May be repeated for d fferent top cs

SPA 578 Novel of the Mexican Revolution. 3) N
Representat ve works and authors of th s genre (Guzmán Azue a, Urqu zo, Mun z and Romero nc ud ng re ated or periphera off shoots n nd genous n ve s.

SPA 581 Latin American Popular Culture. (3) N
Stud es n selected top cs of Lat n Amer can popu ar cu ture w th emphas s on appropr ate academ c mode s for the cr t cal ana ys s of these mater a s.

SPA 582 Studies in Latin American Film. (3) N
Exam nat on of the ro e of f m n o temporary Lat n Amer can cul ture f ms viewed and ana yzed as casebook examp es. Sem nar

SPA 591 Seminar. (3 N
Spanish and Span sh Amer can terary, cu tura and ngu st c top cs

SPA 691 Figures and Works Seminar. 3) N
Top cs may be selected from Span sh a d Span sh Amer can iteratures.

SWEDISH (SWE)

SWE 101 Elementary Swedish. 4 F
Reading wr t ng speak ng and understand ng of bas c Swed sh. 4 hours ecture, 1 hour lab

SWE 102 Elementary Swedish. 4 S
Read ng wr t ng speak ng and understand ng of bas c Swed sh 4 hours ecture, 1 hour ab Prerequisite· SWE 101 or equ va ent

SWE 201 Intermed ate Swedish. (4) F
Rev ew of Swed sh grammar w th emphas s on the development of the sk l s of speak ng, sten ng comprehens on read ng and wr t ng 4 hours ecture, 1 hour lab Prerequ s te: SWE 102 or equ va ent

SWE 202 Intermediate Swedish. 4 S
Rev ew of Swed sh grammar w th emphasis on the development of the sk l s of speak ng, sten ng comprehens on read ng and wr t ng 4 hours ecture, 1 hour ab Prerequ s te SWE 201 or equ va ent

THAI (THA)

THA 101 Elementary Thai I. (5) F
Bas c commun cat'on read ng, and wr t ng sk s ntens ve ora aura classroom dr l supp emented by prose read ngs n Tha scr'pt 4 hours ecture, 1 hour ab

THA 102 Elementary Thai II. (5) S
Bas c commun cat on read ng, and wr t ng sk ls ntens ve oral/aura classroom dr supp emented by prose reading 4 hours ecture 1 hour ab Prerequ s te THA 101 or equ va ent

THA 201 Intermediate Thai I. 5 F
Systemat c rev ew of grammar Cont nued development of commun cation sk s with 'ncreased emphas s on read ng and writ'ng 4 hours lecture 1 hour ab. Prerequ s'te· THA 102 or equ valent *General Stud ies G*

THA 202 Intermediate Thai II. 5 S
Systematic rev'ew of grammar Continued development of commun cat on sk l s w'th ncreased emphas s on reading and writ ng 4 hours lecture 1 hour ab Prerequis te THA 201 or equ va ent *General Studies· G*

VIETNAMESE (VTN)

VTN 101 Elementary Vietnamese I. 5 F
Bas c sk l s n modern conversat ona V etnamese and deve opment of bas c read ng and wr t ng sk s, w th spec a emphas s on tones 4 hours ecture 1 hour ab.

VTN 102 Elementary Vietnamese II. 5 S
Bas c sk s in modern conversat ona V etnamese and deve opment of basic read ng and wr ting sk s, w th spec a emphas s on tones 4 hours ecture 1 hour ab Prerequ s te VTN 101 or equ va ent

VTN 201 Intermediate Vietnamese I. (5 F
Improve students speak ng, l sten ng, read ng and wr t ng compe tence through d a ogues read ng passages, pattern dr and gram mar and commun cat ve exerc ses 4 hours lecture 1 hour ab Prerequ s te VTN 102 or equ va ent *General Stud es· G*

VTN 202 Intermediate Vietnamese II. 5) S
Improve students speak ng l sten ng read ng, and writ ng compe tence through d a ogues, reading passages pattern dri , and gram mar and commun cat ve exerc ses 4 hours ecture 1 hour lab Prerequ s te VTN 201 or equ valent *General Studies G*

Department of Mathematics

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REGENTS' PROFESSOR
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PROFESSORS
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ASSISTANT PROFESSORS
CARLSON, GELB D. JONES KALISZEWSKI, NIKITIN, PREWITT, ZANDIEH, ZUO

MATHEMATICS—B.A.

The B.A. degree in Mathematics consists of a minimum of 36 semester hours in mathematics and additional course work in closely related fields, as approved by the advisor, for a total of at least 51 semester hours. The required courses must include the following·

CSE	200	Concepts of Computer Science *N3* 3
		or CSE 183 Applied Problem Solving with FORTRAN *N3* 3)
		or CSE 100 Principles of Programming 3)
MAT	270	Calculus with Analytic Geometry I *N1* 4
MAT	271	Calculus with Analytic Geometry II *N1* 4
MAT	272	Calculus with Analyt c Geometry III *N1* 4
MAT	274	Elementary Differential Equations *N1* 3
MAT	300	Mathematical Structures *L2* 3
MAT	342	Linear Algebra. . . 3
MAT	370	Intermediate Calculus 3
		or MAT 371 Advanced Calculus I 3)
Total		27

NOTE: For the Genera Stud es requ rement courses and codes (such as L1 N3 C and H) see "Genera Stud es " page 85 For graduation requ rements see Un vers ty Graduat on Requ rements, page 81 For an explanat on of add t ona omn bus courses offered but not sted n th s cata og see "C ass f cat on of Co rses " page 58

Four 400 level MAT or STP courses must also be approved by the advisor.

The department recommends a one year sequence in some closely related field Students who plan to attend graduate school in mathematics should choose the B.S. degree.

MATHEMATICS—B.S.

The B.S. degree in Mathematics consists of a minimum of 42 semester hours in mathematics plus additional course work in closely related fields, as approved by the advisor, for a total of at least 55 semester hours The required hours must include the following:

CSE	200	Concepts of Computer Science *N3*	3
		or CSE 183 Applied Problem Solving with FORTRAN *N3* (3	
		or CSE 100 Principles of Programming *N3* (3)	
MAT	270	Calculus with Analytic Geometry I *N1*	4
MAT	271	Calculus with Analytic Geometry II *N1*	4
MAT	272	Calculus with Analytic Geometry III *N1*	4
MAT	342	Linear Algebra	3
Total			18

To satisfy the remaining required hours, the student selects either the applied mathematics, computational mathematics, general mathematics, or statistics and probability option.

General Mathematics Option. For the general mathematics option, the student must take the following courses:

MAT	274	Elementary Differential Equations *N1*	3
MAT	300	Mathematical Structures *L2*	3
MAT	371	Advanced Calculus I	3
MAT	372	Advanced Calculus II	3
MAT	410	Introduction to General Topology	3
		or MAT 415 Introduction to Combinatorics (3	
		or MAT 443 Introduction to Abstract Algebra 3	
		or MAT 445 Theory of Numbers (3)	
MAT	423	Numerical Analysis I *N3*	3
MAT	461	Applied Complex Analysis	3
		or MAT 462 Applied Partial Differential Equations 3)	
		or MAT 475 Differential Equations (3	
STP	421	Probability	3
Total			24

Three more hours in a MAT course must also be approved by the advisor.

The department recommends a one year sequence in some closely related field.

Pure Mathematics Option. For the pure mathematics option, the student must take the following courses:

CSE	200	Concepts of Computer Science *N3*	3
		or CSE 100 Principles of Programming *N3* (3)	
MAT	274	Elementary Differential Equations *N1*	3
MAT	300	Mathematical Structures *L2*	3
MAT	372	Advanced Calculus II	3
MAT	442	Advanced Linear Algebra	3
MAT	444	Intermediate Abstract Algebra	3
MAT	472	Intermediate Real Analysis	3
Total			21

Students must also take two courses from the following:

MAT	410	Introduction to General Topology	3
MAT	415	Introduction to Combinatorics	3
MAT	445	Theory of Numbers	3
		or MAT 461 Applied Complex Analysis (3)	
		or STP 421 Probability (3)	

Two more MAT or STP courses at the 400 level must also be taken.

Applied Mathematics Option. For the applied mathematics option, the student must take the following courses:

CSE	200	Concepts of Computer Science[1] *N3*	3
CSE	210	Data Structures and Algorithms I[1] *N3*	3
MAT	274	Elementary Differential Equations *N1*	3
MAT	371	Advanced Calculus I	3
MAT	372	Advanced Calculus II	3
MAT	425	Numerical Analysis II *N3*	3
MAT	451	Mathematical Modeling *N2*	3
MAT	461	Applied Complex Analysis	3
MAT	462	Applied Partial Differential Equations	3
PHY	121	University Physics I: Mechanics *S1/S2*[2]	3
PHY	131	University Physics II: Electricity and Magnetism *S1/S2*[3]	3
STP	421	Probability	3
Total			36

[1] CSE 100, Introduction to Computer Science I, may be substituted for CSE 200 or 210, but this is not recommended.

[2] Both PHY 121 and 122 must be taken to secure S1 or S2 credit.

[3] Both PHY 131 and 132 must be taken to secure S1 or S2 credit

For PHY 121 and 131, the corresponding laboratory courses (PHY 122 University Physics Laboratory I and PHY 132 University Physics Laboratory II) are strongly recommended.

Students should choose additional courses from the following:

IEE	476	Operations Research Techniques Applications *N2*	4
MAT	415	Introduction to Combinatorics	3
MAT	416	Combinatorial Mathematics II	3
MAT	419	Introduction to Linear Programming *N2*	3
MAT	423	Numerical Analysis I *N3*	3
MAT	443	Introduction to Abstract Algebra	3
MAT	452	Introduction to Chaos and Nonlinear Dynamics	3
MAT	455	Introduction to Fractals and Applications	3
MAT	472	Intermediate Real Analysis	3
MAT	475	Differential Equations	3
STP	425	Stochastic Processes	3
STP	427	Mathematical Statistics	3

Computational Mathematics Option. For the computational mathematics option, the student must take the following courses:

CSE	200	Concepts of Computer Science *N3*	3
CSE	210	Data Structures and Algorithms I *N3*	3
CSE	310	Data Structures and Algorithms II	3
MAT	274	Elementary Differential Equations *N1*	3
MAT	300	Mathematical Structures *L2*	3
		or MAT 243 Discrete Mathematical Structures (3	
MAT	371	Advanced Calculus I	3

MAT	423	Numerical Analysis I *N3*	3
MAT	425	Numerical Analysis II *N3*	3
MAT	427	Computer Arithmetic *N3*	3
STP	326	Intermediate Probability *N2*	3
		or STP 420 Introductory Applied Statistics *N2* 3	
Total			30

The remaining hours are to include three upper-division courses, at least two of which must be MAT or STP courses, including one at the 400 level, and all of which must be approved by the advisor.

Statistics and Probability Option. For the statistics and probability option, the student must take the following courses:

MAT	300	Mathematical Structures *L2*	3
MAT	371	Advanced Calculus I	3
		or MAT 472 Intermediate Real Analysis (3)	
MAT	372	Advanced Calculus II	3
STP	420	Introductory Applied Statistics *N2*	3
STP	421	Probability	3
STP	425	Stochastic Processes	3
		or STP 427 Mathematical Statistics (3)	
Total			18

The remaining courses in mathematics and statistics, as approved by the advisor, may be selected from the following.

IEE	476	Operations Research Techniques Applications *N2*	4
MAT	415	Introduction to Combinatorics	3
MAT	419	Introduction to Linear Programming *N2*	3
MAT	421	Applied Computational Methods *N3*	3
MAT	423	Numerical Analysis I *N3*	3
MAT	425	Numerical Analysis II *N3*	3
MAT	442	Advanced Linear Algebra	3
STP	425	Stochastic Processes	3
STP	427	Mathematical Statistics	3
STP	429	Experimental Statistics *N3*	3

A coherent set of courses in a related field is also required.

Actuarial Science. The faculty in the Department of Mathematics offer courses that cover the content of the mathematical examinations of the Society of Actuaries. The option in statistics and probability is particularly suited to students who wish to pursue actuarial careers. See the department's actuarial advisor for more information.

MINOR IN MATHEMATICS

The minor in Mathematics consists of a minimum of 24 semester hours. Required courses are as follows:

MAT	270	Calculus with Analytic Geometry I *N1*	4
MAT	271	Calculus with Analytic Geometry II *N1*	4
MAT	272	Calculus with Analytic Geometry III *N1*	4
MAT	342	Linear Algebra	3
Total			15

Electives are chosen in consultation with a mathematics advisor and must include three upper division MAT or STP courses. In addition, CSE 200 Concepts of Computer Science and CSE 210 Data Structures and Algorithms I are recommended. An approved Minor Verification Form must be submitted to the Graduation Office of the College of Liberal Arts and Sciences.

SECONDARY EDUCATION—B.A.E.

Mathematics. Students pursuing the major teaching field may choose from two options.

Option One. With this option, the academic specialization consists of the following required courses:

CSE	200	Concepts of Computer Science *N3*	3
		or CSE 183 Applied Problem Solving with FORTRAN *N3* (3	
		or CSE 100 Principles of Programming *N3* (3)	
MAT	270	Calculus with Analytic Geometry I *N1*	4
MAT	271	Calculus with Analytic Geometry II *N1*	4
MAT	272	Calculus with Analytic Geometry III *N1*	4
MAT	300	Mathematical Structures *L2*	3
		or MAT 243 Discrete Mathematical Structures (3	
MAT	310	Introduction to Geometry	3
MAT	342	Linear Algebra	3
MAT	370	Intermediate Calculus	3
		or MAT 371 Advanced Calculus I (3)	
MAT	443	Introduction to Abstract Algebra	3
		or MAT 445 Theory of Numbers (3)	
MTE	483	Mathematics in the Secondary School	3
STP	420	Introductory Applied Statistics *N2*	3
Total			36

MTE 482 Methods of Teaching Mathematics in Secondary School is required as part of the 31-hour professional education requirement but cannot be counted as part of the 36 hour major requirement.

Option Two. This option may be exercised only in combination with option two in "Chemistry" (page 349) or "Physics" (page 408). The mathematics portion of this 60 hour program consists of 30 semester hours in mathematics. Required courses are as follows:

MAT	270	Calculus with Analytic Geometry I *N1*	4
MAT	271	Calculus with Analytic Geometry II *N1*	4
MAT	272	Calculus with Analytic Geometry III *N1*	4
MAT	274	Elementary Differential Equations *N1*	3
		or MAT 371 Advanced Calculus I 3	
		or MAT 460 Applied Real Analysis 3)	
MAT	300	Mathematical Structures *L2*	3
MAT	310	Introduction to Geometry	3
MAT	342	Linear Algebra	3
MAT	443	Introduction to Abstract Algebra	3
Total			27

Recommended

CSE	100	Principles of Programming	3
		or CSE 183 Applied Problem Solving with FORTRAN (3	
		or CSE 200 Concepts of Computer Science (3)	

NOTE: For the General Studies requirement courses, and codes such as L1, N3, C, and H) see "General Studies," page 85. For graduation requirements, see University Graduation Requirements," page 81. For an explanation of additional omnibus courses offered but not listed in this catalog, see Classification of Courses," page 58.

Minor Teaching Field. The minor teaching field consists of the following required courses:

MAT 270	Calculus with Analytic Geometry I *N1*	4
MAT 271	Calculus with Analytic Geometry II *N1*	4
MAT 272	Calculus with Analytic Geometry III *N1*	4
MAT 274	Elementary Differential Equations *N1*	3
	or MAT 371 Advanced Calculus I 3)	
	or MAT 460 Applied Real Analysis (3	
MAT 300	Mathematical Structures *L2*	3
MAT 310	Introduction to Geometry	3
MAT 342	Linear Algebra	3
Total		24

GRADUATE PROGRAMS

The faculty in the Department of Mathematics offer programs leading to the degrees of Master of Natural Science, M.S., and Ph D Consult the *Graduate Catalog* for requirements.

MATHEMATICS (MAT)

MAT 106 Intermediate Algebra. (3) F S, SS
Topics from basic algebra such as linear equations, polynomials factoring, exponents, roots and radicals Prerequisite. 1 year of high school algebra

MAT 114 College Mathematics. (3 F S, SS
Applications of basic college level mathematics to real life problems Appropriate for students whose major does not require MAT 117 or 170 Prerequisite: MAT 106 or 2 years of high school algebra. *General Studies N1*

MAT 117 College Algebra. (3) F S SS
Linear and quadratic functions systems of linear equations logarithmic and exponential functions sequences, series and combinatorics. Prerequisite· MAT 106 or 2 years of high school algebra *General Studies N1.*

MAT 119 Finite Mathematics. 3) F S, SS
Topics from linear algebra, linear programming, combinatorics, probability and mathematics of finance Prerequisite MAT 117 or equivalent *General Studies· N1.*

MAT 122 University Mathematics. (3 F S SS
Overview of contemporary and applicable mathematics Graph analysis scale and proportions, exponential models and introductory probability applications Prerequisite four years of high school mathematics including a course in analytic geometry or precalculus (or MAT 117 or equivalent) *General Studies N1*

MAT 170 Precalculus. (3) F, S SS
Intensive preparation for calculus (MAT 260, 270 and 290). Topics include functions including trigonometric), matrices, polar coordinates vectors complex numbers and mathematical induction Prerequisite with a grade of "B" or higher MAT 106. Prerequisite with a grade of C" or higher MAT 117 or two years of high school algebra *General Studies N1*

MAT 210 Brief Calculus. 3) F S, SS
Differential and integral calculus of elementary functions with applications Not open to students with credit in MAT 260 270 or 290. Prerequisite. MAT 117 or equivalent *General Studies N1*

MAT 242 Elementary Linear Algebra. (2) F S SS
Introduction to matrices, systems of linear equations, determinants, vector spaces Linear transformations, and eigenvalues Emphasizes development of computational skills Prerequisite 1 semester of calculus or instructor approval

MAT 243 Discrete Mathematical Structures. 3) F S, SS
Introduction to attices graphs Boolean algebra, and groups, with emphasis on topics relevant to computer science Prerequisite· 1 semester of calculus

MAT 260 Technical Calculus I. (3) F S SS
Analytic geometry differential and integral calculus of elementary functions emphasizing physical interpretation and problem solving. Not open to students with credit in MAT 210 270, or 290 Prerequisite· MAT 170 or equivalent *General Studies N1*

MAT 261 Technical Calculus II. (3) F, S, SS
Continuation of MAT 260 Prerequisite MAT 260 or instructor approval *General Studies N1*

MAT 262 Technical Calculus III. (3) F S
Infinite series, an introduction to differential equations and elementary linear algebra Prerequisite MAT 261 or equivalent *General Studies· N1*

MAT 270 Calculus with Analytic Geometry I. (4) F, S SS
Real numbers limits and continuity, and differential and integral calculus of functions of 1 variable Not open to students with credit in MAT 290 The sequence MAT 270 and 271 may be substituted for MAT 290 to satisfy requirements of any curriculum Prerequisite with a grade of "C" or higher: MAT 170 or satisfactory score on placement examination. *General Studies N1*

MAT 271 Calculus with Analytic Geometry II. (4) F, S SS
Methods of integration, applications of calculus elements of analytic geometry improper integrals sequences and series Not open to students with credit in MAT 291 The sequence MAT 270, 271, 272 may be substituted to satisfy requirements for MAT 290 and 291 Prerequisite with a grade of "C" or higher MAT 270 or equivalent *General Studies N1*

MAT 272 Calculus with Analytic Geometry III. (4) F, S, SS
Vector valued functions of several variables multiple integration, and introduction to vector analysis The sequence MAT 270, 271, 272 may be substituted to satisfy requirements for MAT 290 and 291. Prerequisite with a grade of "C" or higher. MAT 271 or equivalent. *General Studies· N1*

MAT 274 Elementary Differential Equations. (3) F S SS
Introduction to ordinary differential equations, adapted to the needs of students in engineering and the sciences MAT 272 or equivalents recommended Prerequisite· MAT 271 or equivalent. *General Studies N1*

MAT 290 Calculus I. (5 N
Differential and integral calculus of elementary functions topics from analytic geometry essential to the study of calculus Prerequisite. MAT 170 or equivalent *General Studies· N1*

MAT 291 Calculus II. 5 N
Further applications of calculus partial differentiation multiple integrals and infinite series Prerequisite· MAT 290 or equivalent

MAT 300 Mathematical Structures. 3) F, S
Logic and set theory induction functions order and equivalence relations cardinality Emphasis on writing proofs Prerequisite: 1 semester of calculus or instructor approval *General Studies: L2*

MAT 310 Introduction to Geometry. 3) S
Congruence, area parallelism similarity and volume and Euclidean and non Euclidean geometry. Prerequisite. MAT 272 or equivalent.

MAT 342 Linear Algebra. (3) F S SS
Linear equations matrices, determinants, vector spaces bases, linear transformations and similarity inner product spaces, eigenvectors, orthonormal bases, diagonalization, and principal axes Pre- or corequisite MAT 272 or equivalent

MAT 362 Advanced Mathematics for Engineers and Scientists I. (3) F, S SS
Vector analysis Fourier analysis and partial differential equations. Prerequisites· MAT 272 and 274 *or* equivalents

MAT 370 Intermediate Calculus. (3) F S
Theory behind basic 1 variable calculus continuity, derivative, Riemann integral sequences, and series Not open to students with credit in MAT 371. Prerequisites MAT 272 300

MAT 371 Advanced Calculus I. 3 F, S
Real numbers completeness sequences series, continuity, uniform theorems derivative Riemann integral pointwise uniform convergence, Taylor's theorem. Not open to students with credit in MAT 370. Prerequisite MAT 272 or 300 or instructor approval.

MAT 372 Advanced Calculus II. 3 F, S
Open closed, compact sets in Rn continuity differentiation, partial differentiation integration in Rn inverse/implicit function theorems Not open to students with credit in MAT 460. Prerequisite. MAT 371. Pre- or corequisite MAT 342

MAT 410 Introduction to General Topology. (3) A
Topological spaces metric spaces compactness connectedness and product spaces Prerequisite MAT 300 or 371 or instructor approval

MAT 415 Introduction to Combinatorics. (3) S
Topics include proof techn ques permutat ons comb nat ons, count- ing techn ques nc ud ng recurrence re axations, generating funct ons inclus on exc us on; Ramsey theory and combinatoria designs Pre requ s'tes MAT 300 (or 243) and 342 (or 242 *or* instructor approval.

MAT 416 Introduction to Graph Theory. (3) S
Topics include trees cyc es, match ngs, p anar ty connect v ty, hami ton c ty co or ngs graph a gorithms and other advanced top cs Pre- requ s tes· MAT 300 (or 243) and 342 or 242)*or* instructor approva

MAT 419 Introduction to Linear Programming. (3) S
S mp ex method dua ty, and netw rk flows Appl cat ons to game theory geometry, comb'nator'cs, graph theory, and posets Prerequi sites. CSE 100 (or 200 or 210) MAT 300 (or 243) 342 (or 242) *or* nstructor approva *General Stud es· N2*

MAT 420 Scientific Computing. (3) F
Survey and appl cat on of programm ng languages, brar es and sci entific visua izat on too s Programm ng ass'gnments emphas ze soft ware deve opment sk is Lecture ab Prerequisites· CSE 200 and MAT 274 and 342 *or* equ valents *or* instructor approva

MAT 421 Applied Computational Methods. (3) F, S
Numer ca methods for quadrature d fferentia equat ons roots of non inear equat ons nterpo ation approx mation l near equat ons float ng po nt ar thmetic and roundoff error. Prerequ s tes. MAT 271 (or equiva ent) and fluency n computer programm ng (preferably FOR- TRAN) *or* instructor approva *General Studies· N3*

MAT 423 Numerical Analysis I. (3) F S
Analys s and algor thms for numerical so ut ons inear non near equa- t ons d rect so vers terat ve procedures optim zation Determ nation of e genvalues. E ementary computer ar thmet c. Prerequ s tes: MAT 342 and 371 and fluency n computer programm ng *or* instructor approva *General Studies. N3*

MAT 425 Numerical Analysis II. (3) F S
Ana ys s of and a gorithms for numer ca nterpo ation ntegrat on, and different at'on. Numer ca so ut on of ord nary d'fferent a equat ons and method of ines. Those seek ng a methods survey course shou d take MAT 421 Prerequ s tes MAT 342 and 371 and fluency n com- puter programm'ng *or* 'nstructor approval *General Studies. N3*

MAT 427 Computer Arithmetic. (3) S
Number systems, hardware software ar thmet c overf ow s gn fi cance, round ng mu tip e prec s on, and automat c error contro ; mpact on anguages arch tectures robust programm ng, and soft- ware development Prerequ site· CSE 100 (or 200) *or* MAT 421 and 423 (or MAT 425) *or* nstructor approva *General Stud es N3*

MAT 442 Advanced Linear Algebra. (3) F
Fundamenta s of inear a gebra, dua spaces, nvar ant subspaces canon cal forms bi near and quadrat c forms, and mu t inear algebra Prerequ s tes. MAT 300 and 342 *or* instructor approval.

MAT 443 Introduction to Abstract Algebra. (3) F
ntroduct on to concepts of abstract a gebra. Not open to students w th credit in MAT 444. Prerequ s tes: MAT 300 and 342 *or* nstructor approva

MAT 444 Intermediate Abstract Algebra. (3 S
Bas c theory of groups, r ngs, and f e ds inc ud ng an introduct on to Ga o s theory Appropr ate as preparat on for MAT 543 Prerequ s tes MAT 300 342.

MAT 445 Theory of Numbers. 3) S
Prime numbers un que factor zat on theorem congruences D ophan- t ne equat ons pr m t ve roots and quadratic rec proc ty theorem Pre requ s tes: MAT 300 and 342 *or* nstructor approva .

MAT 451 Mathematical Modeling. (3) S
A deta ed study of 1 or more mathemat ca mode s that occur 'n the phys ca or b olog ca sciences May be repeated for credit with instructor approva . Prerequ s tes MAT 242 (or 342) and 274 *or* instructor approva *General Stud es N2*

MAT 452 Introduction to Chaos and Nonlinear Dynamics. (3) F
Propert es of nonl near dynam ca systems dependence on init a con- dit ons strange attractors per od doub ng; b'furcations· symbo c dynam cs Sma e B rkhoff theorem; and app 'cations. MAT 371 s rec ommended Prerequ s tes· MAT 274 342 or 242).

MAT 455 Introduction to Fractals and Applications. (3) S
Fracta s; self s m ar structures fractals with terated funct on systems of maps computing fracta s, fracta d mensions, chaotic dynam cs on fracta s, app ication ons MAT 371 s recommended. Prerequ s tes. MAT 274 342 (or 242)

MAT 460 Applied Real Analysis. 3 S
Vectors, curv near coord ates Jacob ans mpl c t funct on theorem ne and surface ntegra s, Green s Stokes and d vergence theorems. Not open to students w th cred t 'n MAT 372 Prerequ sites MAT 242 (or 342), 272 274

MAT 461 Applied Complex Analysis. 3) F SS
Ana yt c funct ons comp ex ntegrat on Tay or and Laurent series, res idue theorem, conforma mapp ng, and harmon c functions Prerequi- s te: MAT 272 or equiva ent

MAT 462 Applied Partial Differential Equations. (3) S
Second order part a different al equat ons, emphas z ng Laplace, wave and diffus on equat ons So ut ons by the methods of character- st cs separation of var'ab es and ntegra transforms. Prerequisites. MAT 242 (or 342), 274

MAT 472 Intermediate Real Analysis. (3) F
Introduction to ana ys s n metr c spaces w th emphas s on the rea ne. Appropr ate as preparation for MAT 570 Prerequ s tes· MAT 300, 342.

MAT 475 Differential Equations. 3) F
Asymptotic behav or of so ut o s of inear and non inear ord nary d f ferentia equations, stab ty, Sturm L ouv e problems boundary value prob ems, and s ngu ar po nt behav or of autonomous systems. Pre- requisites: MAT 242 (or 342 274

MAT 476 Partial Differential Equations. (3) S
First order quas near second order inear (wave Laplace, heat). Character st cs, harmon c funct'ons max mum princip es, Fourier ser es separat on of variab es Prerequisites MAT 274 (or 475) 372 (or 472)

MAT 485 History of Mathematics. (3 N
Topics from the h story of the or g n and development of mathematica deas Prerequ s te MAT 272 or equ va ent

MAT 505 Perturbation Methods. (3) N
Non near osc lat ns stra ned coord nates renorma izat on mu t p e sca es, boundary layers, matched asymptot c expans ons turn ng point prob ems and WKBJ method Cross l sted as MAE 505. Cred t s a lowed on y for MAE 505 or MAT 505

MAT 510 Point Set Topology. 3 F
Topolog cal spaces metric spaces, c mpactness connectedness ocal propert es, product and decompos t on spaces, mapp ngs cover ing propert es, and separat on propert es Prerequ s te MAT 371 or 410 or nstructor approva

MAT 511 Point Set Topology. (3 S
Continuat on of MAT 510 Prerequ s te MAT 510 or nstructor approva .

MAT 514 Enumerative Combinatorics I. (3 F
F rst semester of a systemat c deve opment of enumerat've comb nat or cs nc ud ng e ementary count ng techn ques s eve methods, and partia y ordered sets Prerequ s te graduate stand ng or instructor approval

MAT 515 Enumerative Combinatorics II. 3 S
Second semester of a systemat c deve opment of enumerative comb - natorics nclud'ng att ces exp nent a structures symmetr c func- t ons and se ected spec a top cs Prerequ s te MAT 514 or nstructor approva

MAT 516 Graph Theory I. 3 F
F rst semester of a systemat c deve opment of graph theory nc ud ng· matchings, connect v ty arbor c ty p anarity, co or ng network f ows. Prerequ s'te· graduate stand ng or nstructor approva .

MAT 517 Graph Theory II. 3 S
Second semester of a systemat c deve opment of graph theory nc ud ing dense and sparse graphs, Ramsey theory, ham ton c ty random graphs, m nors Prerequ site MAT 516 or nstructor approval

MAT 518 Combinatorial Optimization I. (3 F
First semester of a systemat c deve opment of comb nator a optim za- t on ncluding near programm ng dua ty pr ma dua algor thms net work f ow a gor thms weighted match ngs Prerequ s te graduate stand ng or nstructor approva .

MAT 519 Combinatorial Optimization II. 3 S
Second semester of a systemat c deve opment of combinatorial opt m zation nc uding. matro d algor thms theory of NP comp eteness polynomia t me approx mat on, dynam c programm ng Prerequisite MAT 518 or instructor approva .

MAT 520 Numerical Linear Algebra. (3 F
D'rect so ut on of near systems terat ve methods e genva ues and eigenvectors s ngu ar va ue decompos tion the QR a gor thm, error propagat on, ar thmet c, and stab ty. Prerequ sites MAT 342 and 423 (or 421 *or* instructor appr va

MAT 521 Iterative Methods. (3) S
Numer cal methods for so v ng near non near systems of equat ons (symmetr c nonsymmetr c terat ve methods f r near systems con jugate grad ents mult gr d methods precond t on ng Kry ov methods Prerequ s tes MAT 371 and 423 or 421 *or* nstruct r approva .

MAT 523 Numerical Optimization. 3 N
L near programm ng unconstrained non near m n m zat n ne search a gor thms conjugate grad ents, quas Newton methods constra ned non near opt m zation grad ent pr ject on and pena ty meth ods. Prerequ site· MAT 342 or 371 or 460 or 520 or equ va ent r nstructo approva

MAT 524 Parallel Numerical Algorithms. (3 N
A gorithms for mass ve y para e hypercube arch tectures, para e FORTRAN; so ution of near non near systems, part a d fferent a equat ons; terat ve methods mu t'gr d doma n dec mp s t on Pre requ s tes MAT 371 and 423 or 421 *or* nstructor approva

MAT 526 Numerical Solution of Bifurcation Problems. 3 N
Non near parameter dependent d fferent a a gebra c equat ons numerical so ut ons b furcat on turn ng po nts cont nuat on methods branch sw tch ng steady state t me dependent cases; Hopf B furca t on Prerequ s tes MAT 371 and 423 or 421 *or* nstructo approva .

MAT 530 Numerical Solution of Ordinary Differentia Equations. 3) F
One step near mu t step methods cons stency order stab ty con vergence d scret zat on roundoff errors error est mat on, adapt ve strategy mp ementat on, software for nonst ff equat ons Prerequ s tes MAT 371 and 423 (or 421 *or* nstruct r approva

MAT 531 Numerical Solution of Stiff Differentia Systems. 3) S
Runge Kutta methods order cond t ons construct on of h gh y stab e methods order stars error est mat on steps ze se ect n, contract v ty propert es near mu t step methods P erequ s tes MAT 371 and 423 or 421 *or* instructor approva

MAT 533 Computational Elliptic and Parabolic Partial D'fferential Equations. (3 F
Parabo c and e pt c equat ons f n te d ffere ce f n te e ement meth ods stab ty cons stency convergence pract ca aspects app a t ons, software Prerequ s tes MAT 371 and 423 or 421 *or* nstructor approva .

MAT 534 Computational Hyperbolic Partial Differential Equations. (3) S
Numer cal so ut ons of hyperbo c PDEs f n te d fference methods we -posedness stab ty cons stency convergence adapt ve gr ds Maxwel s equat ons e ast c wave propagat o Nav er Stokes Pre requ s tes MAT 371 and 423 or 421 *or* nstructor app va

MAT 535 Spectral Methods for Partial Differential Equations. 3 N
Spectra , pseudo spectra theory Ga erk n c ocat on methods Tau methods g oba approx mat on propert es stab ty convergence so ut ons for near non near systems Prerequ tes MAT 371 and 423 (or 421) *or* nstructor approva .

MAT 543 Abstract Algebra. (3 F
Groups modu es r ngs and f e ds, Ga o s theory, homo og ca a gebra and the representat o theory. Prerequ s te. MAT 444 or nstructo approva

MAT 544 Abstract Algebra. 3 S
Cont nuat on of MAT 543 Prerequ s te MAT 543 or instru tor approva

MAT 550 Variational Methods. 3 F
Calculus of var ations and ts app cat ons to extrema prob ems c as s ca mechan cs and part a d fferent a equat ons Prerequ s tes MAT 274 and 462 *or* equ va ents

MAT 551 Linear Operators and Integral Equations. 3 S
Bounded l nea and compact ope ators on H bert spaces L ear nte gra equat ons Fredho m and H bert Schm dt theory and approx mate methods Distr butions Prerequ s tes MAT 242 and 462 *or* equ va lents.

MAT 555 Fractal Geometry. 3 N
Geometry and ana ys s of fracta sets def n t ons of d mens ns ca cu at'ng d mens ons· project ons products of fracta s: random f acta s mu t fractal measures and app cat ons Prerequ s tes MAT 371 455 MAT 472 s recommended

MAT 570 Real Ana ysis 3 S
Lebesgue ntegrat n se ected f n t on spaces d fferent at on, abstract measure theory and e ements of funct ona analys s Prereq u s te MAT 372 or n tructor approva

MAT 571 Real Analysis 3 F
Cont nuat on of MAT 570 Prerequ s te MAT 570 or nstructor approva

MAT 572 Comp ex Analysis. 3 F
Ana yt c funct ons ser es and pr duct representat ons ent re and mer omorph c f nct ons, norma fam es R emann mapp ng theorem har mon c funct ons and R emann surfaces Prereq s te MAT 371 or nstructor approva

MAT 573 Complex Analysis. 3 S
C nt nuat n of MAT 572 Prerequ s te: MAT 572 or nstructor approva

MAT 574 Theory of Ordinary Differential Equations. 3 N
Systems ex stence proofs ngu ar t es asymptot c behav or f so u t ons boundedness of so ut ons e genva ues and e genfunct ons, and perturbat on theory Prerequ s te MAT 372 r nstruct r approva

MAT 575 Theory of Ord nary Different al Equations and Dynamica Systems. 3 N
Geometr c approach to ODEs and dynam ca systems un)stab e center man fo ds structura stab ty norma f rms averaging, chaos pers stence May be repeated for red t w th nstructor approval. Pre requ s tes MAT 452 nd 475 *or* MAT 574 *or* nstructor approva

MAT 576 Theory of Partial Differential Equations. 3 N
Ex stence and un queness theorems b undary va ue and nit a va ue prob ems character st s Green s funct ons max mum pr nc p e, d s tr but ons and weak so ut ns Pre equ s te kn w edge of Lebesgue ntegrat n r nstructor approva .

MAT 577 Theory of Part al D fferential Equations. 3 N
Cont nuat on of MAT 576 Prerequ s te MAT 576 or nst uct r approva

MAT 578 Functional Analysis. 3 N
Loca y convex normed and H bert spaces L near operators, spec tra theory and app cat on to c ass ca ana ys s Prerequ s te MAT 472 or 571 or nstructor approva

MAT 579 Functional Analysis. 3 N
Cont nuat on of MAT 578 Prerequ s te MAT 578 or nstructor appr va

MAT 591 Seminar 1 3 N
Top cs may be se ected from the fo ow ng
a A gebra
b Ana y
c App ed Mathemat s
d) Comb nator a Mathemat cs
e Mathemat ca Log c
f Numer ca Ana ys s
g Top gy

MATHEMATICS EDUCATION (MTE)

MTE 180 Theory of E ementary Mathematics. 3 F S SS
Number systems nt t ve geometry e ementary a gebra and mea surement ntended f r pr spect ve e ementary schoo teachers Prerequ s te MAT 117 r equ va ent

MTE 181 Theory of E ementary Mathematics. 3 A
Cont nuat on of MTE 180 Prerequ s te MTE 180 r nstructor approva

MTE 380 Arithmetic in the Elementary School 3 A
H stor ca numerat on systems overv ew f e ementary number the ory, nc ud ng pr mes, factor zat n, d v s b ty bases modu ar sys tems near congruence, a d cont nued fract ns Pre equ s te MTE 181 r nstructor approva .

MTE 381 Geometry 'n the Elementary School. 3) N
nforma geometry nc ud ng concepts of ength area vo ume s m' ar ty and ongruence. C as f cat n of f gures stra ghtedge and com pass const t ons a d mot n geometry Prerequ s te MTE 380 or nstructor appr va

MTE 480 Mathematics in the Upper-Elementary Grades I. 3) N
A ntrodu t to probab ty and stat st cs nc ud ng open ended data gather ng and process ng count ng techn ques samp ng strateg es est mat on a d de s n mak ng Prerequ s te MTE 381 or nstructor approva

MTE 481 Mathematics in the Upper-Elementary Grades II. 3 N
E ementary funct ons and the r app cat ons A thorough nvestigat on of some of the a gor'thms of bas c ar thmet c Prerequ s te MTE 480 or nstructor approva

MTE 482 Methods of Teaching Mathematics in Secondary School. (3) F SS
Exam nation of secondary schoo curr cu ar mater a and ana ys s of instruct ona dev ces Teach ng strateg es eva uat ve techn ques d ag nos s and remed ation and problem so v ng Prerequ s te nstructor approva

MTE 483 Mathematics in the Secondary School. 3 S SS
Topics n geometry, umber theory a gebra, and ana ys s Emphas s on un fy ing pr nc p es. Prerequ s te MAT 310 or nstructor approva

MTE 582 Modern Mathematics for Teachers. 3 N
Theory of sets, rea number system transf n te numbers and other se ected top cs Prerequ s te· nstructor approva

MTE 583 Abstract Algebra for Teachers. (3) N
Postu ational approach to a gebra and e ementary mathemat cal sys tems, nc ud ng groups and f e ds Prerequ s te nstructor approva

MTE 585 Modern Geometry for Teachers. (3) A
Euc dean, project ve, and non-Euc dean geometr es Prerequ s te: nstructor approval.

MTE 587 Analysis for Teachers. (3) N
Subject matter n mathemat cs appropr ate for acce erated programs 'n secondary schoo s nc ud ng analyt c geometry and ca cu us Prerequ s'te· nstructor approva .

MTE 588 Analysis for Teachers. (3) N
Continuat on of MTE 587 Prerequ s te MTE 587 or nstructor approva

STATISTICS AND PROBABILITY (STP)

STP 226 Elements of Statistics. (3) F S SS
Bas c concepts and methods of stat st cs nc ud ng descr ptive stat s t cs s gn f cance tests, est mat on sampl ng and corre at on. Not open to majors n mathemat cs or the phys ca sc ences Prerequ s te. MAT 114 or 117 or equ va ent *Genera Stud es N2*

STP 326 Intermediate Probability. 3) F S
Probab ity mode s and computat ons jo nt and condit ona distr bu tions, moments and fam es of d str but ons Top cs n stochast c pro cesses s mu at on and stat st cs Prerequisite: MAT 210 or equiva ent *General Stud es N2*

STP 420 Introductory Applied Statistics. 3 F, S SS
ntroductory probab ty descr pt ve stat st cs samp 'ng d str but ons, parameter est mat on tests of hypotheses chi square tests, regres s on analys s, ana ys s of var ance and nonparametr c tests Prerequ s te MAT 117 or equ va ent. *Genera Stud es N2*

STP 421 Probability. 3) F
Laws of probab ity, comb nator a ana ys s, random var ab es, proba- b ity d str but ons, expectat ns, moment generat ng funct ons, trans format ons of random var ab es, and centra m t theorem Prerequ s tes MAT 300 and STP 420 *or* equ va ents

STP 425 Stochastic Processes. (3 S
Markov cha ns, stat onary d str but ons pure jump processes 2D order processes and other top cs n stochast c processes Prerequ s tes. MAT 342 STP 421

STP 427 Mathematical Statistics. (3 S
L m t ng d str butions, nterva est mat on po nt est mat on suff c ent stat'st'cs and tests of hypotheses Prerequ s te STP 421.

STP 429 Experimental Statistics. (3 S
Statist ca inference for contro led exper mentat on. Mult ple regres sion corre at on analys s of var ance mu t p e compar sons and non parametr c procedures Prerequ s te STP 420 or equ valent *General Stud es. N3*

STP 525 Advanced Probability. (3) N
Measure-theoret'c foundations of probab l ty d str but on funct ons and character st c funct ons aws of arge numbers and centra m t theo rems, cond t ona probabi t es mart nga es and top cs n stochast c processes Prerequ s tes MAT 571 and STP 421 *or* nstructor approva

STP 526 Theory of Statistical L'near Models. 3) F
Mu t norma d str but on d str but on of quadrat c forms fu and nonfu rank mode s genera zed inverses unba anced data var ance compo- nents and the large samp e theory Prerequ s tes STP 427, know edge of matr x a gebra

STP 530 Applied Regression Analysis. 3 F
Method of east squares simp e and mu t p e near regress on po y nom a regress on, ana ys s of res'dua s, dummy var ab es, and mode bu d ng Prerequ s te. STP 420 or equ va ent

STP 531 Applied Analysis of Variance. 3 S
Factor a des gns, ba anced and unba anced data f xed and random effects random zed b ocks Lat n squares ana ys s of covar ance and mu tiple compar sons Prerequ s te STP 420 or equ va ent

STP 532 Applied Nonparametric Statistics. 3 F
One sample test tests of 2 or more re ated or ndependent samp es measures of correlat on, and tests of trend and dependence Prereq- u s te STP 420 or equ valent

STP 533 Applied Multivariate Analysis. 3) S
D scr m nant ana ysis pr nc pal compo ents factor ana ys s c uster analys s and canonica corre at on Prerequ s te STP 420 or equ va ent

STP 534 Applied Discrete Data Analys's. 3 N
Models for d screte and count data measures of assoc at on and og- near and regress on mode s for cont ngency tab es. Prerequ s te STP 420 or equ valent

STP 535 Applied Sampling Methodology. 3) S
S mp e random strat f ed c uster samp ng var ance est mat'on n complex surveys nonparametr c superpopu at on approaches nonre sponse models c mputat ona methods. Prerequ s te STP 42 or equ va ent

STP 591 Seminar. (1 3 N
Top cs may be se ected from the fo ow ng
(a Probab ty
(b Stat st cs

Department of Microbiology

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Chair
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lsvl.la.asu.edu/microbiology

PROFESSORS
BURKE JACOBS, MOSSMAN, SCHMIDT

ASSOCIATE PROFESSORS
BIRGE, HOFFMAN M SRA, STOUT

ASSISTANT PROFESSORS
BLOOM, CHANG

CLINICAL FACULTY
DOWNS, LEFEVRE MASS ROBERTS

MICROBIOLOGY—B.S.

The B.S. degree in Microbiology consists of a minimum of 41 semester hours in microbiology and approved related fields. Students majoring in Microbiology are required to take the following courses.

BIO 181 General Biology *S1 S2*. 4
BIO 182 General Biology *S2*. 4
BIO 340 General Genetics 4

NOTE: For the Genera Stud es req rement courses and codes (such as L1 N3 C and H) see Genera Stud es page 85. For graduat on requ rements, see ' Un vers ty Graduat on Requ rements " page 81. For an exp anat n of add't ona omn bus courses offered but not sted n th s cata og see 'C ass f cat on of Courses, page 58

Choose between the course combinations below			8
CHM	231	Elementary Organic Chemistry *S1/S2*	(3
CHM	235	Elementary Organic Chemistry Laboratory *S1/S2*	(1)[1]
CHM	361	Principles of Biochemistry	(3)
CHM	367	Elementary Biochemistry Laboratory	(1)
		or	
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)
MIC	206	Microbiology Laboratory *S2*[2]	1
MIC	220	Biology of Microorganisms	3
MIC	302	Advanced Bacteriology Laboratory *L2*[3]	2
MIC	360	Bacterial Physiology	3
MIC	401	Research Paper *L2*[3]	1
Total			30

[1] Both CHM 231 and 235 must be taken to secure S1 or S2 credit

[2] Both MIC 205 and 206 must be taken to secure S2 credit.

[3] Both MIC 302 and 401 must be taken to secure L2 credit.

A minimum of 11 semester hours of upper-division electives in microbiology or approved related fields must be taken.

These elective hours must include two courses chosen from the following:

MIC	421	Experimental Immunology	2
MIC	446	Techniques in Molecular Biology/Genetics Laboratory	2
MIC	470	Bacterial Diversity and Systematics	4
MIC	494	ST: Clinical Bacteriology Laboratory	3
MIC	495	Undergraduate Research	2

In addition, students are required to fulfill the university numeracy requirements with MAT 210 (or 270 or 290) as their N1 course and BIO 420 (or any CSE course that meets the N3 requirement). The required supplemental courses are as follows:

CHM	113	General Chemistry *S1/S2*	4
CHM	115	General Chemistry with Qualitative Analysis *S1/S2*	5
PHY	111	General Physics *S1/S2**	3
PHY	112	General Physics *S1/S2**	3
PHY	113	General Physics Laboratory *S1/S2**	1
PHY	114	General Physics Laboratory *S1/S2**	1
Total			17

* Both PHY 111 and 113 or PHY 112 and 114 must be taken to secure S1 or S2 credit.

CLINICAL LABORATORY SCIENCES—B.S.

The goal of the Clinical Laboratory Sciences degree program is to prepare individuals to practice in the field of clinical laboratory sciences, which includes the major disciplines of clinical chemistry, hematology, immunohematology, and microbiology. Employment opportunities exist in hospital, private, physician, and research laboratories and in government, sales, management, and education. After obtaining a B.S. degree in Clinical Laboratory Sciences, the graduate is eligible for national certification by examination.

A student majoring in Clinical Laboratory Sciences is required to take 40 hours of clinical laboratory sciences courses. Also required are the following courses:

BIO	360	Basic Physiology	4
CHM	113	General Chemistry *S1/S2*	4
CHM	231	Elementary Organic Chemistry *S1/S2*[1]	3
CHM	361	Principles of Biochemistry	3
MIC	205	Microbiology *S2*[2] or MIC 220 Biology of Microorganisms (3)	3
MIC	206	Microbiology Laboratory *S2*[2]	1
Total			18

[1] Both CHM 231 and 235 must be taken to secure S1 or S2 credit

[2] Both MIC 205 and 206 must be taken to secure S2 credit

Equivalent courses may be substituted upon approval of an advisor. Students must consult with the clinical laboratory sciences advisor to select general electives courses. Completion of the degree is dependent upon acceptance of the student into the accredited professional study program, which consists of 41 hours of clinical laboratory sciences courses. The university does not guarantee all students to be accepted into the professional study program due to space limitations at the clinical affiliates and restrictions of program accreditation. For more information on acceptance procedures and program standards, contact the department for a program brochure. For proper course planning, students must meet with a clinical laboratory sciences advisor

MINOR IN MICROBIOLOGY

The minor in Microbiology consists of a minimum of 24 semester hours. Required courses are as follows:

BIO	181	General Biology *S1/S2*	4
BIO	182	General Biology *S2*.	4
BIO	340	General Genetics	4
MIC	206	Microbiology Laboratory *S2*[1]	1
MIC	220	Biology of Microorganisms	3
MIC	302	Advanced Bacteriology Laboratory *L2*[2]	2
MIC	360	Bacterial Physiology	3
Total			21

[1] Both MIC 205 and 206 must be taken to secure S2 credit.

[2] Both MIC 302 and 401 must be taken to secure L2 credit

The remaining upper division microbiology courses are chosen in consultation with an advisor. Students majoring in Biology may not minor in Microbiology.

GRADUATE PROGRAMS

The faculty in the Department of Microbiology offer programs leading to the degrees of Master of Natural Science, M.S., and Ph.D. Consult the *Graduate Catalog* for requirements.

The department participates in the interdisciplinary program for the M.S. and Ph.D. degrees in Molecular and Cellular Biology. Consult the *Graduate Catalog* for courses, faculty, and program information or call 480/965-0743 for more information.