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	441	General Physical Chemistry	3
CHM	442	General Physical Chemistry	3
CHM	453	Inorganic Chemistry	3
CHM	471	Solid State Chemistry	3

Technical Electives

CHE	458	Semiconductor Material Processing	3
CHE	494	Special Topics	1–4
ECE	352	Properties of Electronic Materials	4
EEE	435	Microelectronics	3
EEE	436	Fundamentals of Solid State Devices	3
EEE	439	Semiconductor Facilities and Cleanroom Practices	3
MSE	353	Introduction to Materials Processing and Synthesis	3
MSE	354	Experiments in Materials Synthesis and Processing I	2
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

Chemical 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 *N3*	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	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

CHE	311	Introduction to Chemical Processing	3
ECE	380	Probability and Statistics for Engineering Problem Solving *N2*	3
ECE	394	ST: Conservation Principles	4
ECN	111	Macroeconomic Principles *SB* or ECN 112 Microeconomic Principles *SB*	3
MAT	274	Elementary Differential Equations	3
Total			16

Second Semester

CHE	331	Transport Phenomena I Fluids	3
ECE	384	Numerical Analysis for Engineers I	2
ECE	394	ST: Properties that Matter	4
MAT	272	Calculus with Analytic Geometry III	4
HU or SB elective			4
Total			17

Third Year

First Semester

CHE	332	Transport Phenomena II: Energy Transfer	3
CHE	342	Applied Chemical Thermodynamics	4
CHM	331	General Organic Chemistry	3
CHM	335	General Organic Chemistry Laboratory	1
ECE	300	Intermediate Engineering Design *L1*	3
HU or SB elective			3
Total			17

Second Semester

CHE	333	Transport Phenomena III: Mass Transfer	3
CHE	352	Transport Laboratories *L2*	3
CHE	432	Principles of Chemical Engineering Design	3
CHM	332	General Organic Chemistry	3
ECE	385	Numerical Analysis for Engineers II	2
ECE	394	ST: Engineering Systems	4
Total			18

Fourth Year

First Semester

CHE	442	Chemical Reactor Design	3
CHE	451	Chemical Engineering Laboratory	2
CHE	461	Process Control *N3*	4
HU, SB, and awareness area courses			3
Technical elective			3
Total			15

Second Semester

CHE	462	Process Design	3
HU, SB, and awareness area courses			3
Technical elective			9
Total			15
Total degree requirements*			128

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

BIOENGINEERING—B.S.E.

PROFESSORS
GUILBEAU, TOWE

ASSOCIATE PROFESSORS
GARCIA, HE, PIZZICONI, SWEENEY, YAMAGUCHI

ASSISTANT PROFESSOR
KIPKE

LECTURER
D. BEAUDOIN

Bioengineering (synonyms: biomedical engineering, medical engineering) is the discipline of engineering that applies principles and methods from engineering, the physical sciences, the life sciences, and the medical sciences to understand, define, and solve problems in medicine, physiology, and biology. Bioengineering bridges the engineering, physical, life, and medical sciences. More specifically, the bioengineering program at ASU educates engineering students to use engineering principles and technology to develop instrumentation, materials, diagnostic and therapeutic devices, artificial organs, and other equipment needed in medicine and biology and to discover new fundamental principles regarding the functioning and structure of living systems. The multidisciplinary approach to solving problems in medicine and biology has evolved from exchanges of information between specialists in the concerned areas.

Because a depth of knowledge from at least two diverse disciplines is required in the practice of bioengineering, students desiring a career in bioengineering should plan for advanced study beyond the bachelor's degree. The Bioengineering major at ASU is especially designed for students desiring 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 pages 79–83.

COURSE REQUIREMENTS

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

First-Year Composition

ENG	101, 102	First-Year Composition	6
		or ENG 105 Advanced First-Year Composition	3
		or ENG 107, 108 English for Foreign Students	6
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
SB, HU, 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/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 I *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 I	2
MAT	270	Calculus with Analytic Geometry I *N1*	4
MAT	271	Calculus with Analytic Geometry II	4
MAT	272	Calculus with Analytic Geometry III	4
MAT	274	Elementary Differential Equations	3
Total			21
General Studies/school requirements total			60

Engineering Core

ECE	21	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			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	470	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.

[2] 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, non-invasive imaging, neural engineering, and electrophysiology should consider this area of emphasis. Technical electives must include the following:

BME	350	Signals and Systems for Bioengineers	3
		or EEE 303 Signals and Systems	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	3
		or MSE 471 Introduction to Ceramics	(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 202):

ECE	384	Numerical Analysis for Engineers I	2
		or MAT 242 Elementary Linear Algebra (2)	

Technical electives must include the following:

BME	419	Biocontrol Systems	3
		or BME 350 Signals and Systems for Bioengineers (3) or EEE 303 Signals and Systems (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	411	Biomedical Engineering I	3
		or BME 412 Biomedical Engineering II	(3
BME	415	Biomedical Transport Processes	3
BME	419	Biocontrol Systems	3
		or BME 350 Signals and Systems for Bioengineers	(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 also required in addition to the degree requirements

Bioengineering 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	4
PHY	121	University Physics I: Mechanics *S1/S2*[1]	3
PHY	122	University Physics Laboratory I *S1/S2*[1]	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	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	3
HU, SB, and awareness area courses[3]			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

NOTE: For the General Studies requirement, codes (such as L1, N3, C and H), and courses, see pages 84–108 For graduation requirements see pages 79–83 For omnibus courses offered but not listed in this catalog, see pages 56–57.

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

[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 page 196.

MATERIALS SCIENCE AND ENGINEERING—B.S.E.

REGENTS' PROFESSOR
MAYER

PROFESSORS
DEY, KRAUSE, MAHAJAN

ASSOCIATE PROFESSOR
ADAMS

ASSISTANT 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 pages 79 83.

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

ENG	101, 102	First Year Composition . ... or ENG 105 Advanced First-Year Composition (3) or ENG 107, 108 English for Foreign Students (6)	6
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, 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

NOTE: For the General Studies requirement codes (such as L1, N3, C, and H), and courses see pages 84–108. For graduation requirements see pages 79–83 For omnibus courses offered but not listed in this catalog see pages 56–57

MAT	242	Elementary Linear Algebra	2
MAT	270	Calculus with Analytic Geometry I *NI*	4
MAT	271	Calculus with Analytic Geometry II	4
MAT	272	Calculus with Analytic Geometry III	4
MAT	274	Elementary Differential Equations	3
Total			21
General Studies/school requirements total			59

Engineering Core

ECE	210	Engineering Mechanics. 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	430	Thermodynamics of Materials	3
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			50

[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] In order to take CHM 341 Elementary Physical Chemistry, CHM 331 Organic Chemistry must be taken as the prerequi site.

[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 ar eas. A student may, with prior ap proval of the department, select a gen eral 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	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
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 de sired 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 Process ing. 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 process ing 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	4
PHY	121	University Physics I: Mechanics *S1/S2* [1]	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
MAT	272	Calculus with Analytic Geometry III	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	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 Diffraction	3
HU, SB, and awareness area courses[3]			6
Total			18

Fourth Year

First Semester

MSE	440	Mechanical Properties of Solids	3
MSE	470	Polymers and Composites	3
MSE	471	Introduction to Ceramics	3
MSE	482	Materials Engineering Design	3
Technical elective			4
Total			16

Second Semester

ECE	400	Engineering Communications *L2*	3
MSE	490	Capstone Design Project	3
Advanced science course[4]			3
HU, SB, and awareness area course[3]			3
Technical electives			4
Total			16
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 fulfill HU and SB requirements. See page 196.

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

BIOENGINEERING (BME)

BME 201 Introduction to Bioengineering. (3) F
Impact of bioengineering on society. Developing an awareness of the contributions of bioengineering to solving medical and biological problems. Cross listed as STE 201. Prerequisite: ENG 102 or 105 or 108. *General Studies L1*

BME 202 Global Awareness Within Biomedical Engineering Design. (3) F
Introduction to ethical, legal, social, economic, and technical issues arising from the design and implementation of bioengineering technology. Lecture, critical discourse. Prerequisites: ECE 100, ECN 111 or 112; ENG 102. *General Studies. L1, HU.*

BME 318 Biomaterials. (3) S
Material properties of natural and artificial biomaterials. Tissue and blood biocompatibility. Uses of materials to replace body parts. Prerequisite: ECE 350.

BME 331 Biomedical Engineering Transport I: Fluids. (3) F S
Transport phenomena with emphasis on biomedical engineering fluid systems. Prerequisites: MAT 274; PHY 131.

BME 334 Bioengineering Heat and Mass Transfer. (3) S
Application of the principles of heat and mass transfer phenomena to solution of problems in medicine and medical device design. Prerequisite: ECE 340. Prerequisite with a grade of "C" or higher: BME 331.

BME 350 Signals and Systems for Bioengineers. (3) S
Application of principles of calculus and ordinary differential equations to modeling and analysis of responses, signals, and signal transfers in biosystems. Prerequisites: ECE 301, MAT 272, 274.

BME 411 Biomedical Engineering I. (3) F
Review of diagnostic and prosthetic methods using engineering methodology. Introduction to transport, metabolic, and autoregulatory processes in the human body. Prerequisite with a grade of "C" or higher: BME 334.

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

BME 413 Biomedical Instrumentation. (3) F
Principles of medical instrumentation. Studies of medical diagnostic instruments and techniques for the measurement of physiological variables in living systems. Prerequisites: ECE 300, 334. Prerequisite with a grade of "C" or higher: BME 435. Corequisite: BME 423. *General Studies L2*

BME 415 Biomedical Transport Processes. (3) A
Pr nc'p es of momentum heat and mass transport w th app cat ons to med cal and b o og ca systems and med ca dev ce des gn Prerequis tes MAT 274; PHY 131

BME 416 Biomechanics. 3 F
Mechan ca propert es of bone musc e and soft t ssue Static and dynam c ana ys s of hu man movement tasks such as locomot on Prerequ s te w th a grade of "C or h gher BME 318

BME 417 Biomedical Engineering Capstone Design I. (3) F
Technica , regulatory, econom c, egal, soc a and eth ca aspects of medical device systems eng neer ng des gn Lecture field tr ps Pre requ's tes w th a grade of 'C or higher BME 318, 334.

BME 419 Biocontrol Systems. 3 F
App cat on of near and nonl near contro systems techn'ques toward ana ys s of neuro musculoskeleta card ovascu ar thermal, and mass transfer systems of the body Prerequ s tes ECE 301 MAT 274

BME 423 Biomedical Instrumentation Laboratory. (1) F
Laboratory exper ence with prob ems con cepts and techn ques of b omed cal nstru mentat on in stat c and dynam c env ronments. Lab. Prerequ s tes: ECE 300, 334. Prerequ - site with a grade of "C" or h gher BME 435 Corequ s te BME 413 *General Studies. L2*

BME 435 Physiology for Engineers. 4 F
Physiology of the nervous, muscu ar card o vascu ar endocr ne, rena , and resp ratory systems Emphas zes use of quant tat ve methods n understand ng physiolog ca systems. Lecture, ab Prerequisites. B O 181 and CHM 116 and PHY 131 *or* nstructor approva

BME 470 Microcomputer Applications in Bioengineering. (4) S
Use of m crocomputers for rea t me data co ect on, ana ys s, and control of experiments nvo v ng actua and simu ated phys o og ca systems. Lecture lab Prerequ s tes ECE 100, 334. Prerequ s te w th a grade of 'C" or higher BME 435

BME 490 Biomedical Engineering Capstone Design II. (1 5) F, S
nd v'dua projects n med'cal systems or med ca dev ce design and deve opment Lec ture lab Prerequisite with a grade of 'C or h gher BME 417

BME 496 Professional Seminar. (1–3 F S
Profess ona and eth ca aspects w th a d s cuss on of respons b t es Lecture, f e d trips Prerequ s te nstructor approva

BME 511 Biomedical Engineering. (3 A
D agnost c and prosthet c methods us ng engi neering methodology. Transport metabo c, and autoregu atory processes n the body

BME 512 Biomedical Engineering II. (3) A
Electrophys o ogy and nerve pac ng app ica t ons ntroduct on to biomechan cs and jo nt/ l mb replacement technology, card ovascular and pu monary flu d mechan cs, and math emat ca model ng

BME 513 Biomedical Instrumentation I. (3 A
Pr nc p es of med cal nstrumentation Stud es of med ca d agnost c nstruments and tech n ques for the measurement of phys o og c var ables n v ng systems.

BME 514 Advanced Biomedical Instrumentation. 3 F
Principles of app ed b ophysica measure ments us ng b oe ectr c and rad o ogica ap proach Prerequ'sites ECE 334 MAT 274 (or equivalent).

BME 515 Biomed'cal Transport Processes. 3 N
Pr nc p es of momentum, heat, and mass transport w th app cations to med ca and b o- log cal systems and med ca dev ce des gn Prerequ s te· nstructor approval

BME 516 Topics in Biomechanics. (3 F
Mechan cal propert es of bone musc e, and soft t ssue Stat c and dynam c ana ysis of hu man movement tasks, nc ud ng n depth project Prerequisite nstructor approva .

BME 518 Introduction to Biomaterials. 3) S
Top cs nclude structure property re at onships for synthet c and natura biomater als b ocom- pat b l ty and uses of mater a s to rep ace body parts Prerequisite: ECE 350 or equ va- ent or nstructor approva

BME 519 Topics in Biocontrol Systems. (3) F
Linear and non inear contro systems ana ys s of neuromuscu oskeleta , card ovascular, ther mal, and mass transfer systems of the body inc ud'ng 'n depth project Prerequ sites ECE 301 and MAT 274 *or* nstructor approval

BME 520 Bioelectric Phenomena. (3) N
Study of the orig n, propagation and nterac- t ons of b oe ectric ty in v ng th ngs vo ume conductor prob em mathemat ca ana ys s of b oe ectric nteract ons and uses n med cal d agnost cs.

BME 521 Neuromuscular Control Systems. (3) S
Overv ew of sensor motor bra n structures Appl cat on of non inear, adapt've opt ma and supervisory contro theory to eye-head hand coord nat on and ocomot on

BME 522 Biosensor Design and Application. (3 A
Theory and pr'nc p es of b osensor des gn and app cat on n med c ne and b o ogy Pr nc p es of measurements w th biosensors. Prerequ s te nstructor approva

BME 523 Physiological Instrumentation Lab. (1 F
Laboratory exper ence w th prob ems, con cepts and techn ques of b omed ca instru mentation n stat c and dynam c env ronments Lab Pre or corequ s tes AGB BME 435; BME 413, ECE 334

BME 524 Fundamentals of Applied Neural Control. 3) A
Fundamenta concepts of e ectr ca stimu ation and record ng n the nervous system with the goa of functiona contro restorat on Pre- or corequ s te BME 435 or nstructor approva

BME 525 Surgical Techniques. (2) S
Pr nc p es of surg cal techn ques standard op erat ve procedures federal regu ations, gu de l nes and state of the art methods Lecture lab

BME 532 Prosthetic and Rehabilitation Engineering. (3) A
Ana ys s and cr tica assessment of des gn and contro strateg es for state-of the art med ca dev ces used n rehabil tation eng - neering Pre or corequ s te BME 416 or 516 or EPE 610

BME 533 Transport Processes I. 3) F
Un f ed treatment of momentum heat, and mass transfer from mo ecular theory and con t nuum points of view Cont nuum equat ons of microscop c and macroscop c systems and mu t component and mult phase systems. Cross isted as CHE 533

BME 534 Transport Processes II. (3) S
Cont nuat on of BME/CHE 533 emphas z ng mass transfer. Cross l sted as CHE 534 Pre requ's te: BME/CHE 533

BME 543 Thermodynamics of Chemical Systems. (3) F
C ass ca and stat st ca thermodynam cs of non deal phys cochem cal systems and pro- cesses, pred ct on of opt mum operat ng con d t ons Cross sted as CHE 543.

BME 544 Chemical Reactor Engineering. (3) S
React on rates thermodynam cs and trans- port pr nc p es app ed to the design and op- erat on of chem ca reactors Cross l sted as CHE 544 Prerequ s te BME/CHE 543

BME 551 Movement Biomechanics. (3) S
Mechan cs appl ed to the ana ys s and model ng of phys o og cal movements Computa t ona mode ng of musc es tendons jo nts, and the ske eta system w th app ication to sports and rehab i tat on Prerequisite BME 416 or 516 or nstructor approva .

BME 566 Medical Imaging Instrumentation. (3) N
Des gn and ana ys s of mag ng systems and nuc ear dev'ces for med ca d agnos s, ther apy and research Laboratory exper ments using d agnost c rad o ogy f uoroscopy u tra sound, a d CAT scann ng Lecture, ab Pre requ s te nstructor approva

BME 567 Radiation Shielding and Transport. (3 F
Sh'e d ng for rad'at on therapy d agnost c ra- d o ogy cyc otrons, and nuc ear reactors Monte Carlo and emp rica computat ona methods regu ations and des gn prob ems Cross- sted as EEE 567 Prerequ s te EEE 465

BME 568 Medical Imaging. (3 S
CT SPECT, PET, and MR 3 d mensiona *in v vo* measurements. Instrument des gn, physi o og ca mode ng c inical protoco s, recon struct on a gorithms, and quant tat on ssues. Prerequ site nstructor approva

CHEMICAL ENGINEERING (CHE)

CHE 311 Introduction to Chemical Processing. (3) F S
App cat on of chem cal eng neering ana ys s and prob em so v ng to chemica processes materia and energy ba ance methods and sk s. Prerequ s tes CHM 116; MAT 271

NOTE For the General Stud es requ rement, codes (such as L1, N3 C and H and courses see pages 84–108 For graduat on requirements see pages 79–83. For omn bus courses offered but not sted n th s cata og, see pages 56–57.

CHE 331 Transport Phenomena I: Fluids. (3 F S
Transport phenomena with emphas s on f u d systems Prerequ s tes· CHE 311 ECE 394 ST Conservat on Pr nc p es· MAT 274

CHE 332 Transport Phenomena II: Energy Transfer. 3 F S
Cont nuat on of transport pr nc p es w th em phasis on energy transp rt n stat'onary and f u d systems. Prerequis'te· CHE 331

CHE 333 Transport Phenomena III: Mass Transfer. (3 F S
The app cat on of transport phenomena to mass transfer The des gn of mass transfer equ pment nc ud ng staged processes Pre requis te CHE 332

CHE 342 Applied Chemical Thermodynamics. 4 F S
App icat on of conservat o and accounting pr nc p es w th non dea property estimat on techn ques to mode phase and chem ca equ br um processes Lecture rec tat on Prerequisites CHE 311 ECE 394 ST Con servat on 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 demonstrat on of transport phenomena pr nciples w th exper ments in fluid flow heat, and mass transfer Prerequ s tes CHE 332; ECE 300 Pre- or corequ s te· CHE 333 *Gen era Stud es L2*

CHE 432 Principles of Chemical Engineering Design. 3 F
Mu t component d st at on eng neer ng eco nom cs equ pment s z ng and costs p ant op erat on econom cs and s mu ation 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 chem cal reactor de s gn Prerequ s te CHE 342 Pre or corequ s te. CHE 333

CHE 451 Chemical Engineering Laboratory. 2 F
Operat on. contr l, and des gn of exper mental and industria process equ pment ndependent research projects 6 hours lab Prerequ s tes CHE 333, 352, ECE 384

CHE 458 Semiconductor Material Processing. (3) N
ntroduct on to the process ng and character zation of e ectron c mater als for sem conduc tor app cat ons Prerequ s tes CHE 333, 342

CHE 461 Process Control. 4 F
Process dynam cs str mentat on and feedback app ed t aut mat c process contro Lecture lab. Prerequ s te ECE 394 ST Sys tems. *Genera Stud es N3*

CHE 462 Process Design. 3) S
App cat on of econom c pr nc p es to opt mize equ pment se ect on and des gn deve opment and des gn of process systems. Prerequ s tes. CHE 432 442

CHE 474 Chemica Engineering Design for the Env'ronment. 3 F
Conf ct of process ng mater a s and preserv ng the natura resources Students w l understand/va ue the env ronment and attempt to contro our mpact Prerequ s tes CHE 333, 342

CHE 475 Biochemical Engineering. (3) N
App cat on of chem ca eng eering methods, mass transfer, thermodynam cs and transport phenomena to industr a b otechno ogy Pre requ s te nstructor appr val

CHE 476 Bioreaction Engineering. (3) N
Pr nciples of ana ys s and des gn of reactors for processing w'th ce ls and other b o og ca y act ve mater a s; applicat ons of reaction eng neer ng in b otechno ogy Prerequisite: nstructor approval.

CHE 477 Bioseparation Processes. (3) N
Principles of separat on of bio og cal y act ve chem cals the app cation scaleup, and de s gn of separation processes in b otechno ogy Prerequ'site: instructor approva

CHE 478 Industrial Water Quality Engineering. (3) F
Chem ca treatment process ng qual ty cr tena and contro , system des gn, and water po ut ants Prerequ's tes: CHE 331· senior stand ng

CHE 479 Air Quality Control. (3) F
A r po utant contro , effects, and orig ns. Chem cal and phys ca processes, ncluding combustion contro equ pment des gn, disper sion and sampl ng. Prerequis tes CHE 331· sen or stand ng

CHE 490 Chemical Engineering Projects. (1–5) F S SS
Ind v dual projects in chemica eng neering op erat ons and des gn. Prerequ s te nstructor approva .

CHE 496 Professional Seminar. (1 3) F S
Professiona and ethical aspects with a d scussion of responsibi t es Lecture, field tr ps Prerequ s te: nstructor approva

CHE 501 Introduction to Transport Phenomena. (3) F, S
Transport phenomena w th emphas s on f u d systems Prerequisite: trans tion student w th instructor approva .

CHE 502 Introduction to Energy Transport. (3) F S
Cont nuat on of transport princ ples, w th emphas s on energy transport in stat'onary and flu d systems Prerequ s'te: transition student w th nstructor approval

CHE 503 Introduction to Mass Transport. (3) F, S
The appl cat on of transport phenomena to mass transfer The des gn of mass transfer equipment, inc ud ng staged processes Pre requ s te trans't on student with nstructor ap proval.

CHE 504 Introduction to Chemical Thermodynamics. (3) F S
Energy re ations and equ ibrium conversions based on chemica potent a s and phase equ bria Prerequisite: trans t on student w th n structor approva

CHE 505 Introduction to Chemical Reactor Design. 3) F, S
App cation of k netics to chem cal reactor de s gn Prerequ s te transit on student with in structor approva

CHE 527 Advanced Applied Mathematical Analysis in Chemical Engineering. (3) F
Formulat on and solut on of complex mathemat ca re at onsh ps resu ting from the de scr ption of physical problems n mass, en ergy, and momentum transfer and chemica k net cs

CHE 528 Process Optimization Techniques. (3) S
Method for opt miz ng engineering processes Exper menta des gn and analys s· inear and non inear regress on methods class cal, search and dynam c programm ng a gonthms

CHE 533 Transport Processes I. (3) F
Un fied treatment of momentum heat and mass transfer from mo ecu ar theory and cont nuum po nts of v ew Cont nuum equations of m croscop c a d macroscop c systems and mu ticomponent and mu tiphase systems Cross sted as BME 533

CHE 534 Transport Processes II. (3) S
Cont nuation of CHE/BME 533, emphasiz ng mass transfer Cross sted as BME 534 Pre requisite BME/CHE 533

CHE 536 Convective Mass Transfer. (3 N
Turbulent flow for mu ticomponent systems inc ud ng chem ca react ons with app cat'ons in separat ons and a r po ut on Prerequisite: CHE 533 or MAE 571.

CHE 543 Thermodynamics of Chemical Systems. 3) F
Class ca and statist ca thermodynam cs of non deal phys cochem ca systems and pro cesses, predict on of opt mum operating con d t ons Cross l sted as BME 543.

CHE 544 Chemical Reactor Engineering. (3) S
React on rates thermodynam cs and transport pr nc p es app ed to the design and operat on of chem ca reactors Cross- sted as BME 544. Prerequ s te BME CHE 543

CHE 548 Topics in Catalysis. 3 N
Engineer ng cata ys s emphas z ng adsorp t on k net cs, characterization d ffusiona con s derat ons and reactor des gn. Other topics nc ude mechan sms, surface ana yses and e ectron c structure

CHE 552 Industrial Water Quality Engineering. 3 N
Water pol utants, qua ity cr ter a and contro chem ca treatment process ng and system des gn Case stud es Prerequisite: CHE 331 or equ valent.

CHE 553 Air Quality Control. (3) N
Air po utant or g ns effects and contro . Phys cal and chem ca processes nc ud ng dispers on combust on samp ng contro equ pment des gn, and spec a top cs Prereq u site CHE 331 or equ va ent

CHE 554 New Energy Technology. 3) N
Gas f cat on, l quefact on pyro ys s and combust on processes for coal, wastes, and other raw materia s n s tu processes for coa , oi , sha e, and ge therma energy. Env ronmental qua ty issues

CHE 556 Separation Processes. (3 N
Top cs n b nary mult component separation rate governed and equi brat on processes mass transfer cr ter a energy requ rements, separat ng age ts and dev ces and staged operat ons

CHE 558 Electronic Materials. (3) N
Process ng and character zat on of e ectron c materia s for sem conductor type uses Ther modynam cs and transport phenomena phase equi br a and structure mass transfer and diffus on and therma properties

CHE 561 Advanced Process Control. (3) S
Dynam c process representat on, near opt ma control optimal state reconstruct on and parameter and state est mat on techn ques for cont nuous and d screte time systems.

CHE 563 Chemical Engineering Design. (3) N
Computat onal methods the des gn of chemi ca plants and processes

MATERIALS SCIENCE AND ENGINEERING (MSE)

MSE 353 Introduction to Materials Processing and Synthesis. (3) F
Principles of materials structure and properties with emphasis on applications in bulk and thin film materials processing and synthesis Prerequisites: CHM 116 and PHY 131 *or* equivalents.

MSE 354 Experiments in Materials Synthesis and Processing I. (2) S
Small groups of students complete three experiments selected from a list Each is supervised by a selected faculty member Lab Prerequisite: MSE 353 or equivalent.

MSE 355 Introduction to Materials Science and Engineering. (3) F
Elements of the structure of metals and alloys measurement of mechanical properties, and optical metallography Lecture lab field trips. Prerequisite: CHM 114 or 116.

MSE 420 Physical Metallurgy. (3) F
Crystal structure and defects. Phase diagrams, metallography solidification and casting, deformation and annealing. Prerequisite ECE 350.

MSE 421 Physical Metallurgy Laboratory. (1) S
Focuses on analysis of microstructure of metals and alloys and includes correlation with mechanical properties to some extent Lab Pre- or corequisite: MSE 420

MSE 430 Thermodynamics of Materials. (3) N
Principles of statistical mechanics, statistical thermodynamics of single crystals, solutions, phase equilibrium, free energy of reactions, free electron theory, and thermodynamics of defects. Prerequisite: ECE 340.

MSE 431 Corrosion and Corrosion Control. (3) S
Introduction to corrosion mechanisms and methods of preventing corrosion. Topics include the following: electrochemistry, polarization, corrosion rates, oxidation, coatings, and cathodic protection Prerequisite. ECE 350.

MSE 440 Mechanical Properties of Solids. (3) S
Effects of environmental and microstructural variables of mechanical properties, including plastic deformation, fatigue, creep, brittle fracture, and internal friction Prerequisite: ECE 350.

MSE 441 Analysis of Material Failures. (3) S
Identification of types of failures Analytical techniques. Fractography, SEM, nondestructive inspection and metallography Mechanical and electronic components. Prerequisite ECE 350.

MSE 450 X-ray and Electron Diffraction. (3) F
Fundamentals of X-ray diffraction transmission electron microscopy, and scanning electron microscopy. Techniques for studying surfaces, internal microstructures and fluorescence. Lecture, demonstrations. Prerequisite ECE 350.

MSE 453 Experiments in Materials Synthesis and Processing II. (2) F
A continuation of MSE 354 with emphasis on characterization Small groups complete three experiments supervised by selected faculty members Lab Prerequisites MSE 353 and 354 *or* equivalents.

MSE 454 Advanced Materials Processing and Synthesis. (3) S
Case studies from published literature of current techniques in materials processing and synthesis Student participation in classroom presentations Lecture, recitation. Prerequisites: MSE 353 and 354 *or* equivalents.

MSE 470 Polymers and Composites. (3) F
Relationship between chemistry, structure and properties of engineering polymers. Design, properties, and behavior of fiber composite systems. Cross listed as MAE 455. Prerequisite: ECE 350.

MSE 471 Introduction to Ceramics. (3) F
Principles of structure and property relations in ceramic materials Processing techniques Applications in mechanical, electronic, and superconducting systems Prerequisite ECE 350

MSE 472 Integrated Circuit Materials Science. (3) N
Principles of materials science applied to semiconductor processing and fabrication in metals ceramics, polymers, and semiconductors Prerequisite. ECE 350.

MSE 482 Materials Engineering Design. (3) F, S
Principles of the design process Feasibility and optimization. Manufacturing processes, materials selection, failure analysis and economics Prerequisites. ECE 313, 350

MSE 490 Capstone Design Project. (1–3) F S
For small groups in fundamental or applied aspects of engineering materials, emphasis on experimental problems and design. Prerequisites: MSE 430, 440 450.

MSE 496 Professional Seminar. (1–3) F, S
Professional and ethical aspects with discussion of responsibilities Lectures, field trips. Prerequisite: instructor approval

MSE 510 X-ray and Electron Diffraction. (3) F
Fundamentals of X ray diffraction, transmission electron microscopy, and scanning electron microscopy Techniques for studying surfaces, internal microstructures, and fluorescence. Lecture, demonstrations Prerequisite: transition student with instructor approval.

MSE 511 Corrosion and Corrosion Control. (3) S
Introduction to corrosion mechanisms and methods of preventing corrosion Topics include the following electrochemistry, polarization, corrosion rates, oxidation, coatings, and cathodic protection Prerequisite: transition student with instructor approval.

MSE 512 Analysis of Material Failures. (3) S
Identification of types of failures. Analytical techniques Fractography, SEM, nondestructive inspection, and metallography. Mechanical and electronic components Prerequisite: transition student with instructor approval

MSE 513 Polymers and Composites. (3) F
Relationship between chemistry, structure and properties of engineering polymers. Design, properties and behavior of fiber composite systems

MSE 514 Physical Metallurgy. (4) F
Crystal structure and defects Phase diagrams, metallography, solidification and casting and deformation and annealing Lecture lab Prerequisite transition student with instructor approval

MSE 515 Thermodynamics of Materials. (3) N
Principles of statistical mechanics, statistical thermodynamics of single crystals, solutions, phase equilibrium, free energy of reactions, free electron theory, and thermodynamics of defects. Prerequisite: transition student with instructor approval.

MSE 516 Mechanical Properties of Solids. (3) S
Effects of environmental and microstructional variables of mechanical properties, including plastic deformation, fatigue creep, brittle fracture and internal friction. Prerequisite: transition student with instructor approval.

MSE 517 Introduction to Ceramics. (3) F
Principles of structure, property relations in ceramic materials. Processing techniques. Applications in mechanical, electronic, and superconducting systems Prerequisite: transition student with instructor approval

MSE 518 Integrated Circuits Materials Science. (3) N
Principles of materials science applied to semiconductor processing and fabrication in metals, ceramics, polymers, and semiconductors. Prerequisite: transition student with instructor approval

MSE 520 Theory of Crystalline Solids. (3) F
Anisotropic properties of crystals: tensor treatment of elastic, magnetic electric and thermal properties, and crystallography of Martensitic transformations

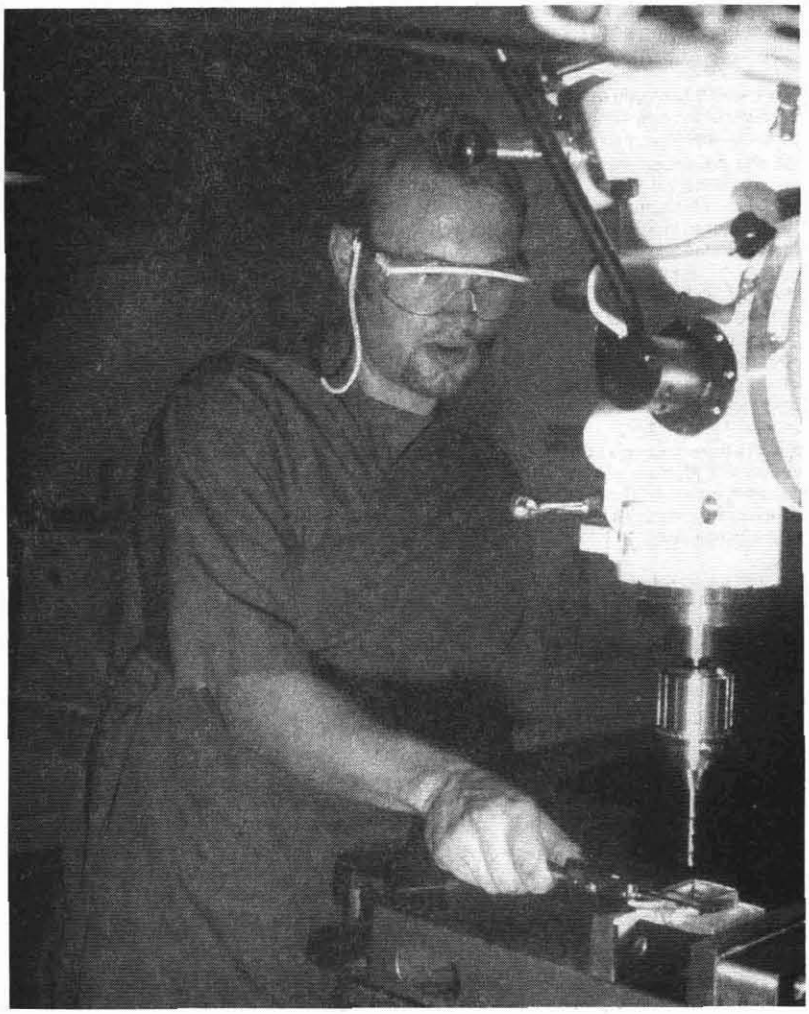
MSE 521 Defects in Crystalline Solids. (3) S
Introduction to the geometry, interaction, and equilibrium between dislocations and point defects Relations between defects and properties will be discussed Prerequisite: ECE 350 or instructor approval

MSE 530 Materials Thermodynamics and Kinetics. (3) S
Thermodynamics of alloy systems, diffusion in solids, kinetics of precipitation, and phase transformations in solids. Prerequisites ECE 340, 350.

MSE 540 Fracture, Fatigue, and Creep. (3) F
Relationship between microstructure and fracture; fatigue and creep properties of materials Environmental effects and recent developments. Current theories and experimental results. Prerequisite MSE 440 or equivalent

MSE 550 Advanced Materials Characterization. (3) N
Analytical instrumentation for characterization of materials; SEM, SIMS Auger, analytical TEM and other advanced research techniques.

NOTE: For the General Studies requirement, codes (such as L1, N3 C and H), and courses see pages 84–108 For graduation requirements see pages 79–83. For omnibus courses offered but not listed in this catalog see pages 56–57



Sean Dengler demonstrates equipment in the Integrated Manufacturing Engineering Laboratory. Created by partnerships between the university and the high-tech industry, the lab offers students practical experience in engineering and manufacturing.
Tim Trumble photo

MSE 556 Electron Microscopy Laboratory. (3) F
Lab support for MSE 558. Cross-listed as SEM 556. Pre- or corequisite: MSE/SEM 558.

MSE 557 Electron Microscopy Laboratory. (3) S
Lab support for MSE 559. Cross-listed as SEM 557. Pre- or corequisite: MSE/SEM 559.

MSE 558 Electron Microscopy I. (3) F
Microanalysis of the structure and composition of materials using images, diffraction and X-ray, and energy loss spectroscopy. Knowledge of elementary crystallography, reciprocal lattice, stereographic projections, and complex variables is required. Cross-listed as SEM 558. Prerequisite: instructor approval.

MSE 559 Electron Microscopy II. (3) S
Microanalysis of the structure and composition of materials using images, diffraction and X-ray, and energy loss spectroscopy. Knowledge of elementary crystallography, reciprocal lattice, stereographic projections, and complex variables is required. Cross-listed as SEM 559. Prerequisite: instructor approval.

MSE 560 Strengthening Mechanisms. (3) S
Deformation of crystalline materials. Properties of dislocations. Theories of strain hardening, solid solution, precipitation, and transformation strengthening. Prerequisite: ECE 350 or equivalent.

MSE 561 Phase Transformation in Solids. (3) N
Heterogeneous and homogeneous precipitation reactions, shear displacive reactions, and order-disorder transformation.

MSE 562 Ion Implantation. (3) S
Includes defect production and annealing. Generalized treatment, including ion implantation, neutron irradiation damage, and the interaction of other incident beams. Prerequisite: MSE 450.

MSE 570 Polymer Structure and Properties. (3) F
Relationships between structure and properties of synthetic polymers, including glass transition, molecular relaxations, crystalline state viscoelasticity, morphological characterization, and processing.

MSE 571 Ceramics. (3) A
Includes ceramic processing, casting, molding, firing, sintering, crystal defects, and mechanical, electronic, and physical properties. Prerequisites: MSE 521, 561.

MSE 573 Magnetic Materials. (3) A
Emphasis on ferromagnetic and ferrimagnetic phenomena. Domains, magnetic anisotrophy, and magnetastriction. Study of commercial magnetic materials. Prerequisite: MSE 520 or equivalent.

Department of Civil and Environmental Engineering

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ASSISTANT PROFESSORS
BAKER MUCCINO, OWUSU-ANTWI, WESTERHOFF, ZHU

CIVIL ENGINEERING

Civil Engineering is primarily concerned with the public domain The profession includes analysis, planning, design, construction, and maintenance of many types of facilities for government, commerce, and industry. These 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 view point 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. Areas of study in the civil engineering curriculum are described below.

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 recently implemented at ASU. 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 conservation and reuse, and surface water quality management

Career opportunities in the field. University graduates with the B.S.E. in Civil Engineering (environmental engineering 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 opportunities are great and are likely to expand. After earning the undergraduate B.S.E. degree in Civil Engineering (environmental 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

NOTE: For the General Studies requirement, codes (such as L1, N3 C and H and courses see pages 84–108 For graduation requirements, see pages 79–83 For omnibus courses offered but not listed in this catalog, see pages 56–57

that students will be prepared for the Fundamentals of Engineering (FE) examination and professional registration. The curriculum also includes a strong emphasis on chemistry, microbiology, and water and wastewater treatment processes.

ENTRANCE REQUIREMENTS

See "Admission," and "Degrees," pages 194–195 for information regard ing 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 student who has successfully completed at least a year (each) of high school chemistry, physics, computer programming; and precalculus, algebra, and trigonometry.

The B.S.E. degree program consists of the following categories:

Civil Engineering

First Year Composition	6
General Studies/School Requirements	54
Engineering Core	19–20
Major	49–48
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 pages 79 83.

Course Requirements. See pages 196–197 for General Studies, school, and engineering core requirements.

DEGREE REQUIREMENTS FOR MAJOR IN CIVIL ENGINEERING

Civil Engineering Core

Twenty-seven hours are required. CEE courses, except CEE 296, may not be taken until all mathematics (MAT) and all engineering core courses (ECE), except ECE 380 and 384 have been completed with an average grade of "C" or higher No CEE 400 level courses may be taken until ECE 380 and 384 have been completed.

CEE	296	Civil Engineering Systems	3
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
CEE	496	Topics in Civil Engineering Practice	1
ECE	380	Probability and Statistics for Engineering Problem 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 Planning and Scheduling *N3*	3
CON	496	Construction Contract Administration	3

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

CEE	362	Environmental Engineering	3
CEE	466	Sanitary Systems Design	3
CHM	231	Elementary Organic Chemistry	3
MIC	220	Biology of Microorganisms or MIC 205 Microbiology *S2* (3) and MIC 206 Microbiology Laboratory *S2* (1)	3

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

NOTE. For the General Studies requirement codes (such as L1, N3, C and H) and courses, see pages 84–108. For graduation requirements, see pages 79–83. For omnibus courses offered but not listed in this catalog see pages 56–57.

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 ... 4
PHY 121 University Physics I: Mechanics *S1/S2*[1] ... 3
PHY 122 University Physics Laboratory I *S1/S2*[1] ... 1

Total ... 14

Second Year

First Semester

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

Total ... 17

Second Semester

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 ... 17

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 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

CEE 496 Topics in Civil Engineering Practice ... 1
Design elective ... 3
HU, SB, and awareness area course(s)[3] ... 4
Technical electives ... 9

Total ... 17

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

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[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 page 196.

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 pages 196–197 for General Studies, school, and engineering core requirements.

Thirty semester hours are required. CEE courses, except CEE 296, may not be taken until mathematics (MAT), and engineering core (ECE) courses, except ECE 380 and 384, have been completed with an average grade of "C" or higher. No CEE 400-level courses may be taken until ECE 380 and 384 have been completed.

CEE 296 Civil Engineering Systems ... 3
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
CEE 496 Topics in Civil Engineering Practice ... 1
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 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 101 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 ... 4
PHY 121 University Physics I: Mechanics *S1/S2*[1] ... 3
PHY 122 University Physics Laboratory I *S1/S2*[1] ... 1

Total ... 14

Second Year

First Semester

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

Second Semester

CHM	231	Elementary Organic Chemistry	3
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
ECN	111	Macroeconomic Principles *SB* or ECN 112 Microeconomic Principles *SB* 3)	3
Total			17

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	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
CHM	341	Physical Chemistry	3
HU, SB, and awareness area course[3]			3
Total			18

Fourth Year

First Semester

CEE	362	Environmental Engineering	3
CEE	440	Engineering Hydrology	3
CEE	466	Sanitary Systems Design	3
CEE	496	Topics in Civil Engineering Practice	1
MIC	205	Microbiology S2	3
MIC	206	Microbio ogy Laboratory *S2*	1
HU, SB, and awareness area courses[3]			4
Total			18

Second Semester

BIO	320	Fundamentals of Ecology 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)	3
CEE	441	Water Resources Engineering	3
CEE	486	Integrated Civil Engineering Design *L2*	3
HU, SB, and awareness area course[3]			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 aero space studies (AES) or military science (MIS) courses to fulfill HU or SB requirements See page 196.

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.

CIVIL ENGINEERING (CEE)

CEE 296 Civil Engineering Systems. (3) F, S
Introduct on to c v eng neering. Prob em so v ng, econom cs descr pt on of c v l eng neering systems design concepts, eth cs, and profess'ona respons b t es. Lecture field trips Pre or coreq s te: ECE 100.

CEE 310 Testing of Materials for Construction. (3 F, S
Structural and behav ora characterist cs eng neer ng propert es, measurements, and app ı-cation of construct on mater a s. Lecture lab Not open to eng neer ng students Prereq-uisite. CON 323

CEE 321 Structural Analysis and Design. (4) F S
Stat ca y determ nate and ndeterminate structures (trusses, beams, and frames) by c ass cal and matr x methods ntroduct on to structura des gn. Lecture rec tat on. Prerequ s tes ECE 312, 313. Pre- or coreq u s tes. ECE 380, 384

CEE 322 Steel Structures. (3) F
Behavior of structural components and sys tems Des gn of stee members and connec t ons Load and resistance factor des gn methods Lecture rec tat on Prerequisite: CEE 321

CEE 323 Concrete Structures. (3) S
Behavior of concrete structures and the de s gn of re nforced and prestressed concrete members nc ud ng footings Partia design of concrete bu d ng system. Lecture recitation. Prerequ site. CEE 321

CEE 340 Hydraulics and Hydrology. (3) F, S
Appl cat on of hydrau ic engineering principles to f ow of iqu ds n p pe systems and open channels hydrostat cs; characteristics of pumps and turb nes. Introduction to hydro ogy Not open to eng neer ng students Lecture, ab. Prerequisite CON 221

CEE 341 Fluid Mechanics for Civil Engineers. (4) F, S
Fundamenta principles and methods of f uid mechan cs forming the analyt ca basis for wa ter resources eng neering. Conduit and open channel flow 3 hours lecture, 1 hour ab. Prerequisites: ECE 312 313. Pre or corequ s tes ECE 380 384

CEE 351 Geotechnical Engineering. (4) F, S
ndex propert es and eng neering characteristics of so ls Compact on, permeab l ty and seepage, compress b lity and settlement, and shear strength Lecture, lab. Prerequisites· ECE 312 313 Pre or corequ sites: ECE 380, 384.

CEE 361 Introduction to Environmental Engineering. (4) F S
Concepts of a r and water pol ution; environmental regu ation risk assessment, chemistry, water qual ty modeling water and wastewater treatment systems designs Lecture, lab. Prerequ sites ECE 312, 313 Pre- or corequ sites ECE 380, 384

CEE 362 Environmental Engineering. (3) S
Natural environment, the carbon cyc e and b ochem stry of wastes, principles of waste treatment, and dra nage systems. Prereq-u s te CEE 361

CEE 371 Introduction to Urban Planning. (3) N
Theoret ca and practical aspects of city plan-n ng. Interre ationships among physical plan-n ng, env ronment government, and soc'ety. Not acceptable as a technical e ect ve for CEE students

CEE 372 Transportation Engineering. (4) F S
H ghway rai water and a r transportation. Operational characterist cs and traffic control devices of each transport mode. Impact on ur ban form Prerequisites: ECE 312 313 Pre or corequ sites ECE 380, 384

CEE 412 Pavement Analysis and Design. (3) F
Design of f ex b e and rigid pavements for h ghways and a rports. Surface base and subgrade courses Cost ana ys s and pavement se ect'on Prerequ s tes· CEE 351; ECE 351.

CEE 423 Structural Design. (3) F
Ana ys s and des gn of re nforced concrete steel masonry, and timber structures Lec ture lab Prerequ s te CEE 323. Corequisite: CEE 322

CEE 432 Matrix and Computer Applications in Structural Engineering. (3) S
Matr x and computer appl cat ons to structural engineering and structura mechanics. Stiff-ness and flexibi ty methods finite elements, and d fferences. Prerequisite CEE 321.

CEE 440 Engineering Hydrology. (3) F
Descr ptive hydro ogy, hydro og'c cycle mod-e s, and systems Ra n runoff models Hydro-og c des gn. Concepts properties and basic equat ons of groundwater flow. Prerequ s te CEE 341.

CEE 441 Water Resources Engineering. (3) S
App cat on of the pr nc p es of hydraul cs and hydrology to the eng neering of water re sources projects des gn and operat on of wa ter resources systems water qua ty Prereq u s te CEE 341

CEE 450 Soil Mechanics in Construction. 3) F S
So mechan cs as app ed to the construct on fie d, nclud ng foundat ons, h ghways, reta n- ng wa s and s ope stab ty Re at onsh p be tween so l character st cs and geologic forma t ons Not open to eng neer ng students Lec- ture, ab Prerequ s te CON 323

CEE 452 Foundations. (3) F, S
App cat ons of so l mechanics to foundation systems, bearing capac ty latera earth pres- sure and s ope stab ty Prerequ s te: CEE 351

CEE 466 Sanitary Systems Design. (3 F
Capac ty p ann ng and design of water sup- ply domest c and storm dra nage and so d waste systems Prerequ s te: CEE 361.

CEE 471 Intelligent Transportation Sys- tems. (3) F
App cat on of advanced technology to the ve h c e and the r adway to so ve traff c conges tion safety, and a r qua ty problems. Prereq u s te CEE 372 o nstructor approval

CEE 475 Highway Geometric Design. (3) S
Des gn of the v s b e elements of the roadway. Fundamental design contro s with app cat on to rura roads at grade ntersect ons, free- ways and nterchanges Lecture rec tat on Prerequ s te CEE 372

CEE 486 Integrated Civil Engineering De- sign. (3) F S
Students are requ red to complete a c v l eng - neer ng des gn n a s mu ated practicing eng neering env ronment Lecture, team learning L m ted to undergraduates n the r f na se mester. Prerequ s tes CEE 321 341 351, 361, 372. *General Stud es L2*

CEE 496 Topics in Civil Engineering Prac- tice. 1 F, S
Professional eng neer ng pract ce nterv ew ng and resumé wr t ng profess ona reg stra t on requ rements cont nu ng educat on graduate study f nanc a p ann ng, and em ployment Prerequ s te sen or stand ng

CEE 512 Pavement Performance and Man- agement. 3) S
Pavement management systems nc ud ng data co ect on eva uat on opt m zat on, eco nom c ana ys s and computer appl cations for h ghway and a rport des gn Prerequ s te CEE 412

CEE 514 Bituminous Materials and Mix- ture. (3 F
Types of b tum nous materia s used n pave ment m xtures Chem ca compos t on and phys ca propert es des rab e aggregate char acter st cs, and opt mum aspha t contents 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 nterrelat on sh ps among m cro and macro properties of cement based materia s. Mechan ca proper ties fa ure theor es, fracture mechan cs of concrete mater a s Cement based compos te mater a s and the durab ity aspects Lecture ab Prerequ site. ECE 350 or 351

CEE 521 Stress Analysis. 3) F
Advanced topics in the ana yt ca determ na- t on of stress and stra n. Prerequ s te CEE 321

CEE 524 Advanced Steel Structures. (3) S
Strength propert es of stee and the r effects on structural behav or Elast c des gn of stee structures. P ast c analys s and des gn of beams, frames and bents Plast c def ect ons P ast c des gn requ rements. Multistory bu ld ngs Prerequ s te CEE 322

CEE 526 Finite Element Methods in Civil Engineering. (3) F
F n te e ement formu at on for so ut ons of structura geotechn ca , and hydraul c prob ems Prerequ s te CEE 432

CEE 527 Advanced Concrete Structures. (3) N
U t mate strength des gn. Comb ned shear and torsion Serviceab ty P ast c ana ys s. Spec a systems Prerequ site CEE 323

CEE 530 Prestressed Concrete. (3) S
Mater als and methods of prestressing. Ana y s s and des gn for flexure, shear, and torsion Prestress osses due to fr ction creep, shr nk- age, and anchorage set Stat ca y ndeterm - nate structures. Des gn of f at s abs bridges and composite beams Prerequ s te: CEE 323

CEE 533 Structural Optimization. (3) S
Linear and non near programm ng Prob em formulat on. Constra ned and unconstrained opt m zat on Sens tivity ana ys s. Approx mate techniques FEM-based opt ma design of me chan ca and aerospace structures Cross sted as MAE 521 Prerequ s te nstructor ap proval

CEE 536 Structural Dynamics. (3) F
Structures and structura members subjected to dynam c load ngs, response spectra theory appl cat ons to br dges and power p ants 'n vest gat ons of the responses of mult degree of freedom structures, and matrix and numeri- ca methods of analys s Lecture, rec tat on Prerequisites CEE 321 nstructor approva

CEE 537 Topics in Structural Engineering. (1 3) F, S
Advanced top cs nc ud ng, w'nd eng'neer ng, earthquake eng neer ng, probab l stic con cepts, and bridge and bu d ng eng neering Prerequ s te nstructor approva .

CEE 540 Groundwater Hydrology. (3) F
Phys cal propert es of aquifers, we pump ng subsurface flow mode ng, unsaturated f ow, numer cal methods, land subs dence and groundwater po ut on Prerequ s te CEE 440 or nstructor approva

CEE 541 Surface Water Hydrology. (3) S
Hydro og'c cyc e and mechan sms, nc ud ng prec p tat on evaporation and transp rat on hydrograph ana ys s, f ood rout ng statist ca methods n hydro ogy and hydro og c des gn Prerequ s te CEE 440 or nstructor approval

CEE 542 Water Resources Systems Plan- ning. (3) N
Ph losophy of water resources p ann ng eco nomic soc al, and eng neering nteraction, in troduct on to the theory and appl cat on of quant tat ve plann ng methodo og es n water resources p ann ng. Guest ecturers, case stud es Prerequ site nstructor approval

CEE 543 Water Resources Systems I. (3) F
Theory and app 'cation of quant tat ve plan ning methodo og es for the des gn and opera t on of water resources systems c ass pro- jects us ng a computer case stud es Pre- or corequ site: CEE 542 or nstructor approval

CEE 545 Foundations of Hydraulic Engi- neering. (3) S
Review of 'ncompressible fluid dynamics F ow in p pes and channe s; unsteady and varied flows, wave mot on Prerequ s te CEE 341.

CEE 546 Free Surface Hydraulics. (3) N
Der vation of 1 d mens onal equat ons used in open channel f ow ana ys s; computat ons for un form and nonuniform f ows unsteady f ow, and f ood rout ng Mathemat cal 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 chan- ne processes Sed ment sources, yie d, and control· hydrolog c analys s Case stud es Prerequ site: CEE 341 or nstructor approva .

CEE 548 Sedimentation Engineering. (3) N
ntroduct on to the transportat on of granular sed mentary materia s by mov ng f u ds Deg radat on, aggregat on and oca scour in a u v al channe s Mathematical and phys ca models Prerequ s te. CEE 547 or nstructor approva

CEE 550 Soil Behavior. (3) S
Phys cochemical aspects of so behav or, sta bi zat'on of so ls and eng neer ng propert es of so ls Prerequ s te CEE 351.

CEE 551 Advanced Geotechnical Testing. (3) N
Odometer triax al (stat c and cycl c) back pressure saturated and unsaturated samp es, pore pressure measurements c osed- oop computer contro ed test ng, n-s tu testing and sampl ng. Lecture, ab Prerequisite: CEE 351

CEE 552 Geological Engineering. (3) S
Geo og ca nvestigat ons for eng neer ng pur poses case histor es, geolog'c structure weathering remote sensing geophys cs and a r photo interpretat on for eng neering site lo cations Lecture, f e d tr ps Prerequ site: CEE 351

CEE 553 Advanced Soil Mechanics. (3) N
App cat on of theor es of e ast c ty and p ast c- ity to so s, theories of conso idation, fa ure theor es, and response to stat c and dynam c oading Prerequisite CEE 351.

CEE 554 Shear Strength and Slope Stabil- ity. (3) S
Shear strength of saturated and unsaturated so s strength deformat on relat onsh ps t me dependent strength parameters effects of sampl ng, and advanced s ope stab l ty Pre- requ s te· CEE 351

NOTE For the Genera Studies requ rement codes (such as L1, N3 C and H , and courses see pages 84–108 For graduat on requirements, see pages 79–83. For omn bus courses offered but not sted n th s catalog see pages 56–57

CEE 555 Advanced Foundations. (3) F
Deep foundations, braced excavations, anchored bulkheads, reinforced earth, and underpinning. Prerequisite: CEE 351.

CEE 556 Seepage and Earth Dams. (3) N
Transient and steady state fluid flow through soil, confined and unconfined flow, pore water pressures, and application to earth dams. Prerequisite: CEE 351.

CEE 557 Hazardous Waste: Site Assessment and Mitigation Measures. (3) F
Techniques for hazardous waste site assessment and mitigation. Case histories presented by instructor and guest speakers. Prerequisites: graduate standing; instructor approval.

CEE 559 Earthquake Engineering. (3) N
Characteristics of earthquake motions, selection of design earthquakes, site response analyses, seismic slope stability, and liquefaction. Prerequisite: CEE 351.

CEE 560 Soil and Groundwater Remediation. (3) S
Techniques for remediation of contaminated soils and groundwaters are presented with basic engineering principles. Prerequisite: instructor approval.

CEE 561 Physical-Chemical Treatment of Water and Waste. (3) F
Theory and design of physical and chemical processes for the treatment of water and waste waters. Prerequisite: CEE 361.

CEE 562 Environmental Biochemistry and Waste Treatment. (3) S
Theory and design of biological waste treatment systems. Pollution and environmental assimilation of wastes. Prerequisite: CEE 362.

CEE 563 Environmental Chemistry Laboratory. (3) F
Analysis of water, domestic and industrial wastes, laboratory procedures for pollution evaluation, and the control of water and waste treatment processes. Lecture, lab. Prerequisite: CEE 361.

CEE 566 Industrial/Hazardous Waste Treatment. (3) F
Emphasis on treatment of local industrial/hazardous waste problems, including solvent recovery and metals. Lecture, project. Prerequisites: CEE 561, 563.

CEE 573 Traffic Engineering. (3) F
Driver, vehicle, and roadway characteristics, laws and ordinances, traffic control devices, traffic engineering studies, and Transportation System Management measures. Prerequisite: CEE 372.

CEE 574 Highway Capacity. (3) S
Highway capacity for all functional classes of highways. Traffic signalization, including traffic studies, warrants, cycle length, timing, phasing, and coordination. Prerequisite: CEE 372.

CEE 575 Traffic Flow Theory and Safety Analysis. (3) N
Traffic flow theory; distributions, queuing, delay models, and car-following. Highway safety; accident records systems, accident analysis, identifying problem locations, and accident countermeasures. Prerequisite: CEE 573 or 574.

CEE 576 Airport Engineering. (3) F
Planning and design of airport facilities. Effect of aircraft characteristics, air traffic control procedures and aircraft demand for runway and passenger handling facilities, on-site selection, runway configuration, and terminal design. Prerequisite: CEE 372.

CEE 577 Urban Transportation Planning. (3) S
Application of land use parameters traffic generation theory, traffic distribution and assignment models, transit analysis, and economic factors to the solution of the urban transportation problem. Prerequisite: CEE 372.

Students enrolled in CEE 580, 590, 592, 599, 792, and 799 are required to attend graduate student seminars at the times shown in the Schedule of Classes. *Each semester, every graduate student enrolled for more than eight semester hours is to enroll for at least one semester hour of CEE 592, 599, 792, or 799.*

Students fast at work in a computer lab located in Wilson Hall. Tim Trumble photo

Department of Computer Science and Engineering

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BHATTCHARYA, DASGUPTA, DIETRICH, FALTZ, GHOSH, HUEY, KAMBHAMPATI, LINDQUIST, MILLER, O'GRADY, PANCHANATHAN, PHEANIS, ROCKWOOD, SEN, S. URBAN

ASSISTANT PROFESSORS
BAZZI, CANDAN, HSU, WAGNER

LECTURERS
DELIBERO, HOUSTON, NAVABI, WHITEHOUSE

Computers have a significant impact on our daily lives, and this impact is likely to be even greater in the future as computer professionals continue to develop more powerful, smaller, faster, and less expensive computing systems. Computer science and computer engineering deal with the study, design, development, construction, and application of modern computing machinery. Other important topics include computing techniques and appropriate languages for general information processing, for scientific computation, for the recognition, storage, retrieval, and processing of data of all kinds, and for the automatic control and simulation of processes.

The curricula offered by the Department of Computer Science and Engineering prepare the student to be a participant in this rapidly changing area of technology by presenting in-depth treatments of the fundamentals of computer science and computer engineering. The department offers two undergraduate degrees: a B.S. degree in Computer 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 Computer 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 students must obtain a minimum grade of "C" in all CSE courses used for degree credit.

GRADUATION REQUIREMENTS

In addition to fulfilling school and major requirements, majors must satisfy all university graduation requirements. See pages 79–83.

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 requirement, 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. More detail on these requirements is available at the department office, on 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

ENG	101, 102	First Year Composition	6
		or ENG 105 Advanced First Year Composition (3) or ENG 107, 108 English for Foreign Students	6
Total			6

General Studies/Department Requirements

Humanities and Fine Arts/ Social and Behavioral Sciences

HU/SB electives	18

Literacy and Critical Inquiry

L1/L2 electives	6

Natural Sciences/Basic Sciences

PHY	121	University Physics I Mechanics *S1/S2*[1]	3
PHY	122	University Physics Laboratory I *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
Science elective[3]			4
Total			12

Numeracy/Mathematics

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	4
MAT	272	Calculus with Analytic Geometry III	4
MAT	342	Linear Algebra	3
Total			21
General Studies department requirement total			57

In addition, the following courses constitute the Computer Science core:

Computer Science Core

CSE	120	Digital Design Fundamentals	3
CSE	200	Concepts of Computer Science *N3*	3
CSE	210	Data Structures and Algorithms I *N3*	3
CSE	225	Assembly Language Programming and Microprocessors (Motorola) *N3* or CSE 226 Assembly Language Programming and Microprocessors (Intel) *N3* (4)	4
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	430	Operating Systems	3
Total computer science core			34
Computer science breadth requirement. Each student must complete 18 hours of CSE 400-level courses.			18
Technical electives. Each student must complete six hours of courses chosen from the computer science technical elective list and approved by the student's advisor			6
Unrestricted electives			7
Total			31
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] This elective may be satisfied by any physics courses requiring PHY 131 as a prerequisite or any laboratory science for majors in the discipline and satisfying the S1 or S2 General Studies requirements (except PHS 110, PHY 101, 105, 111, or 112).

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	Calculus with Analytic Geometry I *N1*	4
HU, SB, awareness area course[1]			3
Total			13

Second Semester

CSE	120	Digital Design Fundamentals	3
CSE	210	Data Structures and Algorithms I *N3*	3
ENG	102	First-Year Composition	3
MAT	271	Calculus with Analytic Geometry II	4
Laboratory science *S2*[2]			4
Total			17

Second Year

First Semester

CSE	240	Introduction to Programming Languages	3
MAT	243	Discrete Mathematical Structures	3
MAT	272	Calculus with Analytic Geometry III	4
PHY	121	University Physics I: Mechanics *S1/S2*	3
PHY	122	University Physics Laboratory I *S1/S2*	1
HU, SB, awareness area course[1]			3
Total			17

NOTE: For the General Studies requirement, codes (such as L1, N3, C, and H), and courses see pages 84–108. For graduation requirements, see pages 79–83. For omnibus courses offered but not listed in this catalog, see pages 56–57.

Second Semester

CSE	225	Assembly Language Programming and Microprocessors Motorola	4
CSE	310	Data Structures and Algorithms II	3
PHY	131	University Physics II Electricity and Magnetism *S1/S2*[3]	3
PHY	132	University Physics Laboratory II *S1/S2*[3]	1
HU, SB, awareness area course[1]			3
Elective			3
Total			17

Third Year

First Semester

CSE	330	Computer Organization and Architecture	3
CSE	340	Principles of Programming Languages	3
MA	342	Linear Algebra	3
HU, SB, awareness area course[1]			3
Unrestricted elective			4
Total			16

Second Semester

CSE	355	Introduction to Theoretical Computer Science	3
CSE	360	Introduction to Software Engineering	3
CSE	430	Operating Systems	3
ECE	380	Probability and Statistics for Engineering Problem Solving *N2*	3
HU, SB, awareness area course[1]			3
Unrestricted elective			3
Total			18

Fourth Year

First Semester

400 level CSE computer science breadth electives			9
L2 elective			3
Technical elective			3
Total			15

Second Semester

HU, SB, awareness area course[1]			3
400 level CSE computer science breadth electives			9
Technical elective			3
Total			15

[1] Engineering students may not use aerospace studies AES or military science MIS courses to fulfill HU and SB requirements. See page 196

[2] This elective may be satisfied by any physics course requiring PHY 131 as a prerequisite or any laboratory science for majors in the discipline and satisfying the S or S2 General Studies requirements except PHS 110, PHY 101, 105, 1 , or 112

Both PHY 13 and 132 must be taken to secure S1 or S2 credit.

Computer Systems Engineering—B.S.E.

The Department of Computer Science and Engineering offers a B.S.E. degree that prepares the student for a career in computer systems engineering. This degree program provides training in both engineering and computer science. The following list specifies departmental requirements for the B.S.E degree in Computer Systems Engineering

First-Year Composition

ENG	101, 1 2	First Year Composition	6
		or ENG 105 Advanced First Year Composition	3)
		or ENG 107, 108 English for Foreign Students	6
Total			6

General Studies/Department Requirements

Humanities and Fine Arts/ Social and Behavioral Sciences

ECN	1	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	122	University Physics Laboratory I *S1/S2*[1]	1
PHY	131	University Physics II Electricity and Magnetism *S1/S2*[2]	3
PHY	32	University Physics Laboratory II *S1/S2*[2]	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	4
MAT	272	Calculus with Analytic Geometry III	4
MAT	274	Elementary Differential Equations	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	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			4
Each student must complete four hours of courses chosen from the computer science technical elective list and approved by the student's advisor			
Total			39
Degree 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.

Computer Systems Engineering Program of Study Typical Four-Year Sequence

First Year

First Semester

CSE	200	Concepts of Computer Science *N3*	3
ECE	100	Introduction to Engineering Design *N3*	4
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
CSE	210	Data Structures and Algorithms I *N3*	3
ENG	102	First Year Composition	3
MAT	271	Calculus with Analytic Geometry II	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	4
PHY	121	University Physics I Mechanics *S1/S2*[1]	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	3
PHY	131	University Physics II: Electricity and Magnetism *S1/S2*[2]	3
PHY	132	University Physics Laboratory II *S1/S2*[2]	1
Total			16

Third Year

First Semester

CSE	310	Data Structures and Algorithms II	3
ECE	300	Intermediate Engineering Design *L1*	3
MAT	342	Linear Algebra	3
HU, SB, awareness area courses[3]			7
Total			16

Second Semester

CSE	340	Principles of Programming Languages	3
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 aero space studies (AES) or military science (MIS) courses to fulfill HU and SB requirements. See page 196.

COMPUTER SCIENCE AND ENGINEERING (CSE)

CSE 100 Principles of Programming. (3) F S SS
Concepts of problem solving, algorithm design, structured programming fundamentals, algorithms and techniques and computer systems concepts. Social and ethical responsibility. Prerequisite MAT 170 *General Studies N3*

CSE 120 Digital Design Fundamentals. 3 F S, SS
Number systems, conversion methods, binary and complement arithmetic, Boolean algebra, circuit minimization, ROMs, PLAs, flip-flops, synchronous sequential circuits. Lecture, lab. Cross-listed as EEE 120. Prerequisite, computer literacy.

CSE 180 Computer Literacy. 3 F S SS
Introduction to personal computer operations and their place in society. Problem-solving approaches using databases, spreadsheets and word processing. May be taken for credit on either Windows or Macintosh, but not both. Lecture, demonstration. Prerequisite, nonmajor *General Studies N3*

CSE 181 Applied Problem Solving with BASIC. (3) F S SS
Introduction to systematic definition of problems, solution formulation and methodology, validation. Computer solution using BASIC, required for projects. Lecture, lab. Prerequisites: MAT 117, nonmajor *General Studies N3*

CSE 183 Applied Problem Solving with FORTRAN. (3 F
A human-oriented systems approach to problem definition, formulation and solution using FORTRAN. Computer solution required for projects. Prerequisites: MAT 170, nonmajor *General Studies N3.*

CSE 185 Internet and the World Wide Web. (3) F S
Fundamental Internet concepts, World Wide Web browsing, publishing, searching, advanced Internet productivity tools.

CSE 200 Concepts of Computer Science. 3) F, S, SS
Overview of algorithms, architecture, languages, operating systems, theory, problem solving with a high-level language (C++). Lecture, lab. Prerequisite, one year of high school programming with a structured language (C++ preferred) or CSE 100 *General Studies N3*

CSE 210 Data Structures and Algorithms I. (3) F, S SS
Object-oriented design, static and dynamic data structures (strings, stacks, queues, binary trees), recursion and searching and sorting. Professional responsibility. Prerequisite CSE 200 *General Studies N3*

CSE 225 Assembly Language Programming and Microprocessors (Motorola). 4 F S, SS
Assembly language programming including input/output programming and exception, interrupt handling, Register, every computer organization, I/O, interfaces, assemblers, and linkers. Motorola based assignments. Lecture, lab. Cross-listed as EEE 225. Prerequisites CSE 100 (or 200) CSE EEE 120

CSE 226 Assembly Language Programming and Microprocessors (Intel). 4 F S
CPU/Memory/peripheral device interfaces and programming. System buses, interrupts, serial and parallel I/O, DMA, coprocessors. Intel based assignments. Lecture, lab. Cross-listed as EEE 226. Prerequisites CSE 100 (or 200), CSE/EEE 120

NOTE. For the General Studies requirement, codes (such as L1, N3, C, and H) and courses, see pages 84–108. For graduation requirements see pages 79–83. For omnibus courses offered but not listed in this catalog, see pages 56–57.

CSE 240 Introduction to Programming Languages. 3) F S SS
Introduct on to the procedura (Ada) applicat ve (LISP and declarative (Pro og) an guages Lecture ab. Prerequ s te CSE 210

CSE 310 Data Structures and Algorithms II. (3) F, S SS
Advanced data structures and a gorithms, n c ud ng stacks, queues trees (B B+ AVL) and graphs Searching for graphs hash ng, externa sort ng. Lecture ab Prerequ s tes CSE 210, MAT 243

CSE 330 Computer Organization and Architecture. (3) F S SS
nstruct on set arch tecture, processor performance and des gn; datapath contro (hardwired, m croprogrammed) p pe n ng, nput/output Memory organ zation w th cache vir tual memory Prerequ s te. CSE/EEE 225 or 226

CSE 340 Principles of Programming Languages. (3) F S, SS
ntroduct on to anguage design and imp e mentat on Paral e machine-dependent and dec arative features, type theory, spec fication recogn t'on translat on, run-time management. Prerequisites· CSE 240 310 CSE/EEE 225 (or 226

CSE 355 Introduction to Theoretical Computer Science. (3) F, S
Introduct on to formal language theory and au tomata, Turing machines decidab l ty undeci dab ity, recurs ve funct on theory and ntro duct on to complexity theory Prerequ s te. CSE 310

CSE 360 Introduction to Software Engineering. (3) F S SS
Software l fe cyc e mode s; project manage ment, team deve opment env ronments and methodo og es, software arch tectures; qua ty assurance and standards lega ethica s sues Prerequisites. CSE 210 240

CSE 408 Multimedia Information Systems. (3 F
Des gn use, and app cations of mu t med a systems An introduct on to acqu sit on, compress on, storage retrieva and presentat on of data from different med a such as mages text, vo ce, and a phanumer c. Prerequ s te: CSE 310

CSE 412 Database Management. (3) F, S
ntroduct on to DBMS concepts Data models and anguages. Relat ona database theory Database security/ ntegr ty and concurrency Prerequ s te CSE 310.

CSE 420 Computer Architecture I. (3) S
Computer arch tecture Performance versus cost trade-offs nstruct on set des gn Bas c processor mplementat on and p pe n ng Prerequ site CSE 330

CSE 421 Microprocessor System Design I. (4) F S
Assembly anguage programm ng and og ca hardware des gn of systems us ng 8 bit m cro processors and m crocontro lers Fundamenta concepts of d g tal system design Re iab ity and soc al, egal mp cat ons Lecture lab Prerequ s te· CSE/EEE 225 or 226.

CSE 422 Microprocessor System Design II. (4) F, S
Design of m crocomputer systems us ng con temporary og c and microcomputer system components Requ res assemb y language programm ng Prerequ s te CSE 421

CSE 423 Microcomputer System Hardware. 3) S
Informat on and techn ques presented n CSE 422 are used to develop the hardware des gn of a mult processor, mu t programm ng m cro processor based system Prerequ s te CSE 422. *General Stud es L2.*

CSE 428 Computer-Aided Processes. (3) A
Hardware and software cons derat ons for computer zed manufactur ng systems Spec fic concentration on automat c nspect on numer ca contro , robot cs and ntegrated manufacturing systems Prerequ s te CSE 330

CSE 430 Operating Systems. 3 F, S
Operating system structure and serv ces processor schedul ng concurrent processes, syn chron zat on techn ques memory manage ment v rtua memory nput/output, storage management, and fi e systems Prerequ s tes CSE 330, 340.

CSE 434 Computer Networks. (3) F S
Cryptography fundamenta s; data compres s on; error hand ng f ow contro mu t hop rout ng, network protoco a gorithms, network rel ab ity, t m ng secur ty, phys ca layer bas cs Prerequ s te CSE 330

CSE 438 Systems Programming. (3) A
Des gn and mplementat on of systems programs nc ud ng text editors, f e ut t es mon'tors, assemb ers, re ocat ng nk ng loaders O hand ers, and schedu ers Prerequ s te: CSE 421 or nstructor approval

CSE 440 Compiler Construction I. (3) F
ntroduct on to programming language mp e mentat on mp ementation strateg es such as comp at on, nterpretat on, and translat on. Major comp at on phases such as ex ca ana ys s, semant c ana ys s, optim zat on and code generat on. Prerequ s tes. CSE 340 355

CSE 450 Design and Analysis of Algorithms. (3) F
Des gn and ana ys s of computer algor thms us ng ana ytica and empir ca methods com plex ty measures design methodo og es, and survey of mportant a gor thms. Prerequisite· CSE 310

CSE 457 Theory of Formal Languages. (3) A
Theory of grammar, methods of syntactic ana ys s and spec f cat on, types of art ficial anguages relat onsh p between forma an guages and automata Prerequ s te· CSE 355.

CSE 459 Logic for Computing Scientists I. (3) F
Proposit onal og c syntax and semant cs proof theory versus mode theory soundness cons stency and comp eteness, f rst order logic log ca theor es, automated theorem proving ground reso ut on pattern match ng un f cation and reso ut'on D jkstras og c, proof ob gat ons and program prov ng. Pre requisite: CSE 355

CSE 461 Software Engineering Project I. (3 F
First of two course software des gn sequence Deve opment plann ng management process modeling, ncremental 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 se quence. Process, product assessment and improvement· ncrementa and team deve opment us'ng CASE too s. Lecture ab. Pre requ site· CSE 461.

CSE 470 Computer Graphics. (3) F S
Display dev ces data structures transforma t ons nteract ve graph'cs 3 d mens onal graph cs, and h dden ine problem Prerequi sites CSE 310; MAT 342

CSE 471 Introduction to Artificial Intelligence. (3) F, S
State space search, heurist c search games know edge representat on techn ques, expert systems, and automated reason ng. Prerequisites· CSE 240, 310

CSE 473 Nonprocedural Programming Languages. (3) S
Funct ona and log c programm ng us ng anguages ke Luc d and Pro og. Typ cal app ca t ons wou d be a Screen Ed tor and an Expert System Prerequis te. CSE 355

CSE 476 Introduction to Natural Language Processing. 3 F
Pr nc p es of computat onal ngu stics formal syntax, and semant cs, as app ed to the de s gn of software with natura (human) lan guage O Prerequ s te CSE 310 or nstructor approva

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

CSE 507 Virtual Reality Systems. (3) S
Computer generated 3D env ronments, simu at on of real ty spat al presence of v rtual objects techno og es of mmers on, track ng systems. Lecture lab Prerequ s te CSE 408 or 470 or 508 or nstructor approva

CSE 508 Digital Image Processing. (3) S
D g ta mage fundamenta s mage trans forms, mage enhancement and restorat on techn ques mage encod ng and segmentat on methods Prerequ s te EEE 303 or instructor approval

CSE 510 Advanced Database Management. (3) F S
Advanced data model ng, deduct ve data bases object oriented databases, distr buted and mu t database systems emerg ng data base techno og es Prerequ site: CSE 412.

CSE 512 Distributed Databases. (3) A
Fragmentat on des gn. Query opt mization D str buted joins Concurrency control Distributed 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 emphasizing the top-down and bottom up eva uat on of dec arat ve rules. Prerequ s te. CSE 510.

CSE 514 Object-Oriented Database Systems. (3 A
Object or ented data mode ing database and anguage ntegration object a gebras, extensi bi ty transact ons, object managers, version ng/conf gurat on, act ve data nonstandard app cat ons Research seminar Prerequisite. CSE 510

CSE 517 Hardware Design Languages. (3) N
Introduct on to hardware des gn languages us- ng VHDL Mode ing concepts for specif ca t on s mulat on, and synthes s. Prerequ s te: CSE 423 or EEE 425 or nstructor approva

CSE 518 Synthesis with Hardware Design Languages. (3) N
Mode ng VLSI design n hardware des gn an- guages for synthes s Transformation of an guage based des gns to phys cal layout Ap- p ication of synthes s tools Prerequis te. CSE 517

CSE 520 Computer Architecture II. (3) F
Computer arch tecture descr ption anguages, computer ar thmet c memory h erarchy de sign, paral el vector and mu t processors and nput/output. Prerequ s tes CSE 420 430

CSE 521 Microprocessor Applications. (4) S
Microprocessor technology and its app cat on to the des gn of pract ca dig tal systems Hardware, assemb y anguage programm'ng, and nterfac ng of m croprocessor-based sys tems Lecture ab Prerequ site CSE 421

CSE 523 Microcomputer Systems Software. (3) F
Developing system software for a mu tiprocessor, mult programm ng m croprocessor based system us ng informat on and techn ques presented n CSE 421, 422. Prerequisite: CSE 422

CSE 526 Parallel Processing. (3) N
Rea and apparent concurrency. Hardware or ganization of mu t processors mult ple com- puter systems sc ent f c attached processors, and other para el systems. Prerequ s te CSE 330 or 423

CSE 530 Operating System Internals. (3) F
Implementation of process management and synchron zation system ca l and interrupt hand ing, memory management device dr v ers and f e systems n UN X. Prerequ s tes· CSE 430; knowledge of C language.

CSE 531 Distributed and Multiprocessor Operating Systems. (3) N
D stributed systems architecture remote f e access, message-based systems object based systems, c ent/server paradigms d s tributed algor thms repl cat on and cons s- tency, and multiprocessor operat ng systems. Prerequisite: CSE 530 or nstructor approva

CSE 532 Advanced Operating System Internals. (3) F
Memory processor, process and commun ca tion management, and concurrency control n the W ndows NT multiprocessor and d strib uted operating system kernels and servers Prerequisite CSE 530 or 'nstructor approval

CSE 534 Advanced Computer Networks. (3) F
Advanced network protoco s and infrastruc ture app cations of high performance net- works to distributed systems, high perfor mance comput ng and mult media doma ns, spec al features of networks. Prerequ s te: CSE 434.

CSE 536 Theory of Operating Systems. (3) S
Protection. Commun cat'on and synchron za t on in d str buted systems, d str'buted f e sys- tems, dead ock theory v rtua memory theory and un processor and multiprocessor thread management Prerequis te CSE 430

CSE 540 Compiler Construction II. (3) S
Forma parsing strategies optim'zat'on tech niques, code generation extens b l ty and transportab l ty cons derat'ons and recent de velopments Prerequisite: CSE 440.

CSE 545 Programming Language Design. (3) N
Language constructs extens b ty and ab stractions, and runt me support Language de sign process Prerequ s te: CSE 440.

CSE 550 Combinatorial Algorithms and Intractability. (3) N
Comb natorial a gorithms, nondeterm n st c a - gor thms c asses P and NP, NP-hard and NP complete prob ems, and ntractab ity. Des'gn techniques for fast comb nator a algor thms Prerequ s te CSE 450

CSE 555 Automata Theory. (3) N
Fin te state mach nes, pushdown automata, near bounded automata Turing machines reg ster mach nes rams, and rasps, re ation ships to computab ity and forma anguages. Prerequ'site· CSE 355

CSE 556 Expert Systems. (3) S
Know edge acqu s t'on and representation ru e based systems frame based systems, val dat'on of knowledge bases inexact rea soning, and expert database systems Pre requ s te CSE 471.

CSE 560 Software Engineering. (3) F S
Software engineer ng foundat'ons, forma rep resentat ons n the software process use of forma sms in creat ng a measured and struc- tured working env ronment Lecture, ab Pre requ s te: CSE 360.

CSE 562 Parallel and Distributed Software Engineering. (3) A
Software engineer ng character'st cs part cular to paral e and distr buted systems. Tools and techniques to support software eng neering in- volving para e process ng and d stributed systems Prerequ site CSE 560

CSE 563 Software Requirements and Specification. (3) A
Exam nat on of the def n t onal stage of soft- ware deve opment; analys s of specif cation representations, forma methods, and tech n ques emphas z ng mportant appl cat on is- sues Prerequ s te CSE 560

CSE 564 Software Design. (3) A
Exam nation of software design ssues and techniques. Inc udes a survey of des gn repre sentat ons and a compar son of design meth ods Prerequisite: CSE 560

CSE 565 Software Verification, Validation, and Testing. (3) A
Test p ann ng, requ rements-based and code- based testing techn ques too s ret ab ity mode s, and stat st ca test ng Prerequ s te: CSE 560.

CSE 566 Software Project, Process, and Quality Management. 3) A
Project management r sk management con figurat 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 algor thms ght ng mode s and shad ng techn ques. User nterface de- s gn. An mat on techn ques. Fracta s and sto- chast c mode s Raster a gor thms Prerequ s te CSE 470

CSE 571 Artificial Intelligence. (3 S
Defin t ons of nte 'gence computer prob em so v ng game p aying pattern recogn t on theorem prov ng and semantic nformat on process ng evolut onary systems, heur st c programm ng. Prerequ s te CSE 471

CSE 573 Advanced Computer Graphics II. (3) S
Mode ng of natural phenomena terra n clouds fire water, and trees Part cle sys tems deformat on of so ds, ant a 'as ng and volume v sua zation Lecture ab. Prerequ s te CSE 470.

CSE 574 Planning and Learning Methods in AI. (3) F
Reason ng about t me and act on p an syn- thes s and execut on 'mprov ng p ann ng per- formance app cat ons to manufacturing nte gent agents Prerequ s te CSE 471 or equ valent

CSE 575 Decision-Making Strategies in AI. (3) S
Automatic knowledge acqu s t on automat c analys s/synthes s of strateg es d stributed p ann ng/prob em solving causa m de ng pred ctive human machine env ronments. Prerequis'te: CSE 471 or 571 or equ va ent

CSE 576 Topics in Natural Language Processing. (3) S
Comparative pars ng strateg es scop ng and reference prob ems, nonfirst-order og ca se mant c representations and d scourse struc ture Prerequ s te CSE 476 or nstructor ap prova

CSE 577 Advanced Computer-A'ded Geometric Design I. 3) F
Genera nterpolat on rev ew of curve nterpo ation and approx mat on spl ne curves v sua smoothness of curves parameter zation of curves ntroduct on to surface nterpo at n and approx'mat on Prerequ s'tes· CSE 470 and 477 *or* instructor approva

CSE 578 Advanced Computer-Aided Geometric Design II. 3 S
Coons patches and Bez er patches tr angular patches arb trar y located data methods ge- ometry process ng of surfaces h gher d men s ona surfaces Prerequ s tes CSE 470 and 477 *or* nstructor approva

CSE 579 NURBs: Nonuniform Rational B-Splines. (3) S
Projective geometry NURBs based mode ng bas c theory of con cs and rat onal Bez er curves rat ona B sp nes surfaces rat nal surfaces, stereograph c maps, quadrics GES data spec fcat on Prerequ s tes CSE 470 477

NOTE: For the Genera Stud es requirement codes (such as L1, N3 C and H) and courses see pages 84–108 For graduat on requ rements see pages 79–83 For omn bus courses offered but not 'sted n th s catalog see pages 56–57

Department of Electrical Engineering

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REGENTS' PROFESSORS
BALAN S, FERRY

PROFESSORS
ALLSTOT, BACKUS CROUCH DeMASSA, GOODN CK GORUR HEYDT HIGGINS KARADY, KOZICKI, PALAIS, PAN, ROEDEL, SADOWSKY SCHRODER SPANIAS, THORNTON

ASSOCIATE PROFESSORS
ABERLE ALLEE, BIRD, CHAKRABARTI COCHRAN, EL GHAZALY, EL SHARAWY, GREENEICH GROND N, HOLBERT, MORRELL, RODRIGUEZ, C SHEN, J. SHEN SI, SKROMME TSAKALIS, TYLAVSKY, ZHANG

ASSISTANT PROFESSORS
CAPONE KARAM, VASILESKA KAFEDZISKA

The professional activities of electrical engineers directly affect the lives of most of the world's population every day They are responsible for the design and development of radio and television transmitters and receivers, telephone networks and switching systems, computer systems, and electric power generation and distribution. Within the broad scope of these systems, the electrical engineer is concerned with a challenging and diverse array of design and development problems.

Electrical engineers design 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.

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 pages 79 83.

COURSE REQUIREMENTS

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

First-Year Composition*

ENG	101, 102	First Year Composition	6
		or ENG 105 Advanced First Year Composition	(3
		or ENG 107, 108 English for Foreign Students	(6)
Total			6

* A minimum grade of "C" is required.

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*[1]	3
PHY	122	University Physics Laboratory I *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
PHY	241	University Physics III	3
Total			15

[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

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	4
MAT	272	Calculus with Analytic Geometry III	4
MAT	274	Elementary Different al Equations	3
MAT	342	Linear Algebra	3
MAT	362	Advanced Mathematics for Engineers and Scientists I.	3
Total			25
General Studies/school requirements total			68

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

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. 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	482	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. Of the remaining technical electives, two courses may be taken outside electrical engineering. With department approval, qualified students may choose two technical electives from other courses in engineering, mathematics, and the sciences at or above the 300 level, including graduate courses. Students must have a GPA of not less than 3.00 and approval of the dean to enroll in EEE graduate level courses. In addition, these technical electives may be chosen from the approved list of courses from the College of Business.

Electrical Engineering Program of Study Typical Four-Year Sequence

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
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
ENG	102	First Year Composition	3
MAT	271	Calculus with Analytic Geometry II	4
PHY	121	University Physics I: Mechanics *S1/S2*[1]	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	4
MAT	274	Elementary Differential Equations	3

NOTE. For the General Studies requirement codes (such as L1, N3, C, and H) and courses see pages 84–108. For graduation requirements, see pages 79–83. For omnibus courses offered but not listed in this catalog see pages 56–57.

PHY	131	University Physics II. Electricity and Magnetism *S1/S2*[2]	3
PHY	132	University Physics Laboratory II *S1/S2*[2]	1
Total			7

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]			3
Total			7

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	Signa s and Systems	3
EEE	360	Energy Conversion and Transport	4
Total			15

Fourth Year

First Semester

ECE	314	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
Technical electives			10
Total			16

[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 aero space studies (AES or military science MIS) courses to satisfy HU or SB requirements. See page 196

ELECTRICAL ENGINEERING (EEE)

EEE 120 Digital Design Fundamentals. (3) F, S, SS
Number systems convers on methods b nary and complement arithmet c, Boolean a gebra c rcuit m n m zat on, ROMs, PLAs, f pf ops, synchronous sequential c rcuits Lecture lab Cross sted as CSE 120 Prerequisite: com puter teracy

EEE 225 Assembly Language Programming and Microprocessors (Motorola). (4) F S SS
Assemb y language programm ng inc ud ng nput/output programm ng and except on/interrupt hand ing Reg ster leve computer organ - zat on, I O nterfaces assemblers and l nkers Motoro a-based ass gnments. Lecture ab Cross sted as CSE 225 Prerequ s tes CSE 100 (or 200); CSE/EEE 120.

EEE 226 Assembly Language Programming and Microprocessors (Intel). (4) F, S CPU memory peripheral dev ce nterfaces and programm ng. System buses, nterrupts seria and para lel O DMA coprocessors. nte based ass gnments. Lecture ab Cross sted as CSE 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 nonl near networks Ana yt cal and numer ca methods Prerequ s te ECE 301

EEE 303 Signals and Systems. (3) F S, SS
Introduction to cont nuous and discrete time s'gna and system analys s, near systems Four er and z transforms Prerequ s te EEE 3 2 Pre or corequisite: MAT 342.

EEE 340 Electromagnetic Engineering I. 4) F, S, SS
Stat c and time vary ng vector f e ds, boundary va ue prob ems; d electric and magnet c mate r'a s, Maxwe l s equat ons boundary cond t ons Prerequ s tes MAT 362· PHY 131

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 gnals 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 supply systems Magnet c circu t analys s, synchronous gen erators, transformers, nduct on and DC ma ch nes Transmiss'on Line Mode ng and De s gn Lecture, ab. Prerequ s te. EEE 302.

EEE 405 Filter Design. (3) F
Pr nc p es of act ve and pass ve ana og f lter des gn frequency doma n approx mat ons, sens t v ty and synthes's of f lters. Prerequ site. EEE 303.

EEE 407 Digital Signal Processing. (4) F
T me and frequency doma n ana ys s differ ence equat ons, z transform, FIR and IR D g ta F ter Des gn D screte Fourier Transform FFT, and random sequences Lecture ab Prerequ sites EEE 303· MAT 342.

EEE 425 Digital Systems and Circuits. (4 F, S
D gita og c gate ana ysis and des gn Propa gat on de ay t mes, fan out power diss pation no se margins Des gn of MOS and b po ar log c fam es includ ng NMOS, CMOS stan dard and advanced TTL ECL and B CMOS. nverter comb nat ona and sequent a ogic c rcu t des gn MOS memories VLS c rcu ts. Computer s mu at ons us ng PSPICE Lecture, ab. Prerequ s te ECE 334.

EEE 433 Analog Integrated Circuits. (3) S
Analys s design and appl cat ons of modern ana og c rcu ts us ng integrated b po ar and f eld effect trans stor techno og'es Prerequ - site ECE 334

EEE 434 Quantum Mechanics for Engineers. (3) F
Angular momentum, wave packets Schroedinger wave equat on probab ity, prob ems in one d mension, principles of wave mechan cs scatter ng tunne ng, central forces angular momentum hydrogen atom, perturbat on theory var at onal techn ques Prerequ sites· ECE 352 EEE 340.

EEE 435 Microelectronics. (3) S
Pract ce of so d state dev ce fabricat on tech n ques, including th n f m and ntegrated cir cu t fabr cat on principles Lecture, ab. Pre or corequ s te EEE 436.

EEE 436 Fundamentals of Solid-State Devices. (3) F S
Sem conductor fundamentals pn junctions, meta sem conductor contacts, meta -oxide- sem conductor capac tors and f e d effect tran s stors, b'polar junction trans stors Prerequi s te: ECE 352

EEE 437 Optoelectronics. (3) N
Bas c operat ng principles of various types of optoelectron c dev ces which p ay mportant ro es n commerc a and commun cation elec tron cs, ght em tt ng diodes, nject on lasers, and photodetectors Prerequ s'te EEE 436.

EEE 439 Semiconductor Facilities and Cleanroom Practices. (3) F
Microcontaminat on control ed environments c eanroom layout and systems, mode ing codes and leg'slat on, ultrapure water, produc tion mater a s, personne and operat ons, haz- ard management advanced concepts Pre requ site. EEE 435 or instructor approval.

EEE 440 Electromagnetic Engineering II. (4) F S
Second half of an ntroductory course in e ec tromagnet c theory and its app icat'on in elec tr ca eng neering Ana yt ca and numerica so ution of boundary value prob ems Ad- vanced transm ss on ines; wavegu des an tennas; rad ation and scatter ng Lecture ab. Prerequ s te EEE 340 or equivalent

EEE 443 Antennas. (3) S
Fundamenta parameters, eng neering prin c'p es and rad at on integra s near w're an tennas, oops and arrays; numerical computa- t ons, measurements Prerequ'site· EEE 340 or equ va ent.

EEE 445 Microwaves. (4) F
Waveguides; circu t theory for waveguiding systems microwave dev ces systems and energy sources, strip nes and m crostrips im pedance match ng transformers measure ments Lecture, lab Prerequisite: EEE 340 or equ va ent.

EEE 448 Fiber Optics. (4) F
Pr nc p es of f ber-opt c commun cat ons. Lec ture, lab Prerequisites EEE 303 340.

EEE 455 Communication Systems. (4) F S
Signa analys s techn ques appl ed to the op erat on of e ectrical commun cat on systems An ntroduction to and overv ew of modern d g ta and ana og commun cat'ons. Lecture ab. Prerequ s tes: EEE 303 350.

EEE 459 Data Communication Systems. (3) S
System characterist'cs. Commun cat ons me dia Commun cation codes Data val d ty checking L ne protoco s, term na s, and sys- tem conf gurat ons Examp es Prerequisites: EEE 303, 350

EEE 460 Nuclear Concepts for the 21st Century. (3) N
Rad ation nteractions damage dose and n- strumentation. Cosm c rays, satel te effects soft errors; transmutation doping. F ss on re actors nuclear power. TMI Chernobyl. Radio active waste. Prerequisite: PHY 241 or 361.

EEE 463 Electrical Power Plant. (3) F
Nuclear, foss and solar energy sources Analys s and des gn of steam supp y systems electrical generat ng systems, and aux iary systems Power p ant eff c ency and opera tion Prerequisites: ECE 301, 340 (or PHY 241).

EEE 470 Electric Power Devices. (3) F
Ana ysis of dev ces used for short c rcu t pro tection 'nc ud ng c rcu't breakers, re ays, and current and voltage transducers Protect'on against switch ng and ightn'ng over voltages. Insulation coord nation Prerequisite: EEE 360.

EEE 471 Power System Analysis. (3) S
Review of transm'ssion ne parameter ca cu- ation Zero sequence mpedance symmetri- cal components for fault ana ysis short c rcu t ca cu ation review of power f ow ana ys s, power system stab' 'ty, and power system control concepts. Prerequ s te. EEE 360

EEE 473 Electrical Machinery. (3) F
Operating principles construct ona details, and design aspects of convent ona DC and AC machines, transformers and machines used n computer disc dr ves pr nters wrist watches, and automob es Prerequ s te EEE 360

EEE 480 Feedback Systems. (4) F S
Analysis and design of inear feedback sys- tems. Frequency response and root locus techniques, ser es compensat on and state vanab e feedback. Lecture, ab. Prerequ s te EEE 303.

EEE 482 Introduction to State Space Meth- ods. (3) F
D screte and continuous systems in state space form control ab ity, stabi ty and po e p acement Observab ty and observers Pre- or corequ s tes EEE 303, 480, MAT 342

EEE 490 Senior Design Laboratory. (3) F S
Project-oriented laboratory Each student must complete one or more des gn projects during the semester Lecture, ab. Prerequ s tes ECE 300, 334 EEE 303; sen or status. *General Stud es: L2*

EEE 506 Digital Spectral Analysis. (3) S
Princ'p es and applicat ons of dig ta spectra ana ysis least squares, random sequences parametric and nonparametric methods for spectra estimation Prerequisites EEE 407, 554

EEE 507 Multidimensional Signal Process- ing. (3) F
Process'ng and representat on of mu t d men- s onal s gna s Des gn of systems for process ng mult d mens ona data ntroduct on to m age and array process ng ssues Prerequ site. EEE 407 or nstructor approva

EEE 508 Digital Image Processing and Compression. (3) S
Fundamenta s of d g tal mage percept on representat on, process ng, and compress on. Emphas s on mage cod ng techn ques Sig nals nc ude st p ctures and mot on v deo 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 ana ysis funct on approx mat on and n format on representat on by networks app - cations n contro systems and s gna ana y s s Prerequ s te nstructor approva

EEE 523 Advanced Analog Integrated Cir- cuits. (3) F
Ana ysis and des gn of analog ntegrated c r- cu ts: analog c rcu t b ocks reference c rcu ts operat'ona -ampl fier c rcu ts feedback, and non near c rcu ts Prerequ s te EEE 433 or equivalent

EEE 525 VLSI Design. (3) F S
Ana ysis and des gn of Very Large Sca e nte grated (VLS) C rcu ts Phys cs of sma de vices fabr cat on regu ar structures, and sys- tem t m ng Open on y to graduate students

EEE 526 VLSI Architectures. 3 F
Spec al purpose architectures for s gna pro- cess ng. Des gn of array processor systems at the system evel and processor evel H gh level synthes s Prerequ s te CSE 330 or EEE 407 or nstructor approva

EEE 530 Advanced Silicon Processing. 3 S
Th'n f lms CVD ox dat on d ffus on on-im- p antat on for VLSI meta zat on s cides ad vanced thography dry etch ng rap d thermal processing 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 odes, b po ar and junct on fie d effect trans stors, and MOS capacitors and trans stors Prerequ s te EEE 436 or equ valent

EEE 532 Semiconductor Device Theory II. (3) S
Advanced MOSFETs charge coup ed de v ces so ar ce ls photodetectors, ght em t ting diodes, m crowave dev'ces, and modula tion doped structures Prerequis te: EEE 531

EEE 533 Semiconductor Process/Device Simulation. (3) F
Process s mulat on concepts ox dat on, on mp antat on d ffus on, dev ce s mulat on con cepts pn junct ons MOS dev ces b po ar trans stors Prerequ s te EEE 436 or equ va ent

EEE 534 Semiconductor Transport. (3 S
Carrier transport n sem conductors Ha ef fect, h gh e ectr c fie d Bo tzmann equat on corre at on funct ons carr er carr er nter actions Prerequ s tes EEE 434 436 or 531 .

EEE 536 Semiconductor Characterization. (3 S
Measurement techn ques for sem'c nductor mater a s and dev ces E ectr'cal opt ca phys ca and chem cal character zat on meth- ods Prerequis te EEE 436 or equ va ent

EEE 537 Semiconductor Optoelectronics I. (3) F
E ectron c states n sem conductors quantum theory of rad at on absorpt on processes, ra d at ve processes, nonrad at ve processes photolum nescence and photon c dev ces Prerequ s tes EEE 434, 436 (or 531

EEE 538 Semiconductor Optoelectron cs II. (3) S
Materia and dev ce phys cs of sem conductor asers ght-emitt ng d odes and photodetec tors. Emerg ng mater al and dev ce technology n I-V sem conductors Prerequ s te EEE 537

EEE 539 Introduction to Sol'd-State Elec- tronics. (3) F
Crysta att ces, rec proca att ces quantum stat st cs, att ce dynamics, equ br um and nonequ br um processes n semiconductors Prerequ site: EEE 434

EEE 541 Electromagnetic Fields and Guided Waves. 3) F
Po ar'zat on and magnet zat on d e ectr c conducting an sotrop c, and sem conducting med a dual ty un queness and mage theory; p ane wave funct ons, wavegu des, resona tors and surface gu ded waves Prerequ s te EEE 440 or equivalent

EEE 543 Antenna Analysis and Design. 3 F
Impedances, broadband antennas, freque cy ndependent antennas m n atur zat , aper ture antennas, horns ref ectors, ens anten nas and cont nuous sources des gn tech n ques Prerequ s te EEE 443 or equ va ent

EEE 544 High Resolution Radar. 3 N
Fundamenta s; w deband coherent des gn waveforms, and process'ng stepped fre- quency synthet c aperture radar SAR n- verse synthetic aperture radar ISAR 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 attenua tors, 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 Prerequis te EEE 448 or nstructor approva

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NOTE. For the General Studies requirement codes (such as L1, N3 C and H , and courses see pages 84–108 For graduat on requ rements see pages 79–83. For omn bus courses offered but not l sted n th s catalog see pages 56–57

EEE 547 Microwave Solid-State Circuit Design I. 3 N
App at on of sem conductor character st cs to pract ca de gn f m crowave m xers detec tors m ters sw tches attenuators mu t p e phase sh fters a d amp f ers Prerequ s te EEE 545 or nstruct r approva

EEE 548 Coherent Optics. 3) N
D ffr ct n enses opt cal process g, ho og raphy e ectro opt cs and asers Prerequ s te EEE 440 or equ va ent

EEE 549 Lasers. 3 N
Theory a d des gn of gas, so d and sem con ductor asers Prerequ s te EEE 448 or n structor approva

EEE 550 Transform Theory and Applications. 3 N
ntroduct n to abstract ntegrat on funct on spaces and comp ex analys s n the context of ntegra transf rm theory App cat ons to s g a ana ys s commun cat on theory and system theory Prerequ s te EEE 303

EEE 551 Informat on and Coding Theory. 3 N
Fundamenta theorems f nformat on theory for s urces and channe s, convo ut ona and burst codes P e equ s tes EEE 553, 554.

EEE 552 Digital Communications I. 3 S
Fundame ta s f d g ta commun cat ons comp ex s gna theory modu at on, opt ma co- he e t and ncoherent rece vers coded modu at and the V terb a gor thm Prerequ s tes EEE 455 554

EEE 553 Error-Correcting Codes. 3 S
App at on f modern a gebra to the des gn of ra d e ror detect ng and error-correct ng b ock des P erequ s te EEE 455

EEE 554 Random Signal Theory I. 3 F
App at on of stat st ca techn ques to the rep rese tat on and ana ys s of e ectr ca s gna s a d t commun cat ons systems ana ys s. Pre requ s tes EEE 303 and 350 *or* nstructor ap prova

EEE 555 Random Signal Theory II. (3) S
Pr cess ng of s g a s n the presence of no e Random s gna s corre at on frequency spectra est mat on f ter ng no se pred ct on and t ans ents Prerequ s te EEE 554.

EEE 556 Detection and Estimation Theory. 3 S
C mb at o of the c ass ca techn ques of stat st ca nference and the random process character zat n of commun cat on radar and other modern data pro ess ng systems Pre requ s tes EEE 455 554

EEE 558 Digita Communications II. (3 F
ont nuat on of EEE 552 Advanced top cs n d g ta c mmu cat ons· synchron zat on mu t path and fad ng equa zat on m sce a neous t p cs P erequ s te EEE 552

EEE 571 Power System Transients. (3 N
S mp e sw tch ng trans ents Trans ent ana y s s by deduct n Damping of transients Ca pac tor and reactor sw tch ng. Trans ent recov ery vo tage Travel ng waves on transm ss on nes L ghtn ng Protect on of equ pment aga nst trans ent overvo tages ntroduct on to computer ana ys s of trans ents. Prerequ s'te: EEE 471

EEE 572 Advanced Power Electronics. 3) N
Ana ys s of dev ce perat on nc ud ng thyris tors, gate turn off thyristors and trans stors Des gn of rect f er and nverter c rcu ts Appl cat ons such as var ab e speed dr ves HVDC, motor contro and un nterruptab e power sup p es Prerequ s te EEE 470

EEE 574 Computer Solution of Power Systems. 3 S
A gorithms for d g ta computat on for power flow fault and stab ty ana ys s Sparse ma- tr x and vector programm ng methods, numeri ca ntegration techn ques stochast c meth ods, so ut on of the east squares problem Prerequ s te· EEE 471

EEE 577 Power Engineering Operat ons and Planning. 3 F
Econom c d spatch un t comm tment, dynam c pr gramm ng power system p ann ng and op erat'on contro generat on mode ng AGC and power product on. Prerequ s te EEE 471 or graduate stand ng

EEE 579 Power Transmission and D'stribution. 3 S
H gh vo tage transm ss on ne electr c des gn conductors corona R and TV no se nsu a tors, c earances DC characteristic feeders vo tage drop, and capac tors Prerequ s te EEE 470

EEE 581 Filter ng of Stochastic Processes. 3 N
Mode ng, est mat on and f lter ng of stochas t c processes w th emphas s on the Ka man f ter and ts appl cat ons n s gna process ng and contro Prerequ s tes EEE 482, 550, 554

EEE 582 Linear System Theory. 3 S
Contro ab ty bservab ity, and rea zat on theory for mu t var ab e cont nuous t me sys tems Stab zat on and asymptot c state est - mat on. D sturbance decoup ng non nteract- ng contro Prerequ s te EEE 482

EEE 585 Digital Control Systems. 3 F
Ana ys s and des gn of d g'ta and samp ed data contro systems nc uding samp ng theory z-transforms the state trans t on method, stab ty des gn and synthes s. Pre equ s tes EEE 482 550

EEE 586 Nonlinear Control Systems. 3 N
Stab' ty theory, nc ud ng phase p ane de scrib ng funct on, L apunov s method and fre quency doma n c ter a for cont nuous and d s crete, non near and t'me vary ng systems Prerequ s te EEE 482

EEE 587 Opt mal Control. 3) F
Opt ma contro of systems Ca cu us of var a t ns, dynam c programm ng, near quadrat c regu ato numer cal methods and Pontry- ag n s pr nc p e Cross sted as MAE 507 Prerequ's'te EEE 482 or MAE 506

EEE 606 Adaptive Signal Processing. (3) F
Pr nc p es app cations of adapt ve s gna pro cess ng, adapt ve l near comb ner, W ener east squares so ut on, gradient search per- formance surfaces LMS RLS a gor thms b ock time frequency doma n LMS Prerequ s tes EEE 506 554

EEE 631 Heterojunctions and Superlattices. 3 F
Pr nc p es of heterojunct ons and quantum we structures band neups opt ca and e ectr ca propert es ntroduct on to hetero- junct on dev ces Prerequ s tes EEE 436 531.

EEE 632 Heterojunction Devices. (3) N
Pr nc p es of sem conductor heterojunctions and quantum wel s are app ed to the ana ys s of advanced e ectron c and opt ca dev ces Dev ces stud ed are modulat on doped f e d ef- fect trans stors MODFETs pseudomorph c MODFETs heterojunct on b po ar trans stors, quantum we and superlatt ce optical detec tors modulators, and asers Prerequ s tes: EEE 434 436 531, 631

EEE 641 Advanced Electromagnetic Field Theory. 3 N
Cy ndrica wave funct ons wavegu des and resonators; spher ca wave funct ons and resonators; scatter ng from p anar cy indr ca , and spher ca surfaces Green s functions. Prerequis te EEE 541 or equ va ent

EEE 643 Advanced Topics in Electromagnetic Radiation. 3 N
H gh frequency asymptot c techn ques geo metr ca and phys ca theor es of d ffraction GTD and PTD moment method MM), radar cross sect on RCS) pred ct on, Fourier trans- forms n rad at on, and synthes s methods Prerequ s te EEE 543

EEE 647 M'crowave Solid-State Circuit Design II. 3) F
Pract ca des gn of m crowave free-runn ng and vo tage contro ed osc llators us ng Gunn and mpatt diodes and trans stors analys s of no se character st cs of the osc ator Prereq u s tes. EEE 545 547

EEE 686 Adaptive Control. (3) N
Ma n top cs covered adapt ve dent f cat on, convergence parametric models perfor mance and robustness properties of adaptive contro ers pers stence of exc tat on and sta b ty Prerequ s tes: EEE 582 and 586 *or* n structor approval.

EEE 731 Advanced MOS Devices. (3) S
Thresho d vo tage subthreshold current sca ng sma geometry effects hot electrons, and a ternative structures. Prerequ s te EEE 531

EEE 732 Advanced Bipolar Devices and Circuits. (3 N
Crit ca exam nat on of new b po ar dev ce and c rcu t techno og es Performance trade-offs sca ng effects and mode ing techn ques Pre requ s te EEE 531

EEE 770 Advanced Topics in Power Systems. 3 N
Power system prob ems of current nterest, approached at an advanced techn ca leve for mature students Prerequ s tes EEE 577 a d 579 *or* equiva ents nstructor approva

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NOTE For the Genera Stud es requirement codes (such as L1 N3, C, and H , and courses, see pages 84–108 For graduat on requirements, see pages 79–83 For omn bus courses offered but n t sted n th s cata og see pages 56–57

Department of Industrial and Management Systems Engineering

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PROFESSORS
BAILEY DOOLEY, HENDERSON, HOGG, KEATS, MONTGOMERY, SMITH, UTTAL, WOLFE

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ASSISTANT PROFESSORS
CARLYLE, FOWLER, MOU

The industrial engineer (IE) provides leadership for American organizations in reestablishing competitiveness in the global marketplace through system integration and productivity improvement. No challenge can be greater than improving productivity, which is the application of knowledge 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 lead ership 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 pages 79–83.

Course Requirements

See pages 196–197 for General Studies, school, and engineering core course requirements

Industrial Engineering Major

The following courses are required

ASE	485	Engineering Statistics *N2*	3
ECE	380	Probability and Statistics for Engineering Problem Solving *N2*	3
IEE	205	Microcomputer Applications in Industrial Engineering *N3*	3
IEE	300	Economic Analysis for Engineers	3
IEE	305	Information Systems Engineering *N3*	3
IEE	367	Methods Engineering and Facilities Design	4
IEE	374	Quality Control *N2*	3
IEE	394	ST: Introduction to Manufacturing Processes	4
IEE	431	Engineering Administration	3
IEE	461	Integrated Production Control	3
IEE	463	Computer-Aided Manufacturing and Control *N3*	3
IEE	475	Introduction to Simulation *N3*	3
IEE	476	Operations Research Techniques/Applications *N2*	4
IEE	490	Project in Design and Development	3
Technical elective			3
Total			48

Industrial Engineering
Program of Study
Typical Four-Year Sequence

First Year

First Semester

CHM	114	General Chemistry for Engineers *S1/S2*[1]	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

ECN	111	Macroeconomic Principles *SB*	3
		or ECN 112 Microeconomic Principles *SB* (3)	
ENG	102	First Year Composition	3
MAT	271	Calculus with Analytic Geometry II	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
Total			17

Second Year

First Semester

IEE	205	Microcomputer Applications in Industrial Engineering *N3*	3
IEE	300	Economic Analysis for Engineers	3
MAT	242	Elementary Linear Algebra	2
MAT	272	Calculus with Analytic Geometry III	4
PHY	131	University Physics II: Electricity and Magnetism *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
MAT	274	Elementary Differential Equations	3
Core elective			3
Basic science elective[5]			3
HU, SB, and awareness area course[3]			3
Total			18

Third Year

First Semester

ASE	485	Engineering Statistics *N2*	3
IEE	305	Information Systems Engineering *N3*	3
IEE	367	Methods Engineering and Facilities Design	4
IEE	374	Quality Control *N2*	3
HU, SB, and awareness area course(s)[3]			4
Total			17

Second Semester

ECE	300	Intermediate Engineering Design *L1*	3
ECE	312	Engineering Mechanics II Dynamics	3
ECE	350	Structure and Properties of Materials	3
IEE	394	ST: Introduction to Manufacturing Processes	4
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	Integrated Production Control	3
IEE	475	Introduction to Simulation *N3*	3
HU, SB, and awareness area course[3]			3
Total			16

Second Semester

ECE	400	Engineering Communications *L2*	3
IEE	463	Computer Aided Manufacturing and Control *N3*	3
IEE	490	Project in Design and Development	3
Technical elective			3
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

[3] Engineering students may not use aero space studies (AES) or military science (MIS) courses to satisfy HU or SB requirements. See page 196

[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

Manufacturing Engineering

Manufacturing engineering is the field of engineering that focuses on the design, implementation, and optimization of manufacturing functions and operations. Competing in a worldwide environment leads to the need for a world-class manufacturing operation. Integration of all manufacturing entities, whether physical or informational, is a task for the manufacturing engineer. Automation decisions, their economic consequences, and the role of total quality control and management are some of the functions of the manufacturing engineer.

Manufacturing engineers are key role players in all manufacturing organizations; for example, electronic, aerospace, and automotive are just three categories of manufacturing. The ability for any manufacturing operation to compete just in the United States, let alone worldwide, requires that the manufacturing segment of the operation be efficient, cost effective, and produce products that are defect free. The manufacturing engineer is instrumental in how well the organization will compete through determination of the correct manufacturing processes and equipment, the best work flow possible, and efficient total quality control and statistical process control innovations. Recent reports have shown that the U.S. semiconductor and automotive manufacturing operations have regained their preeminent positions in the world. The role for the manufacturing engineer can only grow in these two industries as well as in all the other industries that make up this important segment of the economy. Salary potential is very competitive with all other engineering fields.

The following courses are required for the manufacturing engineering option.

ECE	380	Probability and Statistics for Engineering Problem Solving *N2*	3
ECE	394	ST: Introduction to Manufacturing Engineering	3
IEE	205	Microcomputer Applications in Industrial Engineering *N3*	3
IEE	300	Economic Analysis for Engineers	3
IEE	374	Quality Control *N2*	3

NOTE. For the General Studies requirement, codes (such as L1, N3, C, and H) and courses, see pages 84–108. For graduation requirements, see pages 79–83. For omnibus courses offered but not listed in this catalog, see pages 56–57.

IEE	394	ST: Introduction to Manufacturing Processes	4
IEE	431	Engineering Administration	3
IEE	461	Integrated Production Control	3
IEE	463	Computer Aided Manufacturing and Control *N3*	3
IEE	498	PS Manufacturing Design Project	3
MAE	406	CAD/CAM Applications in MAE	4
Technical electives*			19
Total			47

* Technical electives must meet ABET requirements of engineering science and engineering design

INDUSTRIAL AND MANAGEMENT SYSTEMS ENGINEERING (IEE)

IEE 205 Microcomputer Applications in Industrial Engineering. (3) F, S
Concepts related to development of operational capability in the use of microcomputer hardware, software and networking as related to industrial engineering applications Prerequisite: ECE 100 *General Studies N3*

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: IEE 205. *General Studies N3*

IEE 367 Methods Engineering and Facilities Design. (4) F
Analyzing and designing work systems for productivity including time and motion studies human factors, material handling, facility layout and location Lecture lab Prerequisites EE 205, 300

IEE 374 Quality Control. (3) F
Control charting and other statistical process control techniques Organization and managerial aspects of quality assurance plus acceptance sampling plans Prerequisite: ECE 380 *General Studies N2*

IEE 431 Engineering Administration. 3) F
Introducing quantitative and qualitative approaches to management functions, engineering administration, organizational analysis, decision making and communication Prereq uisite: 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 Integrated Production Control. (3) F
Production control techniques for the planning, analysis control and evaluation of operating systems. Time series forecasting network planning, scheduling, and control. Prerequisites: ECE 380, IEE 205.

IEE 463 Computer-Aided Manufacturing and Control. (3) F, S
Computer control in manufacturing CIM, NC, logic controllers group technology, process planning and robotics Prerequisite "C" programming capability. *General Studies N3*

IEE 464 Concurrent Engineering. (3) N
Understanding and analysis of comprehensive design issues, including product attributes, manufacturing processes and service issues Prerequisites ECE 100; IEE 205.

IEE 475 Introduction to Simulation. (3) F S
Using simulation and modeling in analysis and design of network and discrete systems with statistical aspects Prerequisites ECE 380 IEE 205 *General Studies N3*

IEE 476 Operations Research Techniques/ Applications. (4) F S
Linear programming network optimization Markov processes queuing models, emphasizing model building for solving industrial system problems. Prerequisites ECE 380, MAT 242. *General Studies N2*

IEE 490 Project in Design and Development. (3) F, S
Individual or team capstone project in creative design and synthesis Prerequisite: senior standing.

IEE 505 Applications Engineering. (3) F
Develop working knowledge of application systems development tools needed for computer integrated enterprise Includes techniques for application generation in fourth and fifth generation software environments Topics include client server network systems decision support systems and transaction systems in distributed environment

IEE 511 Analysis of Decision Processes. (3) S
Methods of making decisions in complex environments and statistical decision theory; effects of risk uncertainty and strategy on engineering and managerial decisions. Prerequisite. ECE 380

IEE 520 Ergonomics Design. (3) S
Human physiological and psychological factors in the design of work environments and in the employment of people in man machine systems Open-shop laboratory assignments in addition to class work Prerequisite: IEE 437 or 547

IEE 530 Enterprise Modeling. (3) S
Focus on social, economic, and technical models of the enterprise with emphasis on the management of technological resources Included are organization, econometric, financial and large scale mathematical models

IEE 531 Topics in Engineering Administration. (3) S 2000
Considerations given to philosophical, psychological, political, and social implications of administrative decisions Prerequisite EE 532 or instructor approval

IEE 532 Management of Technology. (3) F
Topics including designing a technical strategy; technological forecasting interfacing marketing engineering and manufacturing, designing and managing innovation systems creativity; application of basic management principles to technology management. Prerequisite IEE 431 or 541 or instructor approval.

IEE 533 Scheduling and Network Analysis Models. (3) S 2000
Application of scheduling and sequencing algorithms, deterministic and stochastic network analysis, and flow algorithms Prerequisites. ECE 380 EE 476 (or 546)

IEE 541 Engineering Administration. (3) F
Introducing quantitative and qualitative approaches to management functions, engineering administration organizational analysis, decision making, and communication IEE 431 students ineligible.

IEE 543 Computer-Aided Manufacturing and Control. (3) S
Computer control in manufacturing, CIM, NC, logic controllers, group technology, process planning and robotics IEE 463 students ineligible. Prerequisite: "C" programming capability.

IEE 544 Concurrent Engineering. (3) N
Understanding and analysis of complex design issues, including product attributes, manufacturing processes and service issues. IEE 464 students ineligible. Prerequisites. ECE 100, IEE 205

IEE 545 Discrete Event Simulation. (3) F, S
Modeling and analysis of stochastic systems using queuing theory and simulation. Statistical aspects of systems and analysis of output measures. Prerequisites EE 475 (or equivalent), instructor approval

IEE 546 Operations Research Techniques/ Applications. (4) F, S
Linear programming network optimization Markov processes, queuing models, emphasizing model building for solving industrial system problems. IEE 476 students ineligible. Prerequisites ECE 380 (or equivalent); IEE 205, instructor approval.

IEE 547 Human Factors Engineering. (3) F
Study of people at work; designing for human performance effectiveness and productivity. Considerations of human physiological and psychological factors. Open only to students without previous credit for IEE 437.

IEE 552 Strategic Technological Planning. (3) S
Study of concept of strategy, strategy formulation process, and strategic planning methodologies with emphasis on engineering design and manufacturing strategy, complemented with case studies An analytical executive planning decision support system is presented and used throughout course. Pre- or corequisite. IEE 545 or 566 or 567 or 574 or 575

IEE 560 Database Concepts for Industrial Management Systems. (3) S
Application of object oriented database technology concepts to manufacturing and enterprise systems

IEE 561 Production Systems. (3) F, S
Enabling theory for production control systems including class item discounting, costing, factory physics, factory variability inventory control, JIT, lot sizing and sequencing. Prerequisites ASE 485 (or 500 or ECE 380) and IEE 461 and 475 and 546 (or equivalents) and MAT 242

IEE 562 Computer Aided Manufacturing (CAM) Tools. (3) F
Current top cs n automat on, distributed con tro control code generat on, control og'c va ı dat on CAM ntegrat on, CAD CAM data structures, plann ng for contro systems. Top cs vary by semester. Prerequ s te EE 463 or 543 or equivalent.

IEE 563 Systems Analysis for Distributed Systems. 3) S
Ana ys s and des gn of distributed groupware appl cat ons for manufacturing and enterpr se systems. Prerequ s te ECE 380

IEE 564 Planning for Computer-Integrated Manufacturing. (3) F
Theory and use of IDEF methodology in p an n ng for f exib e manufactur ng robotics and rea time contro S mulat on concepts app ied to computer- ntegrated manufacturing plan n ng Prerequ s te IEE 463 or 543.

IEE 565 Computer-Integrated Manufacturing Research. (3) S
Determ nat on and eva uat on of research ar eas n computer- ntegrated manufacturing, n c ud ng rea -time software manufactur ng n format on systems, f ex b e and ıntegrated manufacturing systems, robot cs and com puter graph cs Prerequ site IEE 564

IEE 566 Simulation in Computer-Integrated Manufacturing Planning. (3) F
Use of s mu ation n computer- ntegrated manufacturing p anning re ated to f ex b e, n tegrated, and robot cs manufactur ng systems. Use of computer graph cs comb ned with s mulat on ana ysis for CIM decision support Prerequisite IEE 545

IEE 567 System Simulation. (3) S
Use of s mu ation n the ana ys s and des gn of systems nvo v'ng cont nuous and discrete processes simu ation anguages stat st ca aspects of s mulat on. Prerequ s te EE 545.

IEE 569 Advanced Statistical Methods. (3) F 1998
App ıcat on of stat stica nference procedures, based on ranks to eng'neering prob ems. Effi c ent a ternat ves to c ass cal stat st cal nfer ence constra ned by norma ity assumptions Prerequ s te ASE 485 or 500

IEE 570 Advanced Quality Control. (3) S
Econom c-based acceptance samp ing mult' attribute acceptance samp ng, narrow mit gaug ng n nspector error and attributes ac-ceptance sampl ng, pr nc p es of qual ty man-agement and selected top cs from current l t erature Prerequ site: ASE 485 or 500 or equ va ent

IEE 571 Quality Management. (3) F
Tota qua ty concepts qua ity strateg es qua ty and compet t ve posit on, qual ty costs, ven dor re at ons, the qual ty manua and qual ty n the services Prerequ s te EE 431 or 541

IEE 572 Design of Engineering Experiments. (3 F, S
Ana ys s of var ance and experimenta des gn Topics ınclude genera des gn methodology, ncomplete b ocks confound ng, fract onal rep cation and response surface methodol ogy Prerequ s te. ASE 485 or 500.

IEE 573 Reliability Engineering. (3) S
Nature of rel ab ity, t me to fa ure densit es, ser es/para lel/standby systems complex sys-tem re iab l ty Bayes an re ab l ty and se-quent a re ab ty tests Prerequis te ECE 380

IEE 574 Applied Deterministic Operations Research Models. (3) F S
Formulat on, solut on, ana ys s, and app ca tion of determ nist c mode s ın operat ons re search, ıncluding those of near programm ng, nteger programm ng, and non near program ming Prerequ s te· IEE 476 or 546.

IEE 575 Applied Stochastic Operations Research Models. (3) S
App ıcat on of stochast c mode s nc ud ng n ventory theory queu ng theory Markov pro-cesses, stochastic programming and renewa theory Prerequ s te ASE 485 or 500

IEE 577 Decision and Expert Systems Methodology. (3) F
Systems approach to the ana ysıs design and ımp ementat'on of dec s on support sys tems Emphas s on development of data bases mode bases d a ogs and systems ar-ch tecture as we as systems effectiveness Introduction to expert systems as dec s on a d ncluded. Term project required Prerequ s te IEE 205 or equivalent

IEE 578 Regression Analysis. (3 F
A course n regression mode bu d ng oriented toward eng neers/phys cal scient sts Top cs nc ude near regression d agnost cs b ased and robust f tt ng non near regression Pre requ s te ASE 485 or 500

IEE 579 Time Series Analysis and Forecasting. (3) F 1999
Forecast ng time ser es by the Box-Jenk ns and exponent a smoothing techn ques, ex st ng d gita computer programs are ut zed to augment the theory Prerequisites ASE 485 (or 500 , IEE 461

IEE 582 Response Surfaces and Process Optimization. (3) S
An ntroduct on to response surface method and ts app cat ons Top cs nc ude steepest ascent canon ca ana ys s, des gns, and opt mal ty cr ter a. Prerequ s te EE 572

IEE 672 Advanced Topics in Experimental Design. (3) S 2000
Eng neer ng app cations of factona and frac-tional factona des gns w th random zat on re str ctions, ana ys s techn ques n parameter compar son, m ssing data unbalanced de s gns Prerequ site IEE 572 or nstructor ap prova .

IEE 677 Regression and Linear Models. (3) S 1999
Genera near models app cations, theory, nc ud ng least squares, max mum l ke hood est'mat on properties of est mators, ke hood rat o tests and computat onal procedures Pre requ site: IEE 578 or nstructor approval

IEE 679 Time Series Analysis and Control. (3) F 1998
dentification estimat on, d agnost c checking techn ques for ARIMA mode s transfer func-t ons mu t p e t me ser es mode s for feedback and feedforward control schemes Prereq u s te. IEE 579 or nstructor approva .

IEE 681 Reliability, Availability, and Serviceability. (3) F 1998
Organizing hardware and software, ntegnty and fault to erant des gn ma ntenance des gn and strategy Markov models fau t free ana y-s s and m tary standards Prerequisite: ECE 380.

Department of Mechanical and Aerospace Engineering

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ASSOCIATE PROFESSORS
CHEN, KOUR S, KUO, MIGNOLET, RANK N, SQUIRES, WELLS

ASSISTANT PROFESSORS
LEE, McNE LL, PHELAN, PUIG SUARI

The Department of Mechanical and Aerospace Engineering is the adminis trative home for two undergraduate ma jors: Aerospace Engineering and Me-chanical Engineering.

Both majors build on the broad expo sure to the engineering, chemical, and physical sciences and the mathematics embodied in the General Studies and engineering core courses required of all engineering students.

The Aerospace Engineering major provides students an education in tech-nological areas critical to the design and development of aerospace vehicles and systems. Aerospace Engineering graduates are typically employed at government laboratories (e.g., NASA) and in a wide range of aerospace and mechanical industries. The Mechanical Engineering major is perhaps one of the most broadly applicable programs in engineering, providing education for a wide variety of employment opportuni-ties.

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 fun damental knowledge that will have long lasting utility in our rapidly changing technical society.

DEGREE REQUIREMENTS

All degree programs in the department require that students 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 pages 79–83.

COURSE REQUIREMENTS

General Studies

See pages 196–197 for General Studies, school, and engineering core course requirements.

Engineering Core Options

Among the options listed on pages 195–196 as part of the engineering core requirements, students in the Department of Mechanical and Aerospace Engineering are required to take the following:

ECE	100	Introduction to Engineering Design *N3*	4
ECE	210	Engineering Mechanics I: Statics	3
ECE	300	Intermediate Engineering Design *LI*	3
ECE	301	Electrical Networks I	4
ECE	312	Engineering Mechanics II: Dynamics	3
ECE	313	Introduction to Deformable Solids	3
ECE	340	Thermodynamics	3
ECE	350	Structure and Properties of Materials	3
Total			26

AEROSPACE ENGINEERING—B.S.E.

The goal of the Aerospace Engineering program is to provide students with an education in technological areas critical 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	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	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
MAE	498	PS Principles of Aerospace Design	3
Area of emphasis technical electives			6
Total			45

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	434	Internal Combustion Engines	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

NOTE For the General Studies requirement, codes such as L1, N3, C, and H and courses see pages 84–108. For graduation requirements see pages 79–83. For omnibus courses offered but not listed in this catalog see pages 56–57.

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 49 Projects in Design and Development *L2* . . . 3

Computer Methods. Select from these courses

ASE 485 Engineering Statistics V2 . . . 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 464 Concurrent Engineering 3
IEE 475 Introduction to Simulation *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

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 460 Feedback Systems . . . 4
EEE 482 Introduction to State Space Methods 3
MAE 417 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 114 General Chemistry for Engineers *S1/S2* 4
or CHM 116 General Chemistry *S1/S2* (4
ECE 103 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

ENG 102 First Year Composition 3
MAT 242 Linear Algebra 2
MAT 271 Calculus with Analytic Geometry II . . . 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

Total . . . 16

Second Year

First Semester

ECE 210 Engineering Mechanics I: Statics . . . 3
MAT 272 Calculus with Analytic Geometry III . . . 4
MAT 274 Elementary Differential Equations . . . 3
PHY 131 University Physics II Electricity and Magnetism *S1/S2*[3] 3
PHY 132 University Physics Laboratory II *S1/S2*[3] 1
ECE 350 Structure and Properties of Materials . . . 3

Total . . . 17

Second Semester

ECE 301 Electrical Networks I . . . 4
ECE 312 Engineering Mechanics II: Dynamics . . . 3
ECE 313 Introduction to Deformable Solids . . . 3
ECE 340 Thermodynamics . . . 3
ECE 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 460 Gas Dynamics . . . 3
MAE 498 PS: Principles of Aerospace Design . . . 3
HU, SB, and awareness area course[2] 3

Total . . . 15

Fourth Year

First Semester

PHY 361 Introductory Modern Physics . . . 3
MAE 415 Vibration Analysis . . . 4
MAE 462 Space Vehicle Dynamics and Control . . . 3

MAE 463	Propulsion	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 page 196.

[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 thermal systems, and 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		53

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 464	Concurrent Engineering	3
IEE 475	Introduction to Simulation *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

NOTE. For the General Studies requirement codes (such as L1 N3 C and H) and courses, see pages 84–108. For graduation requirements see pages 79–83 For omnibus courses offered but not listed in this catalog see pages 56–57

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
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	Integrated 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
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	Linear Algebra	2
MAT	271	Calculus with Analytic Geometry II	4
PHY	121	University Physics I Mechanics *S1/S2*[1]	3
PHY	22	University Physics Laboratory I *S1/S2*[1]	1
HU, SB, and awareness area course[2]			3
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	4
MAT	274	Elementary Differential Equations	3
PHY	131	University Physics II Electricity and Magnetism *S1/S2*[3]	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 course(s)[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[2]			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 aero space studies AES or military science (MIS) courses to satisfy HU or SB requirements See page 196

[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 Principles 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 or corequisite 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
Position velocities and accelerations of machine parts cams, gears, flexible connectors, and rolling contact Introduction to synthesis Prerequisite· ECE 312.

MAE 351 Manufacturing Processes. (3 S
Automation and assembly systems, forming and machining processes; machining and forming fabs; materials and manufacturing properties tooling and equipment designs Lecture lab Prerequisites: ECE 312 MAE 422 (or 425); MAT 242 or 342)

MAE 361 Aerodynamics I. (3) A
Fluid statics conservation principles stream function velocity potential vorticity Inviscid flow, Kutta-Joukowski theorem airfoil theory and panel methods. Prerequisites: ECE 312 340

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 involving viscous and compressible flow. Prerequisites ECE 384 386; MAE 361 (or 371)

MAE 382 Thermodynamics. (3) A
Applied thermodynamics gas mixtures, psychrometrics, property relationships 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 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 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) Pre- 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

NOTE For the General Studies requirement codes (such as L1, N3 C and H), and courses, see pages 84 108 For graduation requirements see pages 79–83. For omnibus courses offered but not listed in this catalog see pages 56–57.

MAE 435 Turbomachinery. 3) A
Des gn and performance of turbomach nes n clud ng steam gas and hydrau c turb nes, centr fuga pumps compress rs fans and b owers Pre or corequ s te MAE 361 or 371.

MAE 436 Combustion. 3) A
Thermochem ca and reaction rate processes combust on of gaseous and condensed-phase fue s Appl cat ons to propu s on and heat ng systems Po utant format on Prerequ site MAE 388

MAE 441 Principles of Design. (3) F S
Conceptua and embod ment design of me chan ca elements form synthes s; mater a select on fa ure modes manufacturab l ty to - erances common mechan sms and machine e ements Lecture ab project) Prerequ s tes ECE 300, 350. Pre or corequ site MAE 422 or 425

MAE 442 Mechanical Systems Design. (3) A
App cat on of design pr nc p es and tech n ques to the synthes s, mode ng and optim zat on of mechan ca e ectromechan ca and hydrau c systems Prerequisites: MAE 422 or 425 , 441

MAE 443 Engineering Design. (3) F S
Group projects to des gn eng neer ng compo nents and systems Prob em def n t on de at on mode ng, and ana ys s dec s on mak- ng and documentat on act v t es emphas zed 6 hours ab Prerequ s te MAE 441

MAE 446 Thermal Systems Design. (3) A
App cat on of eng neer ng princ p es and tech- n ques to the model ng and ana ys s of ther- ma systems and components Opt m zat on techn q es are presented and the r use dem onstrated Prerequ s te ECE 300 MAE 388

MAE 447 Robotics and Its Influence on Design. 3 A
Robot app cat ons conf gurations s ngu ar pos t ons and work space modes of contro ; v s on programm ng exerc ses, des gn of parts f r assemb y Prerequ s te. MAE 317

MAE 455 Polymers and Composites. (3) F
Re at onsh p between chem stry, structure and properties of eng neering po ymers De- s gn propert es, and behav or of f ber com- pos te systems Cross sted as MSE 470 Prerequ s te: ECE 350

MAE 460 Gas Dynamics. (3 A
Compress b e f ow at subson c and supersonic speeds, duct f ow normal and ob que shocks, perturbat on theory and w nd tunnel design Pre equ sites ECE 386 MAE 361 or 371)

MAE 461 Aerodynamics II. (3) A
Transon c/hyperson c f ows, w ng theory Nav er Stokes am nar turbu ent shear f ows pressure drop n tubes separation drag v s cous nv sc d nteract on and w ng des gn Prerequ s te: MAE 460.

MAE 462 Space Vehicle Dynamics and Control. (3 F
Att tude dynam cs and c ntro aunch ve h c es orb ta mechan cs orb ta transfer ren dezvous space m ss on des gn space struc tures spacecraft control systems des gn Pre requ s te MAE 317

MAE 463 Propulsion. 3) A
Fundamenta s of gas turb ne eng nes and de s gn of components Pr nc p es and des gn of rocket propu s on and a ternat ve dev ces. Lect re, des gn pro ects Prerequ s te ECE 386 Pre or corequ s te MAE 361 or 371).

MAE 464 Aerospace Laboratory. (3) F, S
Aerodynam c f ow parameters flow over a r- fo s and bod es of revo ution flow v sual za- t on; computer aided data acqu s t on and pro- cess ng; boundary ayer theory. 1 hour ecture 4 hours lab Prerequ s tes ECE 386, MAE 361 460

MAE 465 Rocket Propulsion. (3) A
Rocket fl ght performance nozzle des gn combust on of l qu d and so d propellants· component des gn; advanced propuls on sys- tems; nterplanetary miss ons; test ng Pre- requ s te MAE 361 or 371

MAE 466 Rotary Wing Aerodynamics and Performance. (3) A
Introduct on to he copter and prope er ana y s s techn ques Momentum b ade e ement and vortex methods Hover and forward fl ght Ground effect, autorotation and compressib - ty effects. Prerequ s tes ECE 386 and MAE 361 *or* nstructor approva

MAE 467 Aircraft Performance. (3) A
Integrat on of aerodynam c and propulsive forces nto a rcraft performance des gn Est - mat on of drag parameters for des gn Engine a rfo select on Conceptual des gn methodo ogy Lecture design 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 related to aerospace veh c e design work ng from m ss on definit on and cont nu ng through pre minary design Prereq- u s tes: MAE 361, 413 463 *General Studies L2*

MAE 469 Projects in Astronautics or Aeronautics. (3 F S
Various mult d sc p nary team projects ava' ab e each semester. Projects nc ude des gn of high speed rotocraft autonomous veh c es quid fue ed rockets, m cro aer a veh cles sate ites. Prerequ s te nstructor approva

MAE 471 Computational Fluid Dynamics. 3) A
Numerical so ut ons for se ected prob ems in flu d mechanics Prerequ s tes ECE 384 MAE 361 (or 371)

MAE 490 Projects in Design and Development. (3) F S
Capstone projects 'n fundamenta or appl ed aspects of eng neer ng. Prerequ s tes: MAE 441 491. *General Studies· L2.*

MAE 491 Experimental Mechanical Engineering. (3) F S
Exper mental and analyt ca stud es of phe nomena and performance of fluid flow, heat transfer thermodynam cs refrigeration and mechan ca power systems 6 hours ab Pre requ s tes EEE 350, MAE 388.

MAE 498 Pro-Seminar. (1–3 N
Specia top cs for advanced students. Appl ca- t on of the engineer ng d sc p nes to des'gn and analys s of modern techn'ca dev ces and systems Prerequ s te nstructor approva .

MAE 504 Laser Diagnostics. (3 S
Fundamentals of optics and the nteract on of ght w th matter Laser sources aser spec troscopy, ve oc metry, part cle s z ng and sur- face characterizat on

MAE 505 Perturbation Methods in Mechanics. (3) N
Non inear osci at ons stra ned coordinates renorma izat on multip e sca es, boundary lay ers matched asymptotic expans ons turn ng po'nt problems and WKBJ method.

MAE 506 Advanced System Modeling, Dynamics, and Control. (3) S
Lumped-parameter mode ing of physica sys- tems w th examp es State var ab e represen tat ons and dynam c response Introduction to modern contro Prerequisite ASE 582 or MAT 442

MAE 507 Optimal Control. (3) F
Opt mal control of systems Calculus of varia- t ons dynam c programm ng, near quadrat c regulator numerical methods, and Pontry- agin s pr nc p e Cross l sted as EEE 587 Pre requis te. EEE 482 or MAE 506

MAE 509 Robust Multivariable Control. (3) S
Characterization of uncertainty n feedback systems, robustness ana ys s, synthes s tech niques, mu tivar ab e Nyqu st cr ter a com puter aided ana ys s and design Prerequi- sites MAE 417 506

MAE 510 Dynamics and Vibrations. (3) F
Lagrange s and Hami ton s equat ons, r g d body dynamics gyroscop c mot on, and small osc lat on theory

MAE 511 Acoustics. (3) F
Pr nc p es underly ng the generat on, transm s s on and recept on of acoustic waves App i cat ons to no se control architectura acous t cs, random v brations and acoust c fat gue.

MAE 512 Random Vibrations. (3) S
Rev ew of probab l ty theory, random pro cesses stationarity, power spectrum wh te no se process, random response of s ngle and multiple DOF systems, and Markov processes simu at on Prerequisite MAE 510 or 'nstruc- tor approva

MAE 515 Structural Dynamics. (3) S
Free v bration and forced response of d screte and continuous systems exact and approxi- mate methods of so ut on, fin te element mod el ng and computationa techniques Pre- requis te MAE 510 or nstructor approva

MAE 517 Nonlinear Oscillations. (3) F
Ex stence, stab ity and b furcat on of solu- t ons of nonlinear dynam cal systems Meth- ods of analysis of regular and chaot c re- sponses Prerequ s te· MAE 510 or nstructor approva .

MAE 518 Dynamics of Rotor-Bearing Systems. (3) S
Natura whirl frequency, critical speed, and re- sponse analys s of rig d and flexib e rotor sys tems Bear ng nfluence and representation Stab ity ana ysis Methods of balanc ng.

MAE 520 Solid Mechanics. (3) F
Introduction to tensors k nemat cs, kinet cs, and const tut ve assumpt ons ead ng to elas t c p ast c and v scoe astic behav or App ca t ons.

MAE 521 Structural Optimization. (3) S
Linear and nonl near programming Prob em formulat on Constrained and unconstrained opt mizat on Sens tivity ana ys s Approx mate techniques FEM based opt mal design of me chan ca and aerospace structures Cross 'sted as CEE 533. Prerequ s te nstructor ap prova .

MAE 522 Variational Principles of Mechanics. (3) S
Virtual work, stat onary, and comp ementary potential energ es Ham ton's pr nc p e App - cation of these and d rect methods to v bra- t ons elasticity, and stab l ty Prerequ s te MAE 520 or equ va ent

MAE 523 Theory of Plates and Shells. 3) F
Linear and non inear theor es of p ates Mem brane and bending theor es of she s She s of revo ut on Prerequisite MAE 520.

MAE 524 Theory of Elasticity. 3) S
Formulat on and so ution of 2 and 3 d men siona boundary value prob ems. Prerequ s te MAE 520

MAE 527 Finite Element Methods In Engineering Science. (3) F
Discret zation, nterpolat on, elementa matr - ces, assembly, and computer mp ementat on App ication to so id and f uid mechan cs, heat transfer and time dependent prob ems Pre requisite ASE 582

MAE 536 Combustion. (3) N
Thermodynam cs chem ca k netics of com bustion Explosion and ignit'on theor es Reac t ve gas dynamics. Structure, propagation and stab l ty of f ames Exper mental methods Prerequ s te. MAE 436 or 'nstructor approva

MAE 540 Advances in Engineering Design Theory. (3) F
Survey of research n eng neering des gn pro- cess artifact and des gn knowledge forma and informa og c, heur st c and numerical searches theory of structure and comp ex ty Prerequisite: graduate stand ng

MAE 541 CAD Tools for Engineers. (3) F
Elements of computer techn ques required to develop CAD software Data structures n- c ud ng l sts, trees, and graphs Computer graph cs, nc uding 2 and 3 d'mensiona a go nthms and user nterface techn'ques.

MAE 542 Geometric Modeling in CAD/CAM. (3) S
Geometr c and so id model ng curve and sur face des gn, CAD database architectures, and integration of so id mode ng nto eng neer ng processes Prerequ s te MAE 541 or instruc tor approva .

MAE 544 Mechanical Design and Failure Prevention. (3) F
Modes of mechan ca fa ure app cat on of pr nc p es of elast c ty and p asticity in mu t ax'a state of stress to design synthes s, fa ure theories· fatigue creep, mpact Prerequ - site: MAE 443.

MAE 546 CAD/CAM Applications in MAE. (4) F
Solut on of eng neering prob ems w th the aid of state-of-the-art software too s in so d mod el ng eng neer ng ana ys s and manufactur ing se ect on of mode ng parameters; re ab ity tests on software Open on y to students without previous cred t for MAE 406 3 hours lecture, 3 hours ab. Prerequ s te nstructor approva .

MAE 547 Mechanical Design and Control of Robots. (3) N
Homogeneous transformat ons 3 d mensiona kinematics geometry of mot on, forward and 'nverse kinemat cs workspace and mot on 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 synthesis of cam gear, and nkage mechan sms· design opt m zat on; methods of planar motion analys s character stics of p ane mot on· spatial kinematics.

MAE 557 Mechanics of Composite Materials. 3) S
Ana ys s of composite materials and app ica- t ons M cromechan cal and macromechanica behav or C ass ca lam nation theory devel oped w th nvest'gation of bend ng extens on coup ng

MAE 560 Propulsion Systems. (3) N
Design of a r-breath ng gas turbine engines for a rcraft propuls on mission analys s, cyc e analys s eng ne siz ng component des gn

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 subson c transon c, and super sonic f ow equations. The method of charac ter st cs. Numer ca gr d generat'on tech n ques Prerequ site: MAE 571 or nstructor approval

MAE 563 Unsteady Aerodynamics. (3 S
Unsteady ncompress b e and compress b e f ow W ngs and bod es in osc atory and tran- s ent mot ons Kerne funct on approach and pane methods Aeroelast c app cat ons. Pre- requ s tes MAE 460 (or 461 , 562

MAE 564 Advanced Aerodynamics. (3) F
Perturbat on method L near zed subsonic and superson c f ows. Th n w ng/s ender body theories L ft ng surface theory. Pane method computat on Prerequ s te MAE 460 or 461.

MAE 566 Rotary-Wing Aerodynamics. (3) F
ntroduct on to he copter and propel er analy s s techn ques Momentum b ade-element and vortex methods Hover and forward fl ght Ground effect autorotation and compressibl ty effects Prerequisite: MAE 361

MAE 571 Fluid Mechanics. (3) F
Bas c k nemat c dynam c and thermodynam c equat ons of the f uid cont nuum and the'r ap p cat on to bas c f u d mode s

MAE 572 Inviscid Fluid Flow. 3) S
Mechan cs of f u ds for flows n wh ch the ef fects of v scos ty may be ignored Potentia flow theory waves and nv sc d compressible flows Prerequ'site· MAE 571

MAE 573 Viscous Fluid Flow. (3) F
Mechanics of flu ds for flows n wh ch the ef- fects of v scos ty are signif cant Exact and ap- prox mate so ut ons of the Nav er-Stokes sys- tem lam nar f ow at ow and h gh Reyno ds number Prerequ s te MAE 571.

MAE 575 Turbulent Shear Flows. (3) F
Homogeneous, isotrop c, and wa turbu ence. Exper mental resu ts ntroduct on to turbulent flow ca cu at ons Prerequ s te MAE 571

MAE 577 Turbulent Flow Modeling. (3) S
Reyno ds equat ons and the r c osure. Mode - ng of s mp e and comp ex turbulent flows cal- culat ons of nternal and external flows and appl cat on to engineer ng prob ems Prerequ site MAE 571

MAE 581 Thermodynamics. (3) F
Basic concepts and aws of c ass ca equ ib r um thermodynam cs; app cat ons to engi neering systems ntroduct on to stat stical thermodynam cs.

MAE 582 Statistical Thermodynam'cs. (3) A
K net c and quantum theory Stat st'ca me- chan cs, ensemb e theory Structure and ther- modynam cs of noninteract ng and interact ng part c es. Bo tzmann integro d fferential equa t on. Prerequ s te: graduate stand ng

MAE 585 Conduction Heat Transfer. (3 F
Bas c equations and concepts of conduct on heat transfer. Mathemat ca formulat on and so ut on (analyt ca and numer ca) of steady and unsteady one- and mu t'dimens ona heat conduct on and phase change problems Pre- requ s tes· ECE 386, MAE 388

MAE 586 Convection Heat Transfer. (3 S
Basic concepts and govern ng equations. Analys's of lam nar and turbu ent heat transfer for nternal and externa f ows. Natura and m xed convection Prerequ s te: MAE 388.

MAE 587 Radiation Heat Transfer. 3) F
Advanced concepts and so ut on methodo o- g es for rad at on heat transfer nc ud ng ex- change of thermal rad at on between surfaces, rad ation n absorb ng, em tt ng, and scattering med a and rad at on comb ned w th conduct on and convect on. Prerequ s te MAE 388

MAE 588 Two-Phase Flows and Boiling Heat Transfer. (3) S
Pool and flow bo ing heat transfer, condensa t on heat transfer, var ous models of vapor l q u d mixture f ows, gas so id m xture f ows, and experimenta measurement techniques

MAE 589 Heat Transfer. 3 F
Basic concepts, phys cal and mathematica mode s for heat transfer App cat ons to con- ductive convective rad at ve and comb ned mode heat transfer Prerequ s te: MAE 388

MAE 594 Graduate Research Conference. (1) F, S
Topics n contemporary research Required every semester of a departmenta graduate students reg stered for 9 or more semester hours. Not for degree cred t.

MAE 598 Special Topics. (1 3) F S
Special topics courses, includ ng the fo low ng wh ch are regu arly offered are open to qua fied students.
(a) Advanced Spacecraft Control
(b) Aeroe ast c ty
(c) Aerospace Veh c e Guidance and Contro
(d) Boundary Layer Stab ity
(e) Hydrodynam c Stab' 'ty
(f) P ast c ty
(g) Po ymers and Compos tes

NOTE For the General Stud es requ rement codes (such as L1 N3 C and H), and courses, see pages 84–108. For graduation requ rements, see pages 79–83. For omn bus courses offered but not sted in th s cata og see pages 56–57.

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.

Manufacturing Engineering. This program option is offered by the Department of Industrial and Management Systems Engineering. See pages 228–229 for program requirements.

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

ENG	101, 102	First Year Composition	6
		or 105 Advanced First Year Composition (3) or ENG 107, 108 English for Foreign Students (6)	
Total			6

General Studies/School Requirements

Humanities and Fine Arts/ Social and Behavioral Sciences

ECN	111	Macroeconomic Principles *SB*[1]	3
		or ECN 112 Microeconomic Principles 3) *SB*[1]	
HU SB, and awareness area courses[2]			13
Total			16

Literacy and Critical Inquiry 7

Natural Sciences

PHY	121	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

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	4
MAT	272	Calculus with Analytic Geometry III	4
MAT	274	Elementary Differential Equations	3
Total			21
General Studies/school requirements total			58

Engineering Core

ECE	210	Engineering Mechanics I: Statics	3
ECE	300	Intermediate Engineering Design *L1*	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			20

Engineering Special Studies Program Major—Premedical Engineering Option

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	413	Biomedical Instrumentation *L2*	3
BME	416	Biomechanics	3
BME	417	Biomedical Engineering Capstone Design I	3
BME	423	Biomedical Instrumentation Laboratory *L2*	1

NOTE For the General Studies requirement codes (such as L1, N3, C, and H) and courses, see pages 84–108. For graduation requirements, see pages 79–83. For omnibus courses offered but not listed in this catalog, see pages 56–57.

BME	435	Physiology for Engineers	4
BME	470	Microcomputer Applications in Bioengineering	4
BME	490	Biomedical Engineering Capstone Design II	4
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			58

[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 page 196.

[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	4
PHY	121	University Physics I: Mechanics *S1/S2*[1]	3
PHY	122	University Physics Laboratory I *S1/S2*[1]	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	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* or ECN 112 Microeconomic Principles *SB* (3)	3
MAT	274	Elementary Differential Equations	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* or ECE 384 Numerical Analysis for Engineers I (2) or ECE 386 Partial Differential Equations for Engineers (2)	2
HU, SB, and awareness area course(s)[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 courses[3]			6
Total			16

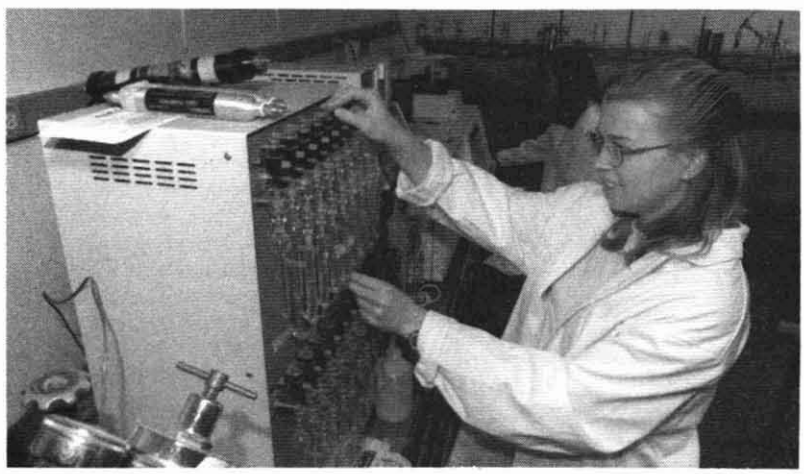
Second Semester

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]			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 page 196.



Sara Gerke, a student in Environmental Civil Engineering, works with a gas chromatograph in the Environmental Engineering Laboratory. Ken Sweat photo

College of Extended Education

Bette F. DeGraw, D.P.A.
Dean

PURPOSE

The College of Extended Education was created in 1990 for the purpose of extending the resources of ASU throughout Maricopa County, the state, and the region. The College of Extended Education oversees ASU's Extended Campus and forms partnerships with other ASU colleges in order 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 boundary of ASU's three physical campuses to provide access to academic 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, CD ROM, 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 working 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*.

College of Architecture and Environmental Design. The faculty in the School of Planning and Landscape Architecture 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 scheduling information. For information about this program, call 602/965-7167 or write

SCHOOL OF PLANNING AND
LANDSCAPE ARCHITECTURE
ARIZONA STATE UNIVERSITY
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 program is offered at the ASU Research Park. Cases, applications, and examples emphasize technology, global competition, and rapid organizational change. Call the College of Business at 602/965-3332 for detailed information about this degree program.

College of Education. Three education degrees—the Bachelor of Arts in Education (B.A.E.) degree in Elementary Education and two Master of Education (M.Ed.) degrees—are available through the Off Campus Degree Program. These degree programs are targeted to specific audiences and are not open to the general public. To learn more about these education degrees, call 602/965-1644.

College of Public Programs. The College of Public Programs offers a Master of Public Administration (M.P.A.) degree. This interdisciplinary program is designed to provide professional training for careers in public administration and management. Opportunities for completing 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 602/965-3926 or write

DICKINSON MCGAW
SCHOOL OF PUBLIC AFFAIRS
ARIZONA STATE UNIVERSITY
PO BOX 870603
TEMPE AZ 85287-0603

School of Social Work. The School of Social Work, in cooperation with the College of Extended Education, offers a Bachelor of Social Work (B.S.W.) degree in Tucson. This program is grant funded for a five-year period and offers a part-time curriculum designed to increase the number of trained child welfare social workers in the rural areas of Arizona. For more information, call Martha Marsden at 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 602/965 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 602/965 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 602/965–5095.

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.

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.

The certificate is designed for the person who wants to know more about the aging process. Increased longevity means that by the year 2040 there could be more than 30 million Americans over the age of 85. For more information, call 602/965 3225 (ASU Main) or 602/543–6600 (ASU West).

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 602/965 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 June. The curriculum is approved by the Arizona State Board of Nursing; Arizona State University, College of Nursing Curriculum Committee, and faculty; and Arizona State University's Graduate College and 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 expected to be very competitive. For more information, call the College of Nursing's Student Services Office at 602/965 2987.

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.*

Instructional Programs. As a convenience to students, courses are conducted off campus in locations throughout the state and on campus in the evening.

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. Instructional Programs and the College of Liberal Arts and Sciences collaborate to offer several degrees in the on campus evening degree program For details, see "Degree Programs" on pages 240–241.

For more information about Instructional Programs, call 602/965 9797.

Distance Learning Technology. Distance Learning Technology uses a variety of technologies, including Instructional Television Fixed Service (ITFS), cable television, public television, satellite, microwave, videotape, CD ROM, the Internet, and independent learning to deliver courses to ASU students at a variety of locations. 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 the class on campus while class is in session via teleconferencing technology. Videotapes 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 complete 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 in the university residence halls.

Interactive Instructional Television Program (IITP). Students employed by companies participating in the IITP may take courses for credit at the work site. A daily courier service circulates course materials between faculty on campus and their students at remote sites. Exams typically are held at the work site. Each company has an on site coordinator to assist with registration, to provide information, and to proctor 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 602/965 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 Gila River Indian Community. Each public site has an on-site coordinator to assist with registration, to provide information, and to proctor exams.

Internet Courses. Several 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/software may be required for Internet courses. Further information is available from Distance Learning Technology at 602/965–6738.

CD ROM Courses. An increasing number of departments are offering courses via CD ROM. These courses allow students to participate in course materials and complete assignments from the location most convenient to them. Certain computer hardware/software is required for CD ROM courses. Students typically register for these courses through Distance Learning Technology.

Independent Learning. These courses allow students to pursue 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. Independent 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 assignments, correspondence with instructors and other course details are available in a catalog from the Independent Learning office at 602/965–6563.

Professional and Continuing Education

Professional and Continuing Education activities focus on professional and personal development as well as lifelong learning. Programs are planned and developed to complement 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 Programs and Institutes. Professional Programs and Institutes develops and offers high quality continuing education programs designed 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 orga

nizations. For more information, call 602/965 3046.

Computer Training Programs. Computer Training Programs is the oldest provider of professional computer software and hardware training in the state. Computer Training Programs offers microcomputing training classes in the latest versions of software and courseware as well as a full range of short, streamlined courses in progressive 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, and in the ASU Sun Cities and Mesa, as well as in many work sites. For more information, call 602/965 9200.

Lifelong Learning Programs. Lifelong Learning Programs provides an informative experience that enriches lives. All programs are open to the public and adults of any age or educational background can learn in an informal noncompetitive environment. Programs in the Sun Cities area are geared toward the retirement communities and include a wide variety of courses from approximately 30 disciplines. These programs are in the process of expansion to the East Valley and throughout Maricopa County. For an international educational travel experience, ASU and TraveLearn partner to provide programs to 15 exciting destinations including Costa Rica, Indonesia, and Kenya. For more information about Lifelong Learning Programs, call 602/727 5264.

Global and Community Outreach

American English and Culture Program. The American English and Culture Program features an intensive course of study designed for adult international students who want to become proficient in English as a second language 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 applicants. Students are required to take an English placement test before the beginning of classes. Certificates of achievement are awarded on completion of the course. Admission to the program does not constitute regular admission to ASU.

Beginning, intermediate, and advanced courses provide instruction in listening, reading, speaking, structure, and writing. Academic advising and orientation to Arizona and the United States are integral parts of the program.

Program wide social activities each term include a major field trip, a picnic, a cultural activity, visits to museums, historical sites, or musical presentations.

Advanced level students may be permitted to enroll concurrently in up to two ASU credit classes with the approval of the director. Several special classes are offered through the 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. Inquiries 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 85287–2376

For more information, call 602/965 2376

Extended Campus Programs. Extended Campus Programs 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 students have access to effective, appropriate university programs. Extended Campus Programs focuses on developing and maintaining education, business, government, professional, 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 602/965 3046.

ASU Downtown Center. The ASU Downtown Center, located at the Phoenix Mercado, is specifically designed to extend ASU into the central Phoenix community, to help address urban challenges, to serve local and state government of Arizona, and to enhance public policy-making capacity.

The center provides instruction and community outreach, carries out applied research, and promotes economic and cultural development. Graduate and upper division courses of interest to government, business, and the professional community are offered. Interactive instructional television courses in engineering, business, liberal arts, and nonlaboratory sciences are also offered.

The ASU Downtown Center also serves as a meeting and conference site. It offers attractive rates, accommodations for small or large groups, beverage and food service, professional equipment, and secure, limited parking. The Downtown Center staff offers a wide range of services in meeting planning. The center is available for use by outside organizations, subject to the limits of university policies and procedures. For more information, call the facility coordinator at 602/965 3046, or write to

ASU DOWNTOWN CENTER
502 E MONROE ST
PHOENIX AZ 85004–2337

ASU faculty, staff, and students may take advantage of computer lab facilities at the ASU Downtown Center. Equipped with IBM personal computers and Macintosh computers, the laboratory has access to VAX, FOCUS, WYLBUR, the libraries, electronic mail, and more A lab assistant is also available.

Students at the ASU Downtown Center have access to ASU library information and resources through the Computer Lab. Students may order library books and return them, in addition, access to the library's online catalog is available. Lab hours vary each semester For more information, call 602/965 3046.

Several College of Extended Education programs and partnerships are located at the Downtown Center.

Professional and Continuing Education. Professional and Continuing Education is part of the Extended Campus and is a unit of the College of Extended Education. This brings the resources of ASU to many who may not be pursuing a traditional degree and are seeking professional and personal enrichment. Three program areas are offered: Computer Training, Professional Programs and Institutes and Lifelong Learning. See pages 242–243 for a description.

Joint Urban Design Program. The Joint Urban Design Program, located in the ASU Downtown Center, is a partnership between the ASU colleges of Architecture and Environmental Design and Extended Education. The program directs institutional and public resources toward developing an understanding of issues that affect the urban quality of Phoenix. For more information, call 602/965–3046.

Urban Data Center. The Urban Data Center, 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 602/965–3046.

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 602/965–3046.

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 Hispanic 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 602/965–8510.

The Mercado, home to the ASU Downtown Center and its Joint Urban Design Program. Tim Trumble photo

College of Fine Arts

J. Robert Wills, Ph.D.
Dean

PURPOSE

The College 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 artist and scholar in the 20th century. The arts, as an integral part of the curricu lum, offer the student a rewarding educational experience balanced and strengthened by studies in related fine arts areas, the humanities, social sci ences, and the sciences

In addition to professional curricula offered in each department and school, the college 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 commu nity is further enriched by study oppor tunities offered at off campus sites. The College of Fine Arts also offers community audiences many hours of cultural enjoyment through myriad concerts, art exhibitions, music and dance concerts, dramatic productions, 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 2,000 stu dents per semester enroll as majors in various degree programs offered through these units. The college also includes the University Art Museum and the Institute for Studies in the Arts.

ADMISSION

Students meeting the university requirements for admission may matricu late in the College of Fine Arts. Separate admission procedures and approv als 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 on pages 63–64. Transfer students are encouraged to contact their department or school or the Office of Student 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 se mester 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.

College of Fine Arts Degrees, Majors, and Concentrations

Major	Degree	Administered by
Baccalaureate Degrees		
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[1] Concentrations: choral-general, instrumental, string	B.M.	School of Music
Music Therapy[1]	B.M.	School of Music
Performance Concentrations: guitar, jazz, keyboard, music theatre, orchestral instrument, piano accompanying, voice	B.M.	School of Music
Theatre Emphases: 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
Graduate Degrees		
Art Concentrations: art education, art history	M.A.	School of Art
Art Concentrations: ceramics, drawing, fibers, intermedia, metals, painting, photographic studies, photography, printmaking, sculpture, wood	M.F.A.	School of Art
Composition	M.M.	School of Music
Creative Writing	M.F.A.[2]	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	M.M.	School of Music
Music Concentrations: choral music; composition; general music; instrumental music; solo performance (instrumental, keyboard, voice)	D.M.A.	School of Music
Performance Concentrations: music theatre musical direction; music theatre performance, performance pedagogy, piano accompanying; solo performance (instrumental, keyboard, voice)	M.M.	School of Music

[1] This major requires more than 120 semester hours to complete.

[2] This program is administered by the Graduate College. See "Graduate College," pages 282–292. Playwriting is an option for students in this program offered by the faculty in the Department of Theatre. Fiction, nonfiction, poetry, and screenwriting are also options in this program offered by the faculty in the Department of English.

Major	Degree	Administered by
Theatre	M A	Department of Theatre
Theatre Concentrations acting, scenography, theatre for youth	M.F.A.	Department of Theatre
Theatre Concentration: theatre for youth	Ph.D.	Department of Theatre

Baccalaureate Degrees

The three baccalaureate degrees dif fer in curricula with respect to the amount of specialization permitted in the major field. The B A. degree pro vides a broad, scholarly, humanistic program, while the other two programs place greater emphasis upon the major field. The university General Studies curriculum plays an integral role within the educational mission of the univer sity and as such constitutes an impor tant component of all undergraduate degrees in the College of Fine Arts. See pages 84–87 for university General Studies requirements

In cooperation with the College of Education, a K 12 endorsement for teacher certification is available in the disciplines of art, dance, music, and theatre for students preparing for a teaching career in the public schools Students should, with the advice and counsel of their arts education advisors, fulfill the requirements for the appro priate area of specialization under the Bachelor of Fine Arts or Bachelor of Music degrees. In addition, a student wishing to be admitted to the Profes sional 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 com pleted 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 de tails on admission requirements and procedures for the PTPP can be found on page 167.

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 lead ing to a minor The minor is not in tended as a substitute for professional work in the arts, but as a complement to various liberal arts and preprofes sional curricula.

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 relevant academic unit for specific requirements and guidelines 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 *Gradu ate Catalog* for specific requirements for the M A , M.F.A M M , D M A , Ed.D., and Ph.D. degrees.

UNIVERSITY GRADUATION REQUIREMENTS

In addition to fulfilling college and major requirements, students must meet all university graduation requirements. For more information, see pages 79 83.

General Studies Requirement

All students enrolled in a baccalaure ate degree program must satisfy a uni versity requirement of a minimum of 35 semester hours of approved course work in General Studies, as described on pages 84–108. Note that all three General Studies awareness areas are re quired. Consult your advisor for an ap proved list of courses. General Studies courses are listed on pages 87 108 fol lowing the section on "General Stud ies," in the course descriptions, in the *Schedule of Classes*, and in the *Summer Sessions Bulletin.*

Courses in the ma or 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 literacy areas, numeracy (computer applications) ar eas, and awareness areas are an excep tion. Students are encouraged to con sult with an academic advisor to ensure that they com ply with all necessary re quirements.

COLLEGE DEGREE REQUIREMENTS

College of Fine Arts degree require ments supplement the General Studies requirement. Descriptions of additional required courses follow Students are encouraged to consult with an aca demic advisor to ensure that they com ply 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 Studies requirement by selecting approved courses as indicated in the *Schedule of Classes*. This requirement may a so be met by taking *any* College of Fine Arts course outside of the student's major

All B A degrees require the equiva lent 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 anguage 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 lan guage courses 101, 102, 201, and 202. This requirement may be fulfil ed at the secondary school level or by examina tion. If acquired in secondary school, two years of instruction n one foreign language is considered the equivalent of one year of college instruction Transfer students are placed in lan guage study at the level above com pleted work

Candidates for the B.M degree in Performance with a concentration in pi ano accompanying or voice and in Theory and Composition with a con centration in theory have specific for eign language requiremei ts, which are

stated with each of the degree require ments (pages 267 269). 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 bac calaureate 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 addi tional semester hours for graduation and a higher cumulative GPA of their majors. To be acceptable as degree credit, all course work in the major dis cipline must show an earned grade of "C" (2.00) or higher

In addition to the general informa tion given below, consult the school and departmental sections that follow for specific 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 be-tween a field of specialization (30 to 53 hours) and one or more related fields (an additional 15 hours). The exact content of the major is selected by a student in consultation with an advisor under rules and regulations of the de partment or school concerned. Audi-tions and/or interviews are required for admission to the B.A. in Theatre with emphasis degree program. Consult the Department of Theatre for specific in formation

Bachelor of Fine Arts (B.F.A.) De-gree. 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 de signed as preprofessional study in art, dance, or theatre education. Auditions and/or interviews are required for ad mission 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 dependent upon the area of specialization. The curriculum for the major is designed to provide a broad yet concentrated preparation with a choice of specialization among the ar eas of choral general music, instrumen tal music, jazz, music performance, music theatre, music therapy, piano ac-companying, and theory composition. An entering undergraduate music stu dent, regardless of the area of special-ization, must perform an entrance audi tion in his or her primary performing medium (voice or instrument)

ACADEMIC STANDARDS

The terms of disqualification, rein statement, and appeals are consistent with those set forth by the university on pages 77 78 of this catalog, except for degree programs in Theatre. For all emphases in the B.A. degree in The atre, a student must have a minimum GPA of 2.50 in the major and an over-all GPA of 2.00 to enroll in upper divi sion 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 mini mum GPA of 3 00 in the major to en roll in upper division courses and to re main in good standing. In addition, a student disqualified in any program is normally not eligible for reinstatement for two semesters

SPECIAL PROGRAMS

Working closely with faculty, visit ing scholars, and artists in residence, students in all fields of the College of Fine Arts participate in dynamic, inno vative programs. Students receive a great deal of individual attention to their creative work and artistic develop-ment.

The School of Art is one of the larg est programs of its kind in the country and offers students a wide range of spe-cialties in media, art history, and art education. The faculty are nationally recognized and provide excellent in struction in a curriculum with many different educational opportunities. Some of the unique offerings are book-making and papermaking, digital, film, neon, and video animation, and foun dry In addition, internships are avail able in galleries and museums through out the Phoenix area. The Children's Art Workshop is an on campus pro gram taught by students in art educa tion for school age children in the met ropolitan area. Northlight Gallery, a teaching gallery, hosts exhibitions or ganized and curated by students. Visit-ing 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 leadership positions in art, education, and industry

Recognized as one of the top pro-grams 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 Ari zona Repertory Theatre (DART), a stu dent touring outreach company. An ambitious performance program offers several concerts to the public each year with additional works created and per formed by graduate and undergraduate students. Students work closely with renowned artists and companies who visit the campus annually and with re searchers in the areas of dance science, dance in relation to technology, dance music composition, labanotation, sound, and video production. ASU stu dents and faculty have consistently taken top honors at the regional and na tional festivals of the American College Dance Festival 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 di vergent 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 suc-cessfully 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 inau gurated a redesigned B.A. degree pro-gram that allows a 54-hour emphasis in acting, design/technical theatre, direct-ing/stage management, or history/ theory and criticism. A strong feature of the new B A. degree program is the broad liberal arts education, which cul tivates in the student the ability to un derstand human behavior and values in societies of the past and present, an es sential 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 in ternationally acclaimed programs in theatre education and theatre for youth; an outstanding playwriting area that in fuses 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 act ing coaches; and a nationally recog nized 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 the atre and the quality of the faculty, stu dent body, and facilities often attracts professionals to ASU. The department recently premiered productions by three Pulitzer prize-winning playwrights. An nually, the *Genesis New Plays Project* (which has student actors, designers, and playwrights working with profes sional actors, directors, and playwrights to discuss new scripts in a workshop) is coproduced with the state's League of Resident Theatres (LORT company, the Arizona Theatre Company. Four to six subscription series plays are pro duced in the 500 seat Galvin Theatre and the smaller Lyceum Theatre. An additional eight to 14 student directed shows are presented as part of the scholarship series The theatre for youth area, with ASU Public Events, cosponsors an International Youth Arts Festival that 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 Col lection in Hayden Library, which in-cludes 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 inter national recognition of the theatre for youth faculty.

Since theatre is a collaborative art form, students at the undergraduate level are required to learn and partici pate 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 train ing. 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. Stu dents in the B A. and M.F.A scenogra phy 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. A new M F A degree in Theatre with a concentration in acting is based on a conservatory model in which students have intensive training in voice, movement and acting with classical, contemporary, and new scripts, augmented by study in theatre history, theory, and criticism.

A faculty playwright works closely with both undergraduate and graduate directing students to create and show case original scripts from students and faculty An interdisciplinary M F.A. de gree 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 The atre 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 undergradu ate credit. Application for admission to a graduate course for undergraduate credit must be completed in advance of the regular registration period. The ap plication must be approved by the in structor of the class, the student's advisor, the chair or director of the department or school, and the dean of the col lege in which the course is offered.

Preprofessional Programs. Students preparing for admission to professional graduate schools should obtain infor mation regarding admission require ments by writing directly to the schools in which they are interested.

School of Art

Julie F. Codell
Director
(ART 102) 602/965–3468
www.asu.edu/cfa/art

PROFESSORS
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ASSISTANT PROFESSORS
McIVER, PESSLER, WOLFTHAL

LECTURER
HOK N

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 Under graduate 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 gen eral education in the field with some specialized work at the upper division level.

NOTE For the General Stud es requ rement, codes (such as L1 N3 C, and H) and courses see pages 87 108 For graduat on requ rements see pages 79–83. For omn bus courses offered but not isted n th s cata og see pages 56–57

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 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 pages 79–83 for university graduation requirements and pages 247–248 for college degree requirements.

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	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," pages 348–360. (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 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.

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	3
ARS	202	Art of Africa, Oceania, and the Americas	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	350	19th Century Photography *HU*	3
ARS	351	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	Introduction 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	3
ART	494	ST: 19th-Century Photo Processes	3
Total			21

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," pages 348–360.

NOTE: For the General Studies requirement codes (such as L1, N3, C and H) and courses see pages 87–108. For graduation requirements see pages 79–83. For omnibus courses offered but not listed in this catalog see pages 56–57.

BACHELOR OF FINE ARTS DEGREE

Art

The major in Art consists of 75 se mester hours, with a concentration in one area selected on the basis of the student's interests. The following con centrations are available to the student: art education, ceramics, drawing, fi bers, intermedia, metals, painting, pho tography, printmaking, and sculpture

Core Curriculum. All students in this degree program follow the same core curriculum in art for the first two se mesters:

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	3
ART	112	Two D mensional 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 stu dent's program of study. Art courses that do not have the same title and de scription as ASU catalog courses must have the approval of the School of Art standards committee.

GRADUATION REQUIREMENTS

In addition to fulfilling the major re quirements, students must meet all uni versity graduation requirements and college degree requirements. See pages 79 83 for university graduation re quirements and pages 247 248 for col lege degree requirements.

Art Education

Core Curriculum. See above for the courses that make up the core curricu lum

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	Special Topics	3
ARE	496	Methods and Assessment of Learning in Art	3
Total			21

Area of Proficiency. Twenty one se mester hours are required with a mini mum of 15 semester hours in a specific area of studio or art history with at least 12 upper division semester hours

Art History. Six semester hours of ARS upper division electives are re quired with one course in art during the 20th century.

Additional Requirements. The fol lowing courses are additional require ments:

ART	201	Photography I	3
ART	223	Painting I	3
ART	231	Sculpture I or ART 261 Ceramic Survey 3) or ART 272 Jewelry I (3 or ART 274 Wood I (3) or ART 276 Fibers I 3)	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 ap proved by an art education advisor. The art proficiency courses must in clude a minimum of 15 semester hours in a specific area of studio art or art his tory. Twelve of these semester hours must be upper division credits. The art proficiency can be in art history, ce ramics, drawing, fibers, intermedia, metals, painting, photography, print making, or sculpture. Teaching experi ence is provided in the Children's Art Workshop, which is an on campus pro gram based in studio and art history for children ages five to 15. Participation in the workshop is part of the require ments for ARE 486 Art Education: Strategies and Applications. ARE 486 meets the state certification require ments for the elementary methods class, and ARE 496 Methods and As sessment of Learning in Art meets the requirements for the secondary meth ods 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 edu cation may also choose to become cer tified for teaching art K 12. If certifi cation is elected while pursuing the art education undergraduate degree, addi tional 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 be fore 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 pro cess, students must meet the U.S. and Arizona constitution requirement Cer tification may also be pursued after re ceiving 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 Appl cations	3
ARE	496	Methods and Assessment of Learning in Art	3
Total			12

The B.F A. degree in Art with a con centration in art education and the post baccalaureate program for certification in art have special art education appli cation procedures This procedure is separate from, and in addition to, the admission requirements of ASU Ac ceptance is based on a 2.50 GPA, com pletion 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-divi sion courses), and a "B" or higher in ARE 450 and 460. In addition, under graduate and postbaccalaureate stu dents 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 page 251 for the courses that make up the core curriculum.

Specialization. The following courses make up the specialization:

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	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 page 251 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	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 page 251 for the courses that make up the core curriculum.

Specialization. The following courses make up the specialization:

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

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 page 251 for the courses that make up the core curriculum.

Specialization. The following courses make up the specialization:

ART	439	Mixed Media	3
ART	440	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 Printmaker I	3

Two of the following three courses (six semester hours) are required:

ART	439	Mixed Media	3
ART	440	New Media Concepts	3
ART	442	Folk/Outsider Art	3
ART	443	Intermedia	3
ART	444	Computer Art I *N3*	3
ART	446	Computer Art II *N3*	3
ART	448	Computer Animation I	3
ART	449	Computer Animation II	3
ART	494	ST (Intermedia elective)	3

Art History. Three semester hours of non-Western ARS 438 Art of the 20th Century I and 439 Art of the 20th Century II are required.

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 page 251 for the courses that make up the core curriculum.

Specialization. The following courses make up the specialization:

ART	272	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 page 251 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	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 page 251 for the courses that make up the core curriculum.

Specialization. The following courses make up the specialization:

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 nine 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	409	Photographic Exhibition	3
ART	494	ST: Photo	3

Art History. ARS 350 and 351 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 page 251 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 10 courses (nine semester hours) are required:

ART	352	Lithography I	3
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

NOTE: For the General Studies requirement codes (such as L1, N3, C, and H), and courses see pages 87–108. For graduation requirements, see pages 79–83. For omnibus courses offered but not listed in this catalog, see pages 56–57.

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 page 251 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

Five of the following nine courses (15 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	Special Topics	3

Art History. Six semester hours of upper division ARS courses are required.

Additional Requirements. The following courses are required.

ART	261	Ceramic Survey	3
ART	272	Jewelry I	3
ART	276	Fibers I	3
Total			9

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, or sculpture. 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. Prereq u s tes ENG 101 102 junior standing *General Studies. HU*

ARA 460 Gallery Exhibitions. 3) F S
Practical experience in a 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*

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

ARE 450 Studio Art: Art History I. (3 A
Artistic traditions before the 20th century as a basis for studio and art history instruction 2 hours lecture 2 hours studio Prerequisite *or* coreq u'site: ARE 460

ARE 460 Disciplines of Art Education. (3 A
Explorations in art education as disciplines, history, and people artmaking development at diverse ages events and abilities Lecture, discussion Prerequisites ARS 101 and 102 and ART 113 and 115 *or* instructor approval.

ARE 470 Art Criticism: Aesthetics. (3) F
Traditions of aesthetics and artistic sm conceptual issues in contemporary art education in the visual arts. 2 hours lecture 2 hours studio. Prerequisite. ARE 460 or instructor approval

ARE 482 Studio Art: Art History II. (3) S
Artistic traditions of the 20th century as a basis for studio and art history instruction. 2 hours lecture, 2 hours studio Must be taken before enrollment in ARE 486 Students are recommended to take ARE 470 concurrently Prerequisite ARE 450

ARE 486 Art Education: Strategies and Applications. 3 F
The implementation and evaluation of art instruction for K 12 populations includes teaching of Saturday classes in the Children's Art Workshop Prerequisite ARE 482

ARE 496 Methods and Assessment of Learning in Art. 3 S
Individual or group research on the assessment of art learning incorporating theory and practice Prerequisites ARE 470 and 486 *or* instructor approval

ARE 510 Art Education Colloquium. 3 F
History of art foundations of art education and faculty presentation of positions regarding teaching and research related to the visual arts Must be taken in the first 6 hours of study

ARE 520 Issues in Teaching Art History. (3 A
Critical examination of issues concerning teaching art history to different populations of students History of art and philosophical foundations and emphasis on developing inquiry into historical and cultural contexts of art Recommended to be taken before ARE 525

ARE 525 Research on Teaching Art History. (3 A
Review of empirical and historical research, research methods learning theory and assessment of learning in art history P ot studies on the effects of instruction upon learning Recommended to be taken after ARE 520

ARE 530 Issues in Teaching Studio Art. 3 A
Critical examination of issues concerning teaching multicultural art to different populations of students. Historical and philosophical foundations reviewed Recommended to be taken before ARE 535 Lecture discussion

ARE 535 Research on Teaching Studio Art. (3) A
Review of empirical and historical research methods, learning theory and assessment of learning in studio art including developmental studies and the impact of instruction upon learning Recommended to be taken after ARE 530

ARE 540 Teaching Art in Cultural Contexts. (3) A
Relationship of multicultural perspectives to teaching/learning art critic sm, aesthetics studio art, and art history

ARE 610 Issues and Trends in Art Education. (3) N
Doctoral - level investigation of historical and contemporary issues related to teaching and research in art education.

ARE 611 Curriculum Development in Art Education. 3) N
Doctoral - level inquiry into the philosophical psychological and sociological foundations of curriculum development

ART HISTORY (ARS)

ARS 100 Introduction to Art. 3) F S SS
Development of understanding and enjoyment of art and its relationship to everyday life through the study of painting sculpture architecture and design May not be taken for credit by student who has completed ARS 300 nor used as art history credit by Art majors *General Studies HU.*

ARS 101 Art of the Western World I. (3) F S, SS
History of Western art from the Paleol th'c pe r od through the Midd e Ages *General Studies· HU, H.*

ARS 102 Art of the Western World II. (3) F, S, SS
H story of Western art from the Rena ssance to the present. *General Stud es: HU, H*

ARS 201 Art of Asia. (3) A
H story of the art of the As'an cultures, w'th emphas s on Ch na, Japan, and ndia Meets non Western art h story requ rement *Genera Studies: HU, H*

ARS 202 Art of Africa, Oceania, and the Americas. (3) A
H story of art of Africa Oceania, and the New World. Meets non Western art h story requ re ment *General Stud es: HU, H.*

ARS 300 Introduction to Art. (3) F S
Course content same as ARS 100 but re quires a h gher eve of accompl shment and comprehens on. May not be taken for credit by student who has comp eted ARS 100 nor used as art history credit by Art majors. *Gen eral Studies. HU*

ARS 302 Art of Africa, Oceania, and the Americas. (3) A
H story of art of Afr ca, Ocean a and the New World Meets non-Western art h story require ments Not open to students who have taken ARS 202 Prerequ sites ARS 101, 102 *General Studies. HU H*

ARS 310 The Renaissance in Tuscany. (3) SS
Course taught in F orence, ta y H story of arts in Tuscany w th focus on c ty of Florence from 14th through 16th centur es Lecture, tours Complet on of ARS 101 and 102 sug gested.

ARS 340 Art in America. (3) A
American art from co on al times through the Second World War Not ava ab e to students who have had ARS 444 542 or 543 Prereq- uis tes ARS 101 and 102 *or* nstructor ap- prova *General Studies. HU, H*

ARS 350 19th-Century Photography. (3) A
History of photography from the med um s preh story to 1914. personal ties, processes, images, and deas *General Stud es. HU.*

ARS 351 20th-Century Photography. (3) A
Persona t es, processes mages, and deas n photography from 1914 to present. Prerequ - s tes: ARS 101 and 102 *or* nstructor approva *General Studies· HU.*

ARS 384 Art History Internships. (3) A
Institutionally based pract cum with n an art museum or profess ona v sua arts organiza tion Internsh p.

ARS 400 History of Printmaking. (3) A
H story of the print as an art form and ts re a- t on to other modes and forms of art st c ex pression Prerequis tes ARS 101 and 102 *or* nstructor approva . *General Stud es: HU, H*

ARS 402 Art of Ancient Egypt. (3) N
Aesthet c, phi osophica and cu tura bas s of Egyptian art from pre Dynast c period through New Kingdom Emphasis on sculpture and ar chitectural monuments Prerequ s tes ARS 101 and 102 *or* nstructor approval *General Studies HU, H*

ARS 404 Greek Art. (3) A
H story of art arch tecture of Aegean civi za tions (Cyc ad c M noan Mycenaean) and of Greece to end of Hel en st c per od. Prerequ s tes ARS 101 and 102 *or* instructor approval. *Genera Stud es HU H*

ARS 406 Roman Art. 3) A
Art and arch tecture of Etruria the Roman Re- pub c, and the Roman Emp re Prerequ s tes ARS 101 and 102 *or* nstructor approval. *Gen era Stud es: HU, H.*

ARS 410 Early Christian and Byzantine Art. (3) A
Art and arch tecture of the early church and the Byzant ne Emp re from the 4th to the 15th century Prerequ s tes ARS 101 and 102 *or* nstructor approva *General Stud'es. HU*

ARS 412 Early Medieval Art. (3) N
Pa nting sculpture, arch tecture and the m nor arts from M grat on Carol ng an, and Ottonian per ods cons dered w thin re igious soc al and economic contexts Prerequ s tes ARS 101 and 102 *or* instructor approva *Gen- eral Studies. HU H*

ARS 414 Romanesque Art. (3) A
Sculpture, paint ng arch'tecture and minor arts n western Europe ca 1030–1200 con- sidered w th n rel g ous econom c, and soc a contexts Prerequ s tes ARS 101 and 102 *or* nstructor approval. *General Studies HU H*

ARS 416 Gothic Art. (3) A
Paint ng, scu pture, and arch tecture n west ern Europe during the Goth c per od Prerequi sites ARS 101 and 102 *or* nstructor approva *General Stud es HU*

ARS 417 Late Gothic Art in Central Europe. 3) N
Scu pture, pa nt ng and arch tecture of the ate Goth c sty e ca 1350–1525) cons dered w th n re igious soc al, econom c, and po tical contexts Prerequ s tes ARS 101 and 102 *or* instructor approval

ARS 418 Renaissance Art in Northern Europe. (3) A
Graph cs pa nting sculpture, and arch tecture ca 1450–1550 Reformat on themes and Re na ssance style cons dered w th n re ig ous po t ca socia , and econom c contexts Pre- requis'tes: ARS 101 and 102 *or* 'nstructor ap proval *General Studies: HU.*

ARS 420 Early Rena'ssance Art in Italy. 3) N
Paint ng scu pture and arch tecture in Ita y from 1300 to 1500 Prerequis tes ARS 101 and 102 *or* nstructor approva . *General Stud es HU H*

ARS 422 Italian High Renaissance Art and Mannerism. (3) A
History of Ita an art during the 16th century, nc uding the achievements and nf uence of Leonardo da V nc , Raphae and M chel ange o. Prerequ s tes: ARS 101 and 102 *or* n structor approva *General Stud es· HU.*

ARS 424 Italian Baroque Art. (3) A
ta 'an pa'nt ng, scu pture and architecture of the 17th century. Prerequ s tes ARS 101 and 102 *or* nstructor approva . *General Studies HU H.*

ARS 426 Art of the 17th Century in Northern Europe. 3 A
Baroque pa nt ng sculpture, and architecture n F anders the Nether ands, France, and En g and Prerequ s tes: ARS 101 and 102 *or* n- structor approva *General Studies HU H*

ARS 428 Art of the 18th Century. 3) A
H story of pa nt ng, scu pture arch tecture graphic arts and the decorat ve arts from 1700 to the French Revo ut on (1789) Prereq u's tes: ARS 101 and 102 *or* nstructor ap proval *General Stud'es HU H*

ARS 430 Art of Spain and Its Colonies. (3) A
Arch tecture pa nt ng, and sculpture from 1500 to 1800 Co on a focus on centra Mex'co and the Amer can Southwest Prereq u s te: ARS 102 or nstructor approva . *Gen eral Studies. HU H*

ARS 432 From David to Daumier: European Art 1780–1860. (3) F
Cr t ca study of the visua arts n Europe from eve of French Revo ut on to the Par s World s Fair of 1855 Neoc assicism, Rea ism, and Ro- mant c sm Cross l sted as HUM 494 Prereq u sites ARS 101 and 102 *or* instructor ap- proval. *General Stud es HU H*

ARS 434 From Courbet to Cézanne: History of European Art 1860–WWI. (3) S
Aesthet c, po itica and socia forces affect'ng the v sual arts n the ate 19th century. Con centrat on on Cub sm Express on sm, Impres- s on sm and Post Impress on sm Cross l sted as HUM 494 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
History of European avant garde movements Concentrat on on post mpress onism, symbo ism, express on sm, and cub sm Prerequi 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 Prerequ s tes: ARS 101 and 102 *or* nstructor approva . *General Studies HU H*

ARS 439 Art of the 20th Century II. (3) A
Art since World War , w th cons deration of new concepts and exper mentation w th media and modes of presentation Prerequ sites ARS 101 and 102 and 438 *or* nstructor ap- prova *General Stud es HU H*

ARS 442 Critical Issues in American Painting I. (3) A
Exp ores themes and soc al ssues n Amer- can art with a cr t ca study of American pa nt- ing from the 18th century to 1850 Lecture, d scussion Prerequ s tes: ARS 101 and 102 *or* nstructor approva *General Studies· HU.*

ARS 443 Critical Issues in American Painting II. (3 A
Exp ores themes and social issues n Amer - can art with a cr t ca study of Amer can paint- ing from 1850 to 1900 Lecture d scuss on Prerequ s tes ARS 101 and 102 *or* nstructor approva *General Studies· HU*

NOTE For the Genera Stud es requ rement codes (such as L1 N3, C, and H) and courses see pages 87 108 For graduat on requirements, see pages 79–83 For omn bus courses offered but not sted in th s cata og, see pages 56–57

ARS 444 Modern American Art, 1900–1945. (3) A
Amer can paint ng scu pture, photography and arch tecture 1900–1945. Covers major monuments, nc ud ng the Eight modern sm Precisionism Reg ona sm and the WPA Prerequ sites: ARS 101 and 102 *or* nstructor approva *Genera Stud es HU H*

ARS 453 Issues in Contemporary Photography. (3 A
A d scuss on seminar dentify ng, defin ng and research ng the ssues and deas that inf u ence the appearance and cr t c sm of contemporary mages Sem nars ectures, presentations, papers Prerequis tes ARS 350 351

ARS 454 Research and Writing in Photography. 3) A
Pr nciples and practice of research and wr ting n the h story and cnt c sm of photography Papers requ red Prerequ s tes ARS 450 and 451 *or* instructor approva ENG 101 and 102 *or* equ va ents

ARS 457 History of Art Criticism. (3) N
Theones of cnt c sm of the visua arts from ate 18th century to present. Prerequ s tes ARS 101 and 102 *or* nstructor approval. *General Studies· H.*

ARS 458 Critical Theories in the Visual Arts. (3) N
Exam nes current cr t ca theor es through their app cation to a v sua arts May nc ude new h stor c sm, Marx sm deconstruct on post structura sm sem ot cs Lacan an psy choana ys s fem n sm postmodern sm Lec ture d scussion student presentat ons. Pre requ s tes ARS 101 and 102 *or* nstructor ap prova . *General Studies HU*

ARS 459 Writing Art Criticism. (3) N
Trad t onal and contemporary approaches to the cnt c sm of art Students w l wr te cr t ca essays The atter half of the semester w stress the cr t cism of contemporary art n var ous med a Prerequisite: ARS 458 or nstruc tor approva

ARS 462 Precolumbian Art I. (3) A
Arch tecture sculpture, ceram cs pa nt ng, and other arts of Mesoamer ca before Euro pean contact Sat sf es non Western art h s tory requ rement Prerequ s tes: ARS 101 and 102 *or* nstructor approval. *General Studies HU H*

ARS 463 Precolumbian Art II. (3 A
Arch tecture, scu pture ceramics texti es and other art of South America before European contact w th focus on the Centra Andes. Sat sf es non-Western art h story requ rement. Prerequ s tes ARS 101 and 102 *or* nstructor approva *General Stud es HU, H*

ARS 465 Native North American Art. (3) A
Nat ve Amer can art forms of the Un ted States and Canada from preh stonc times to the present. Prerequ s tes ARS 101 and 102 *or* nstructor approva Meets non-Western art history requ rement *General Studies· HU H*

ARS 466 Native American Art of the Southwest. 3) A
Amer can Ind 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 approval *General Stud es HU C H*

ARS 468 Art of the Arctic and Northwest Coast. (3) N
Art assoc ated with ceremony shamanism, and da y fe in the Arct c and on the North west Coast Meets non Western art h story re quirement Prerequ s tes ARS 101 and 102 *or* nstructor approval. *General Stud es HU.*

ARS 469 Mexican Art. (3 A
Art of Mexico and re ated Central American cu tures from the preh stonc to the contempo rary schools Meets non Western art h story requ rement Prerequ's tes ARS 101 and 102 *or* nstructor approva . *Genera Studies HU, H*

ARS 472 Art of China. (3 A
Study of major forms n Chinese art r tua bronze, scu pture ceram c ca graphy, paint ng and arch tecture Satisf es non Western art h story requ rement Prerequ s tes: ARS 101 and 102 *or* instructor approva *Genera Studies HU.*

ARS 473 Art of Japan. (3) A
Japanese art from the Joman per od to the present. Sat sfies non-Western art h story re qu rement Prerequis tes ARS 101 and 102 *or* nstructor approva . *General Stud es HU*

ARS 475 Chinese Painting. 3 A
From Ku K a ch n to Ch i Pa sh'h Major art sts, sty es and movements 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* 'n structor approva *General Stud es HU.*

ARS 480 Research Methods. (3) F, S
Methodo ogy and resource materia for art his tonca research Techniques of scho arly and cr t cal wnt ng and eva uat on of b b ographc sources Prerequisites: ARS 101 and 102 *or* instructor approva *General Studies L2*

ARS 485 Women in the Visual Arts. (3) S
Histor ca study of art by women n var ous med a related soc al, po it ca educational s sues representat on of women in art. Lecture d scuss on Prerequ s te ARS 101 or 102 or nstructor approva *General Stud es L2*

ARS 498 Pro-Seminar. (3–6) A
Undergraduate sem nar n topics se ected from the fo lowing Problems or cnt cism n·
(a) Amer can Art
(b) Amer can nd an Art
(c) Anc ent Art
(d) Baroque Art
(e) Ch nese Art
(f) Medieva Art
(g) Modern Art
(h) Photograph c History
Pre Co umb an Art
(j) Rena ssance Art
Prerequ s te nstructor approva .

ARS 501 Methodologies and Art History. (3) F
The h story of the d sc p ne and an exp ora tion of var ous methodologies cr't ca theory, and b b iographies used by art h stor ans Sem nar

ARS 502 Critical Studies in Egyptian Art. (3) N
Egypt an art from pre Dynast c to New K ng dom penods Focus on aesthet c, ph osoph cal, and cu tura 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 zat ons (Cyc ad c, M noan Mycenaean) and of Greece to end of He lenist c period Research paper and read ngs requ red

ARS 506 Critical Studies in Roman Art. (3) A
Art and arch tecture of Etrur a the Roman Re publ c and the Roman Empire Research pa per and or supp ementa readings requ red.

ARS 514 Critical Approaches to Romanesque Art. (3) N
Sculpture, pa nt ng arch tecture and the m nor arts n western Europe ca 1030–1200, c ns dered w th n re g ous econom c and so cial contexts Research paper requ red

ARS 516 Critical Approaches to Gothic Art. (3) N
Architecture scu pture, pa nt ng and the m nor arts n western Europe ca 1150–1350, considered w thin re g ous socia , and eco nom c contexts. 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 w thin re g ous soc a econom c and po t cal contexts Research or reading project requ red

ARS 522 Sixteenth Century Italian Art. (3) A
Crit ca study of pa nting sculpture, and archi tecture n 16th century ta y n ts re g ous and h storica context

ARS 528 Eighteenth Century Art in Europe. 3 A
Crit ca study of European art from the late Ba roque to the early years of Neoclass c sm.

ARS 530 Art of Spain and New Spain. (3) A
Cr t ca study of arch tecture pa nting and scu pture from 1500 to 1800. Lecture confer ence

ARS 532 Art, Politics, and Patronage 1770–1850. 3 F
Cr t ca ana yses of po t ca events n Europe ssues 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 cal study of visua arts us ng pr mary source mater a from m d 19th century to WW w th n ph osoph ca , soc o econom c contexts Lecture tutor a Prerequisite nstructor ap prova

ARS 542 Critical Issues in American Painting I. (3) A
Exp ores themes and soc a issues n Amer can art w th a cnt ca study of Amer can pa nt ng from the 18th century to 1850 Lecture, d scuss n Prerequ s tes ARS 101 102.

ARS 543 Critical Issues in American Painting II. (3 A
Explores themes and soc al ssues n Amer can art w th a cnt ca study of American pa nt ng from 1850 to 1900 Lecture ab Prereq u s te nstructor approva .

ARS 544 American Modernism and Realism, 1900–1945. (3) A
Cr t ca study of the soc a , po tical, and art s t c changes in Amer'can art dur ng the f rst 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 tical study of art and arch'tecture of Mex co and Maya area before Span sh contact Lec ture, conference.

ARS 565 Native Art of North America. (3) A
A cr t ca exam nation of Nat ve Amer can art with n cu ture, preh story to the present Pre requisites ARS 101 a d 102 *or* nstructor ap prova

ARS 574 Studies in Japanese Art. (3) A
A cr tical exam nat on of the nature and h story of Japanese art, ts r ch heritage and its in-debtedness to fore gn sources Lecture dis cussion. Prerequ s tes. ARS 101 and 102 *or* nstructor approval.

ARS 575 Approaches to Chinese Painting. (3) F
A critical h story of Ch nese paint ng from Eastern Chou to 1911 Emphasis on masters, reg ona deve opments and conceptual under p nn ngs Lecture discussion. Prerequis tes: ARS 101 and 102 *or* nstructor approva

ARS 591 Seminar. (3–6) A
Graduate seminar in top cs se ected from the fo lowing. Prob ems or crit c sm n:
(a) American Art
(b) Amer can ndian Art
(c) Anc ent Art
(d) Baroque Art
(e) Chinese Art
(f) Medieva Art
(g) Modern Art
(h) Photograph c H story
( ) Pre-Columb an Art
(j) Rena ssance Art
Prerequ s te instructor approva

STUDIO CORE CURRICULUM (ART)

ART 111 Drawing I. (3) F, S SS
Fundamenta technical, and perceptual ski ls us ng common draw ng med a and their appl - cation to p ctor a organ zat on 6 hours a week.

ART 112 Two-Dimensional Design. (3) F S, SS
Fundamenta s of pictorial des gn 6 hours a week

ART 113 Color. (3) F S SS
Princip es of color theory as re ated to the v sual arts. 6 hours a week Prerequ s tes: ART 111 112.

ART 115 Three-Dimensional Design. (3) F, S, SS
Fundamenta s of 3D form. 6 hours a week Prerequ sites ART 111 112.

DRAWING (ART)

ART 211 Drawing II. (3) F, S, SS
Cont nued deve opment of techn ca and per ceptua ski s Emphasis on materia s and p c-torial content. 6 hours a week. Prerequisites: ART 113 115.

ART 214 Life Drawing I. (3) F, S SS
Deve opment of sk l and expressiveness n drawing the bas c form construction, and ges ture from the human figure 6 hours a week Prerequisites ART 113, 115

ART 311 Drawing III. (3) F, S
Emphasis on composition exploration of drawing med a. 6 hours a week Prerequ s tes ART 211, 214 nstructor approva

ART 314 Life Drawing II. (3) F S
Drawing from the model w th greater refer ence to structura graph c, and compos t onal concerns 6 hours a week Prerequ s te ART 214 or instructor approval.

ART 315 Life Drawing III. (3) F S
The human f gure as the subject for draw ng Emphas s on conceptual a ternatives and management of mater a s 6 hours a week Prerequ s te ART 314 or nstructor approval

ART 411 Advanced Drawing. (3) F S
Visua and nte lectual concepts through prob em solv ng and ndependent study Emphas s on the nd v dual creat ve statement. 6 hours a week May be repeated for cred t. Prerequ sites ART 311, nstructor approva .

ART 414 Advanced Life Drawing. (3) F, S
Various med a and techn ques on an ad vanced eve The human figure as an expres-sive veh cle n various contexts 6 hours a week. May be repeated for cred t Prereq-uisite: ART 315 or nstructor approva

ART 415 Art Anatomy. (4) N
Study of human anatom cal structures as ap pl ed to the practice of f gure or ented art. 3 hours lecture, 5 hours stud o a week Prereq uis te: ART 214

PAINTING (ART)

ART 223 Painting I. (3) F, S, SS
Fundamental concepts and materials of tradi-tional and exper menta paint ng med a Em phasis on preparation of pa nt ng supports, compos t on, and co or 6 hours a week. Pre requ s tes ART 113, 115.

ART 227 Watercolor I. (3) F, S
Fundamental concepts, materia s, and tech n ques of watercolor Emphasis on prob em solving basic ski s, composit on, and color. 6 hours a week Prerequ s tes: ART 113 115

ART 323 Painting II. (3 F, S
Deve opment of competency n sk lls and ex pression Assigned problems nvo ve ight, space, co or form and content. 6 hours a week. Prerequ s te ART 223 or instructor ap proval

ART 324 Painting III. (3) F, S
Continuat on of ART 323 6 hours a week Prerequ s te ART 323 or nstructor approva .

ART 325 Figure Painting. (3) F S
The human figure c othed and nude as the subject for pa nt'ng n se ected media 6 hours a week. Prerequ s tes· ART 314 323

ART 327 Watercolor II. (3) A
Explorations of persona expression n water-color Cont nued development of waterco or ski s us ng trad t onal and exper mental mate na s and techniques 6 hours a week. Prereq u s te ART 227

ART 423 Advanced Painting. (3) F S
Continuation of ART 324 6 hours a week May be repeated for cred t Prerequ site· ART 324

ART 425 Advanced Figure Painting. (3) F S
Continuat 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
Continuat on of ART 327 More advanced for-mal, conceptual, and techn ca prob ems in contemporary waterco or 6 hours a week May be repeated for cred t Prerequ s te ART 327

INTERMEDIA (ART)

ART 439 Mixed Media. (3) F S
Exp oring visua effects by combining trad t'ona and nontrad t onal methods techn ques and concepts 6 hours a week. May be re-peated for cred t Stud o. Prerequ sites: ART 113 and 115 and 6 hours add t ona stud o re-quirements *or* nstructor approva

ART 440 New Media Concepts. (3) F S
Continued experiments with new med a and interd sc p inary concerns n art. 6 hours a week. May be repeated for credit. Prereq u s te ART 340. Corequ site: ART 441

ART 441 Video Art. (1) F, S
Uti zing video and aud o equ pment essent a to the product on of broadcast qual ty video art 2 hours a week. May be repeated for cred t Corequ site: ART 440.

ART 442 Folk/Outsider Art. (3) F
Explorat on of ideas, att'tudes, and art of con-temporary "se f taught " 'v s onary," and 'out-s der" artists. Research and stud o practice Lecture stud o Prerequ site ART 115 or in structor approval

ART 443 Intermedia. (3) F S
Experimenta , conceptua , and nterdisc p i nary studio art with emphas s on new med a and technolog es 6 hours a week May be re-peated once for cred t. Prerequ's'te: ART 340 or nstructor approva .

ART 444 Computer Art I. (3) F, S
A study of PC hardware and software for cre-at ng art Emphasis on computer graphics his-tory hardware software configurat ons, DOS, pr nc ples of 2 and 3-d mens onal graph cs 2 hours ecture 2 hours studio Prerequisites: ART 111, 112 or equiva ent), instructor ap proval. *Genera Studies N3*

ART 446 Computer Art II. (3) A
Three-d mens onal mode ing ight ng surface attributes, and specia effects for art app ca-t ons Emphas s on exp c t commands Stu-d'o Prerequis te: ART 444 or nstructor ap-prova *General Studies N3*

ART 448 Computer Animation I. (3) F, S
Pr nc p es and appl cat ons of 3D an mat on for art and des gn us ng DOS and MAC-based systems Lecture d scuss on, stud o. Prereq u s tes ART 113 and 115 *or* nstructor ap-prova .

ART 449 Computer Animation II. (3) F, S
Advanced princ ples and app ications of 3D an'mation for art and design Emphasis on ghting surfaces, and camera motion Stud o. Prerequ s te ART 448 or instructor approva .

ART 450 Computer Animation III. (3) F, S
Spec al effects us ng 2D and 3D static and t me based imagery for the creation of illu-s ons re ated to an art st c theme Stud o Pre requis'te: ART 449 or nstructor approval

ART 530 Two-Dimensional and Three-Dimensional Computer Art. 3) A
ntegration of 2D and 3D computer imag ng for art. Emphas s upon new d rections for com puter imaging which accounts for media char acterist cs Stud o.

NOTE For the Genera Studies requ rement, codes (such as L1, N3 C and H) and courses see pages 87 108 For graduat on requ rements see pages 79–83. For omnibus courses offered but not isted n th s cata og see pages 56–57

ART 540 Advanced Computer Art. 3) A
Study of mot on for 3D mode s i ght sources and surface effects Course assumes students have a comprehension of comp ex mode ng mapp ng, and ght ng Studio Prerequ site· ART 446 or instructor approva

PHOTOGRAPHY (ART)

ART 201 Photography I. (3) F S
Development of sk s and techn ques of b ack and wh te photography. Emphas s on camera work and darkroom procedures 2 hours ec ture 3 hours ab

ART 301 Photography II. (3) F S
Photography as an art med um w th add tional exp orat on into personal photographic aes thet cs 6 hours a week Prerequ s tes: ART 113 and 115 and 201 *or* instructor approval

ART 304 Advanced Photography. (3 F, S
Interpretat on and man pu ation of ght as a too n the performance of express ve photog- raphy 6 hours a week Prerequ s te ART 301 o nstructor approva

ART 305 Color Photography I. (3) F S
App cation of co or transparenc es and pr nts to photograph c art 6 hours a week Prereq u s te ART 304 or nstructor approva .

ART 401 Nonsilver Photography. (3 F S
Recogn t on of the nherent character stics of nons ver processes and the r use n commu n cat ng deas 6 hours a week May be re peated for cred t Prerequ s te· ART 304 or n structor approva

ART 403 Senior Photographic Projects. 3) F S
Techn ca and phi osoph ca ref nement of per sona aesthet c w th various photograph c me d a 6 hours a week May be repeated fo cred t Prerequ s te ART 304 or nstructor ap- prova

ART 404 Portraiture Photography. (3 F, S
Photograph ng peop e. Crit ca d scuss ons and sl de ectures on issues n portraiture 6 hours a week May be repeated for cred t Prerequ s te ART 304 or nstructor approva

ART 405 Advanced Color Photography. (3 F S
ntens ve use of subtract ve co or process n photograph c pr nt ng. 6 hours a week May be repeated for redit Prerequ s te ART 305 or instructor approva

ART 406 Photo Techniques. (3 F S
Camera and darkroom techn ques with em phas s on creat ve contro of the b ack and wh te pr nt 6 hours a week Prerequ s te ART 301 or instructor approva .

ART 407 View Camera. (3 F, S
V ew camera and darkroom techn ques Stu d o lab Prerequ s te ART 301 or nstructor appr va

ART 408 Digital Photographic Images. 3 F S
Scann g man pu at on ref nement, and c mpos t ng f photograph c mages n the computer Lab stud o. Prerequ s te ART 201

ART 409 Photographic Exhibit'on. 3) A
Care of photograph c pr nts pr nt presenta t on, and exh b t n Pract ca exper ence n ga ery operations 6 hours a week May be re peated for cred t Prerequ s te ART 304 or n structor approva

PRINTMAKING (ART)

ART 351 Intaglio I. 3 F, S
ntroduct on to contemporary and trad t ona deve opmenta techn ques for b ack and wh te pr nts 6 hours a week. Prerequ s te nstructor approva

ART 352 Lithography I. (3) F, S
Monochromat c and co or p anograph c printmak ng uti z ng stone and a uminum p ate processes 6 hours a week Prerequ s te ART 113 or instructor approva

ART 354 Screen Printing I. 3 F S
ntroduction to paper d rect and photograph c stenc techn ques 6 hours a week Prereq uisite ART 113

ART 355 Photo Process for Printmaking I. (3) F
ntroduct on to photograph c princ ples and sk s fo photomechan ca pr ntmak ng pro- cesses nclud ng photos kscreen photol tho and photoetch ng 6 hours a week Prereq u s te ART 201 or equ va ent

ART 451 Advanced Intaglio. 3 F S
Var ous contemporary and trad t onal methods of pr nt ng to ach eve co or pr nts 6 hours a week May be repeated for credit. Prereq- u s te nstructor approva

ART 452 Advanced Lithography. (3) F S
Cont nuat on of ART 352 6 hours a week May be repeated for cred t Prerequis te n structor approva

ART 454 Advanced Screen Printing. (3) A
Cont nuat on of ART 354 6 hours a week May be repeated for credit. Prerequ s te in structor approva

ART 455 Advanced Photo Processes for Printmaking. 3 A
A cont nued study of photomechan ca tech n ques and app cat ons to pr ntmaking or pho- tograph c processes Prerequ s te ART 355 or nstructor approva

ART 456 Fine Printing and Bookmaking I. 3) A
Letterpress pr nt ng and typography as f ne art Study of h story alphabets, mechan cs of hand typesett ng, presswork, and various forms of pr nted matter Prerequisite nstruc tor approva

ART 457 Fine Printing and Bookmaking II. 3 A
Cont nuat n of ART 456 Bookb nding book des gn and print ng, advanced typography theory and presswork May be repeated for cred t Prerequ s tes ART 456, nstructor ap- prova

ART 458 Papermaking. (3) F S
H story theory demonstrat ons sheet form ng co lage treatments and 3 dimens ona ap- pr aches 6 hours a week May be repeated for cred t Prerequ site nstructor approval

ART 459 Monoprinting. 3) F, S
The nonmu t p e pr nted mage us'ng a var ety of techn ca approaches 6 hours a week May be repeated for cred t Prerequ'sites ART 311, 323 or any 300-leve pr ntmak ng class) nstructor approva

ART 551 Intaglio Projects. 3 F S
The mater a s and methods of Intag io as a matr x for exp oring var ous contemporary s sues Spec f ca y structured to accommodate the graduate leve draw ng w th no pr nt making background Stud o

SCULPTURE (ART)

ART 231 Sculpture I. (3) F S SS
Exp orat on of sculptura forms through con cepts re ated to basic materials Focus on stu d o production safety aesthet c cr t cism, and h story of scu pture 6 hours a week Prerequi s tes· ART 113 and 115 *or* nstructor approval.

ART 274 Wood I. (3 F, S
Fundamenta woodworking techniques to pro duce creat ve funct ona 3 d mens ona ob jects 6 hours a week

ART 331 Sculpture II. (3) F S
Cont nuat on f ART 231 w th an emphasis on meta fabr cat on as an express ve sculptura process Techniques in we d ng, cutt ng and bend ng of meta s and the r aesthet cs 6 hours a week. Prerequ s te· ART 231 or n- structor approva

ART 332 Sculpture III. (3) F S
Explorations in d verse med a with a focus on mo d mak ng processes Development of the scu pture portfo o 6 hours a week. Prereq uisite ART 331 or nstructor approval.

ART 333 Foundry Casting Methods. (3) F, S
The f ne art and techn ques of metal cast ng: mold mak ng, foundry safety, f n sh ng tech- n ques app cat on of patinas and h story of cast ng 6 hours a week May be repeated for cred t Prerequ s te ART 332 or nstructor ap prova .

ART 374 Wood II. (3) F, S
Ind v dua and d rected prob ems n wood re ated to the product'on of un que funct ona art objects. 6 hours a week Prerequ s tes ART 113 and 115 and 274 *or* instructor approva

ART 431 Special Problems in Sculpture. (3) F S
Deve opment of a personal approach to scu p ture emphas s n form, nd v dua prob ems, and related color techno ogy Profess ona pract ces and presentat 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 creating neon n an art con text. G ass tube bend ng and fabr cat on. Con struct on of artworks ut z ng ight generat ng gasses 6 hours a week May be repeated for cred t Prerequ s te nstructor approva .

ART 436 Architectural Sculpture. (3) N
Sculptura concepts as related to architecture and other man-made env ronments Sca e draw ng, models and rel ef scu pture 6 hours a week May be repeated for credit Prereq u s te ART 332 or nstructor approval.

ART 437 Film Animation. (3) F
Production of short 16mm f ms that feature art cu ated scu ptural objects, mode s do s, puppets and graph cs through the use of s ng e frame f m ng techn ques 6 hours a week May be repeated for cred t Prereq- u s te nstructor approva

ART 438 Experimental Systems in Sculp- ture. (3 S
S mp e electr ca and mechan cal systems that can be ut ized n the context of stud o art and instal ations Act ve product on of stud o art works requ red 6 hours a week May be re- peated for credit Prerequ s te instructor ap- prova

ART 474 Advanced Wood. (3 F S
Extended exper ence and advanced tech n ques n the use of wood to create funct ona works of art 6 hours a week. May be repeated for cred t Prerequ s tes: ART 374· nstructor approva

CERAMICS

ART 260 Ceramics for Nonmajors. (3) F, S, SS
Handbu ld ng methods, wheel throw ng, glaze and decorat ve processes, Raku and stone ware f r ngs 6 hours a week

ART 261 Ceramic Survey. (3 F S SS
Handforming methods throwing on the whee decorat ve processes and g aze appl cat on 6 hours a week. Prerequ s tes· ART 112 115

ART 360 Ceramic Throwing. (3) F S
Des gn analysis and product on of funct ona pottery. Emphas s on throw ng techn ques, surface enrichment, and glaze 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 us ng handbu d ng tech n ques K ln f ring and re ated prob ems. Pre requ s te ART 261

ART 365 Ceramic Handbuilding II. (3) S
Cont nuat on of ART 364 w th an addit ona fo cus on arge sca e works surface treatments, and g aze decorat on with re ated k ln fir ng applicat ons Prerequ s te ART 364 or instruc tor approval

ART 460 Ceramic Clay. (3) S
Research nto var ous c ay body formulat ons oca natura materials, s ip g azes and engobes Lecture lab stud o Prerequ'sites: ART 360 and 364 *or* nstructor approval.

ART 463 Ceramic Glaze. (3) F
G aze ca cu ation and formu at on us ng var ous glaze colors and surfaces Lecture lab stud o Prerequ s te. ART 460 or nstructor ap prova

ART 466 Special Problems in Ceramics. (3) F, S SS
Emphas's on personal expression w th n structure of sem nars, cr tiques and stud o work. Profess ona methods of presentation/ documentat on of work 6 hours a week May be repeated for cred t Prerequ s'te: ART 364 or instructor approva .

FIBERS (ART)

ART 276 Fibers I. (3) F S
Exploration of various materials and bas c techniques in the structural use of f bers and surface design on fabr c 6 hours a week Pre requ s tes ART 113 and 115 *or* nstructor ap proval

ART 376 Fibers: Loom Techniques. (3) A nvestigat on of oom techniques and com- puter pattern des gn 6 hours a week Prereq- uisite. ART 113 or 115 or nstructor approva

ART 377 Surface Design. (3) F, S
Surface design on fabr c through the appl ca t on of dyes and pigments Techn ques nclude pa nt ng, pr nting airbrush ng, and the cyano- type process Prerequ site ART 276 or n structor approval.

ART 476 Fibers: Multiple Harness Weaving. (3) F, S
Advanced oom techn ques and computer pat tern des gn Emphas s on nd v dua des gn and loom app cat on Prerequis te ART 113 or 115 or 376 or nstructor approva

ART 477 Printed Textiles. (3) A
Techn ques for screen pr nting on fabr c ex plor ng pattern as a compos t ona e ement Var ous stenc methods nc ud ng photo graphic processes Studio May be repeated for cred t Prerequisite. 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 p erc ng forg ing and solder ng, and forming 6 hours a week. Prerequ s te freshman or sophomore or jun or stand ng.

ART 372 Jewelry II. (3) F S
Fabricated approach to jewe ry mak ng Tech niques in stone sett ng and surface embel sh ment 6 hours a week Prerequisites ART 113 and 115 and 272 *or* instructor approva

ART 373 Metalworking I. 3 A
Compress on, d e and stretch form ng as ap pl ed to ho low form construction Hot and co d forg ng techn ques as app ed to smith ng. 6 hours a week. Prerequ s tes ART 113 and 115 and 272 *or* nstructor approval

ART 472 Advanced Jewelry. (3) F S
Jewe ry mak'ng w'th emphas s on develoPing personal statements and craftsmansh p 6 hours a week May be repeated for cred t. Prerequ sites: ART 372 nstructor approva .

ART 473 Advanced Metalworking. (3) A
Forging and forming techn'ques n nd v dual ized direct ons 6 hours a week May be re- peated for cred t Prerequ s tes ART 373 n- structor approva .

SPECIAL STUDIO ART (ART)

ART 621 Studio Problems. 3) F S SS
Advanced study n the fo owing areas
(a) Ceram cs
(b) Draw ng
(c) F ber Art
(d) Meta s
(e) Pa nt ng
(f) Photography
(g) Pr ntmaking
(h) Sculpture
( ) Stud o Art
(j) Wood
6 hours a week each section May be re- peated for cred t Prerequisite nstructor ap prova

ART 680 Practicum: M.F.A. Exhibition. 1 15) F S, SS
Stud o work n preparation for requ red M.F A exhibit on Publ c exhibit to be approved by the student s superv sory comm ttee and ac compan ed by a f na oral exam nat on. Photo graph c documentation and wr tten statement of problem Prerequis te approva of the stu dent's supervisory comm ttee

Department of Dance

Claudia Murphey
Chair
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www.asu.edu/cfa/dance

PROFESSORS
JONES, KEUTER, LESSARD, LUDWIG, MURPHEY

ASSOCIATE PROFESSORS
KAPLAN, MATT, MOONEY

ASSISTANT PROFESSORS
JACKSON, PARK VISSICARO

ACADEMIC PROFESSIONAL
MITCHELL

For advising purposes, all students registering in a Dance degree program enroll through the College of Fine Arts Each degree program and area of spe cialization has its own check sheet that describes the particulars of course se quence and special requirements. These check sheets are available in the De partment of Dance office

Placement Examinations. All students who enroll in dance major technique courses are required to take part in a placement audition to determine their levels of technical proficiency in mod ern 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 produc tion, or choreography courses at an- other institution are also required to take placement examinations in these 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: choreogra phy, dance education, dance studies, and performance All new Dance ma jors are admitted into the preprofes- sional program. Students audition or

petition for admission into one of the Bachelor of Fine Arts dance concentrations after three semesters 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 pages 79–83 for university graduation requirements and pages 247–248 for college degree requirements.

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	201	Cross Cultural Dance Perspectives *HU G*	3
DAH	401	Dance History I	3
DAH	402	Dance History II	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—choreography, dance education, dance studies, and performance is composed of 25 semester hours.

Choreography

Core Curriculum. See above for the courses that make up the core curriculum.

Specialization. The following courses are required for the choreography specialization:

DAN	228	Dance Notation I	3
DAN	321	Music Literature for Dance	3
DAN	364	Choreography and Accompaniment	3
DAN	365	Advanced Choreography	2
DAN	480	Senior Performance in Dance	4
Total			15

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 above for the courses that make up the core curriculum.

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	2
DAN	480	Senior Performance in Dance	4
Total			15

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	350	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 above for the courses that make up the core curriculum.

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 above for the courses that make up the core curriculum

Specialization. The following courses are required for the performance specialization:

DAN	321	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

NOTE: For the General Studies requirement codes (such as L1, N3, C, and H) and courses see pages 87–108. For graduation requirements, see pages 79–83. For omnibus courses offered but not listed in this catalog see pages 56–57.

Performance. Choose from the fol lowing three courses (6 semester hours are required):

DAN	371	Dance Theatre Performance/Production	1 3
DAN	471	Dance Arizona Repertory Theatre	6
DAN	494	Concert Dance	2

Additional requirements are listed on the check sheet available from the De partment of Dance

A student pursuing the B.F.A. de gree 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 in clude completion of the Pre Profes sional Skills Test (PPST). Students should be advised that at least 20 addi tional 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 di vision 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 re quirements and admission procedures.

GRADUATE PROGRAM

A total of 60 semester hours of grad uate 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 proj ect). In addition to the studio concen trations in choreography and perfor mance, specialized areas of emphasis are available within the 60-semester-hour program. In consultation with the Graduate Director specific interests, needs, and abilities establish a Program of Study that directs course work in al ternative directions.

DANCE HISTORY (DAH)

DAH 100 Introduction to Dance. (3 F, S
Or entation to the field of dance focus ng on h story styles cultural and theatr ca aspects of the art form *General Stud es: HU.*

DAH 190 Introduction to the Dance Profession. (1) F
Or entation to the dance profession ntroduc ng career opt ons and un vers ty department resources Des gned for Dance majors

DAH 201 Cross-Cultural Dance Perspectives. (3) F S
Exp ores the ro e of dance n various cu tures around the wor d *General Stud es HU, G*

DAH 300 Focus on Dance. (3) F S, SS
Specia zed study of cu tura and theatrical aspects of dance such as social dance forms spec f c genres or h storical per ods. May be repeated for cred t Lecture studio. May not be taken for cred t by student who has com p eted DAH 100 *General Studies HU*

DAH 301 Philosophy and Criticism of Dance. (3) F S
Ph osophical ssues n dance and dance cr t c sm w th emphas s on wr tten ana ys s and nterpretat on Prerequ s te 1 semester of F rst Year Compos t on *General Studies L2/ HU*

DAH 401 Dance History I. (3) F
Cu tura and theatr ca deve opment of dance from prehistory through the 19th century Ro mant c per od, nc ud ng the ear y h story of ba et *General Stud es· HU*

DAH 402 Dance History II. 3 S
Cu tura and theatr ca deve opment of dance from 19th-century Romant c per od through Contemporary t mes nc udes ba et, modern and mus cal theatre dance *General Stud es· HU*

DAH 495 Dance Research Sources. (2) F
The nvest gat on of var ous resources and methods for conduct'ng research n dance Sem nar Prerequisite nstructor approva

DAH 496 Senior Thesis Project. 2) S
A cu minat ng research project wh ch inte grates dance and a re ated field of nterest Prerequ s te DAH 495

DAH 501 Philosophy of Dance. 3) S
Ana ys's of trad t onal and contemporary theo ries of dance w th regard to 'ssues of expres s on form and mean ng

DAH 502 Cultural Concepts of Dance. 3 S
Exam nes the c ose connection between cul ture dance and movement through writings n cultural theory dance ethno ogy, and phi oso phy.

DANCE (DAN)

DAN 130 Dance. (1) F, S SS
Ba et, mprov sat on jazz, modern, west Afr can Afro Car bbean, Ba et Fo k or co, Fla menco Lat n ba room, fo k, Ta Chi May be repeated for cred t

DAN 134 Technique and Theory of Modern Dance. (3) F, S
Elementary concepts of modern dance tech n que Deve opment of movement qua ty and performance sk s 6 hours week y May be repeated for cred t P acement aud t on re qu red Prerequ s te· Dance major

DAN 135 Technique and Theory of Ballet. (2) F S
E ementary ba et techn que w th emphas s on a ignment contro and deve opment of the feet w th proper awareness of sty e and phras ng 4 hours week y May be repeated for cred t P acement aud tions requ red

DAN 164 Improvisation. 1 F S
mprov sat on techn ques emp oy ng the bas c e ements of space t me, and energy Stud o

DAN 171 Dance Production Lab: Costume. (0) F S
Part c pation n concert dance product on n the area of costuming Requ red of a l Dance majors Lab

DAN 172 Dance Production Lab: Technical Theatre. (0 F S
Part c pat on n concert dance product on n the area of techn ca theatre Requ red of a l Dance majors Lab

DAN 173 Dance Production Lab: Management. (0) F S
Part c pat on n concert dance product on n the area of product on management Requ red of a Dance majors Lab

DAN 210 Dance Production I. (3) F
Theory and practice of ght ng, scenery, sound and stage management for dance pro duct on Labs cover a areas of product on Lecture ab

DAN 211 Dance Production II. (3) S
Theory and pract ce of arts management and costume des gn for dance product on Labs cover a areas of product on Lecture lab

DAN 221 Rhythmic Theory for Dance I. (2 F
E ements of mus c mus c structures, and their re at onship to dance Emphas s on rhythm c analysis and 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 projects n re ation to mus ca t me and structure CD ROM work n c uded Prerequ s te DAN 221 or prof c ency exam

DAN 228 Dance Notation I. (3) F S
Survey of systems of dance notat on Intro duct on to effort shape ana ys s of movement Emphasis on earning e ementary labanota tion Lecture stud o. Prerequisites DAN 121, MUS 100

DAN 230 Dance. (1) F S
ntermed ate eve s Cont nuat on of DAN 130 2 5 hours a week May be repeated for cred t

DAN 234 Technique and Theory of Modern Dance. (3 F S
ntermed ate concepts of modern dance tech n que Deve opment of movement quality and performance sk s 6 hours week y May be repeated for credit P acement aud t on re qu red Prerequ s te Dance major

DAN 235 Technique and Theory of Ballet. (2) F, S
The advanced study of elementary ballet technique through the traditional exercises, with proper awareness of style and phrasing. 4 hours weekly. May be repeated for credit. Placement audition required.

DAN 237 Beginning Pointe. (1) F, S
The study of elementary pointe technique through the traditional exercises. 2 hours weekly. May be repeated for credit. Prerequisites: basic ballet training; instructor approval.

DAN 264 Improvisational Structures. (3) F, S
Introduction to basic improvisational and choreographic principles with emphasis on current media and technology, group structures, and movement invention. Lecture, studio.

DAN 265 Approaches to Choreography. (3) S
Intermediate application of basic choreographic principles with emphasis on improvisation, form, content, and evaluative skills. Lecture, studio. Prerequisite: DAN 264.

DAN 321 Music Literature for Dance. (3) F, S
Historical survey of music and compositional elements relative to dance. Emphasis on analysis of choreography from a musical standpoint. CD-ROM lab. Lecture, lab. Prerequisites: DAN 221 and 222 *or* instructor approval. Pre- or corequisite: MUS 340.

DAN 328 Dance Notation II. (2) S
Intermediate study of labanotation. Emphasis on score reading. Prerequisite: DAN 327 or equivalent.

DAN 330 Dance. (1) F, S
Advanced levels. Continuation of DAN 230. 2 hours weekly. May be repeated for credit.

DAN 334 Technique and Theory of Modern Dance. (3) F, S
Advanced concepts of modern dance technique. Development of movement quality and performance skills. 6 hours weekly. May be repeated for credit. Placement audition required.

DAN 335 Technique and Theory of Ballet. (2) F, S
Intermediate ballet technique with emphasis on strength, dynamics, rhythmical impulses, and transitions with awareness of proper style and phrasing. 4 hours weekly. May be repeated for credit. Placement audition required.

DAN 337 Intermediate Pointe. (1) F, S
Study of intermediate and advanced pointe technique through the traditional exercises. 2 hours weekly. May be repeated for credit. Prerequisite: DAN 237 or instructor approval.

DAN 340 Dance Kinesiology. (4) S
Kinesiological principles applied to dance technique, including analysis of muscular patterns in dance movement and the pathomechanics of dance injury. Prerequisite: BIO 201 or instructor approval.

DAN 342 Ideokinesis. (2) F
A study of posture using the visualization of image/goals to facilitate improved alignment and movement efficiency. May be repeated for credit. Lecture, studio.

DAN 350 Methods of Teaching Modern Dance in Secondary Education. (3) F
Analysis and acquisition of teaching materials for the technique, improvisation, and choreography of modern dance. Lecture, studio. Pre- or corequisite: DAN 359.

DAN 351 Methods of Teaching Ballet. (3) S
Analysis and acquisition of teaching techniques and materials for ballet, jazz, and multicultural dance forms. Lecture, studio. Pre- or corequisite: DAN 359.

DAN 357 Children's Dance. (3) S
Theory and practice of teaching creative dance to children. Designed for Dance majors and related curricula, but open to all students.

DAN 359 Dance Education Theory. (3) F
Application of principles of motivation, learning, and evaluation to the teaching of dance. Pre- or corequisite: DAN 334 or equivalent.

DAN 364 Choreography and Accompaniment. (3) F
Experience in the use of traditional and nontraditional musical structures as a basis for choreographic projects. Lecture, studio. Prerequisite: DAN 321.

DAN 365 Advanced Choreography. (2) S
Investigation and practice of contemporary styles of choreography. Studio. Prerequisites: DAN 264 and 265 *or* equivalents.

DAN 371 Dance Theatre Performance/Production. (1–3) F, S
Performance or technical theatre work in designated dance productions. 3 hours a week per semester hour. May be repeated for credit. Prerequisite: instructor approval.

DAN 380 Performance Studies Practicum. (2) F, S
Projects include dances reconstructed from labanotation and faculty, guest artist, or student-created performance events. Studio, lab.

DAN 423 Dance, Computers, and Multimedia. (3) F, S
Introduction to desktop multimedia as it relates to dance creation, education, production, and research. Lecture, lab.

DAN 434 Technique and Theory of Modern Dance. (3) F, S
Preparation in the performance and comprehension of professional level modern dance technique. 6 hours weekly. May be repeated for credit. Placement audition required.

DAN 435 Technique and Theory of Ballet. (2) F, S
The study of professional advanced ballet technique with emphasis on preparation for performance. 4 hours weekly. May be repeated for credit. Placement audition required.

DAN 471 Dance Arizona Repertory Theatre. (3) F, S
Professional modern dance company experience and community outreach. Opportunity to work with faculty, guest performers, and choreographers. Lecture, studio.

DAN 480 Senior Performance in Dance. (2) F
Original choreography for group performance with analysis and critique of problems encountered in production. Must be repeated for a total of 4 credits. Prerequisites: DAN 364, 365.

DAN 510 Dance Stagecraft and Production. (1–3) F, S
Theory of costuming, lighting, makeup, scenery, and sound as related to dance performance. May be repeated once for credit. Lecture, studio. Prerequisite: DAN 211 or equivalent.

DAN 521 Sound Lab I. (1) F
Introduction to tape recording, sound mixing, audio tape editing for dance choreographers. Lecture, lab. Prerequisite: instructor approval.

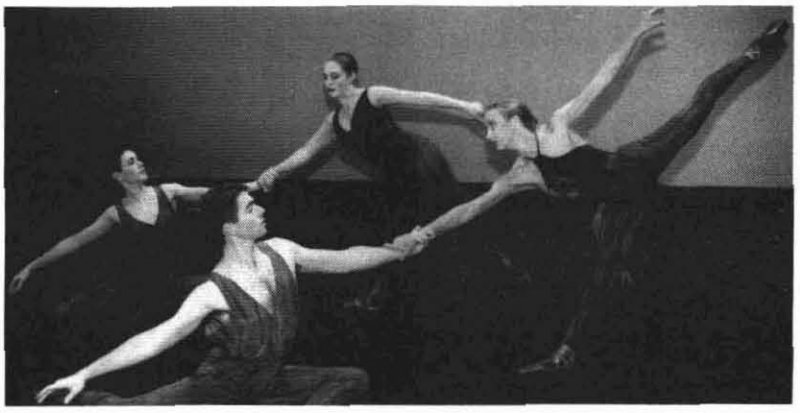
DAN 522 Sound Lab II. (1) S
Continuation of DAN 521. Emphasis on development of audio compositions for choreographic projects. Lecture, lab. Prerequisite: DAN 521.

DAN 523 Dance, Computers, and Multimedia. (3) F, S
Introduction to desktop multimedia as it relates to dance creation, production, education, and research. Lecture, lab.

DAN 534 Technique and Theory of Modern Dance. (2) F, S
Preparation in the performance and comprehension of professional-level modern dance for first-year graduate students. 6 hours weekly. May be repeated for credit. Placement audition required.

DAN 535 Technique and Theory of Ballet. (1) F, S
Graduate study of ballet technique. May be repeated for credit. Placement audition required. Studio.

DAN 542 Ideokinesis. (2) F
A theoretical examination of ideokinetic methods of facilitating postural change and movement efficiency.



"An Evening of Dance" performed by College of Fine Arts students who participate in the Main Stage Series. Tim Trumble photo

DAN 550 Graduate Dance Pedagogy: Modern. 3) S
Overview of the ro e of modern dance techn que and theory in the un vers ty curr culum nc ud ng current pedagog ca theory, diversity, gender May fo ow or precede nternsh p n pract ca teaching

DAN 551 Graduate Dance Pedagogy: Ballet. (3) F
Advanced analysis of teach ng techn ques for ba et Prerequ s te nstructor approva

DAN 561 Choreographer/Composer Workshop. (1 3) N
Ana ysis of exper mentat on w th, and pract ce 'n work ng with composers of music for chore ography. Open to exper enced choreogra phers and composers Lecture stud o. Pre requ'site· nstructor approva .

DAN 564 Solo and Group Choreography I. (3) F
Or g na choreography created for solo and group performance. Stud o. Prerequ s tes DAN 364 and 365 *or* equ va ent.

DAN 565 Solo and Group Choreography II. (3) S
Cont nuat on of DAN 564. Stud o Prerequ - site DAN 564

DAN 571 Dance Theatre. (1–3) F, S
Performance in spec a ly choreographed dance product ons May be repeated for credit. Prerequisite nstructor approva .

DAN 580 Performance Studies Practicum. (2) F, S
Projects nclude dances reconstructed from abanotat on and from, student facu ty , or guest artist-created performance events. Stu dio lab

DAN 591 Seminar. (0–3) F, S
Sem nar focus ng on enr chment topics pro duction aspects of thes s projects, teach ng concerns, spec a ectures f lms, or critiques.

DAN 634 Technique and Theory of Modern Dance. (2) F S
Preparation n the performance and compre hens on of profess ona evel modern dance for second year graduate students 6 hours weekly May be repeated for cred t. Placement audit on required

DAN 640 Advanced Problems in Analysis of Dance Technique. (3) S
Theor es and principles of human anatomy k nesiology and the psycho ogy of earning ap p ed to ana ys s of dance movement Prereq u s tes DAN 340 and 342 *or* nstructor ap prova .

DAN 664 Choreography Workshop. (1 3) F
Choreograph c study n a sem nar context w th facu ty and guest artists. Stud o. May be re peated for cred t Prerequ s tes DAN 564 565

DAN 671 Dance Arizona Repertory Theatre. (3) F S
Profess ona modern dance company exper ence and community outreach. Opportunity to work w th choreographers facu ty and guest performers Lecture stud o

DAN 693 M.F.A. Project. (1 9) F S, SS
Preparat on for required M F A project ap proved by the student s superv sory commit tee Work s fo lowed by a f na ora examina- t on and documentat on appropriate to the project. Prerequ s te: committee approva

School of Music

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HICKMAN, PAGANO

PROFESSORS
ATSUMI, BACON, BRITTON, CLARK, COSAND, CROWE, DOAN, FLEMING, HACKBARTH, HAMILTON, HARRIS, HOFFER, HUMPHREYS, KL EWER BRITTON, KOONCE, LOCKWOOD MAGERS, MAROHN C, METZ, OLDANI, PILAF AN, REBER, RUSSELL, SELLHEIM SHINN, SKOLDBERG, SPINOSA, SPRING, STOCKER, STRANGE, SUNKETT, SWA M, THOMPSON, UMBERSON, WELLS, WILL AMSON WYTKO

ASSOCIATE PROFESSORS
BARROLL-ASCHAFFENBURG, CARPENTER, DeMARS, DREYFOOS HAEFER, HOLBROOK, MAY, MONTGOMERY, PETERSON, RAVE, REYNOLDS, ROCKMAKER ROGERS, SMITH, SOLIS STAUFFER, WILSON

ASSISTANT PROFESSORS
BRYAN, BUSH, LYMAN, McLIN

The School of Music is a member of the National Association of Schools of Music, and the requirements for entrance and graduation set forth in this catalog are in accordance with the published regulations of the association. The following statement of basic musicianship is endorsed by the School of Music:

All musicians, whether performers, composers, scholars, or teachers, share common professional needs. Every musician must to some extent be a performer, a listener, a historian, a composer, a theorist, and a teacher. For this reason, certain subject matter areas and learning processes are common to all baccalaureate degrees in music

Basic musicianship is developed in studies which prepare the student to function in a variety of musical roles which are supportive of his/her major concentration. All undergraduate curricula, therefore, provide the following

1. A conceptual understanding of such musical properties as *sound, rhythm, melody, harmony, texture* and *form* and opportunities for developing a comprehensive grasp of their interrelationships as they form the cognitive affective basis for listening, composing and performing
2. Repeated opportunities for enacting in a variety of ways the roles of listener (analysis), performer interpretation), composer (creation , scholar (research), and teacher
3. A repertory for study that embraces all cultures and historical periods

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 writing to the School of Music Official dates for these auditions are set for each academic year. Students may request to audition on other dates if necessary or may send a tape recording if distance prohibits coming to the campus

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 also take a diagnostic examination in piano during orientation week of their first semester on campus, regardless of previous piano course work completed These transfer students are required to reach a minimum level of achievement indicated on the Piano Placement Exam.

Continuation in the composition program is subject to review in the sophomore or junior year.

All Music Education majors, including transfer and postbaccalaureate 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 pages 79–83 for university graduation requirements and pages 247–248 for college degree requirements.

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.

Recital Attendance. Six semesters of MUP 100 Concert Attendance are required.

Placement 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 excluding Music Education (125 semester hours) and Music Therapy (129 semester hours).

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 pages 79–83 for university graduation requirements and pages 247–248 for college degree requirements.

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 conduct ing courses are required:

MUP	210	Beginning Instrumental Conducting	1
MUP	340	Instrumental Conducting	2
Total			3

Music Education. The following mu sic 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 In struction and eight semester hours of MUP 311 Studio Instruction are required to obtain a proficiency level nec essary to meet the graduation recital re quirement. MUP 495 Solo Performance completes the requirement.

Ensemble. Eight different semesters of participation in an ensemble are re quired, 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.

Placement Examination. Four semesters of class piano (MUP 131, 132, 231, 232), unless waived by a diagnostic ex amination 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 His tory are required

Conducting. The following conduct ing courses are required:

MUP	210	Beginning Instrumental Conducting	1
MUP	340	Instrumental Conducting	2
Total			3

Music Education. The following mu sic 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)	1
MUE	335	Educational Methods for Guitar	1
MUE	336	Educational Methods for Percussion	1
MUE	482	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 the 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 In struction and eight semester hours of MUP 311 Studio Instruction are re quired to obtain a proficiency level nec essary to meet the graduation recital re quirement. MUP 495 Solo Performance completes the requirement.

Ensemble. Eight different semesters of participation in an ensemble are re quired, 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 re quired.

Recommended Elective. MUE 313 Elementary Music Methods.

Placement Examination. Four semes ters of class piano (MUP 131, 132, 231, 232), unless waived by a diagnostic ex amination 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 Counterpo nt or MTC 321 Tonal Counterpoint 2	2
MTC	327	Form and Analysis I	3
Total			17

NOTE· For the Genera Studies requ rement, codes (such as L1, N3, C, and H), and courses, see pages 87 108 For graduat on requ rements see pages 79–83 For omnibus courses offered but not l sted in this cata og, see pages 56–57

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 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.

Placement 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 900 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	320	Modal Counterpoint (or MTC 321 Tonal Counterpoint 2)	2
MTC	327	Form and Analysis I	3
MTC	44	Jazz Theory and Eartraining	2
MTC	441	Jazz Composition	2
Total			25

Music History. The following music history courses are required:

MHI	341, 342	Music History	6
MHI	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	41	Advanced Improvisation	2
MUP	418	Advanced Improvisation	2
Total			10

Workshops. The following courses are required

MUP	319	Recording Studio Techniques	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

Placement 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 (or MTC 321 Tonal Counterpoint 2)	2
MTC	327	Form and Analysis I	3
MTC	425	Studies in 20th Century Theory (or MTC 428 Form and Analysis II 3	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	481	Performance Pedagogy and Materials (or MUP 482 Piano Pedagogy II (2	2
Total			4

Conducting. One of the following two courses is required:

MUP	209	Beginning 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 Solo Performance) and a full recital (MUP 496 Solo Performance) are required.

NOTE For the General Studies requirement codes such as L1, N3, C and H and courses see pages 87–108 For graduation requirements see page 79–83 For noncredit courses offered but not listed in this catalog see pages 56–57

Ensemble. Eight semester hours of ensemble within a minimum 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	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, 342	Music History	6
MHL electives			6
Total			12

Conducting. One of the following two courses is required:

MUP	209	Beginning Choral Conducting	1
MUP	210	Beginning Instrumental Conducting	1

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, one of which must be of major proportion.

Ensemble. Five semesters of MUP 370 Music Theatre: Techniques, three semesters of MUP 371 Music Theatre: Workshops, and eight semesters of MUP 373 Music Theatre: Performance are required.

Recital Attendance. Six semesters of MUP 100 Concert Attendance are required.

Additional Requirements. Six semester hours each in theatre and dance are required. MHL 447 Music Since 1900 should be used to satisfy the General Studies L2 requirement.

Placement 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, 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	340	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.

Placement 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	2
MUP	451	Repertoire	2
MUP	453	Song Literature	2
MUP	454	Song Literature	2
Total			8

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	16
MUP	311	Studio Instruction	8
MUP	337	Studio Instruction Piano Accompanying	8
Total			32

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	[illegible]	Music Theory 19th Century	3
MTC	323	Music Theory 20th Century	3
MTC	320	Modal Counterpoint or MTC 321 Tonal Counterpoint	2
MTC	327	Form and Analysis I	3
MTC	425	Studies in 20th Century Theory	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. 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

Additional Requirements. Sixteen semester hours are required in more than one foreign language, chosen from French, German, and Italian A student may elect one year of one language and either one or two semesters of the other(s), chosen in conference with the advisor.

MHL 447 Music Since 1900 should be used to satisfy the General Studies L2 requirement.

Placement 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	1
MUP	210	Beginning Instrumental Conducting	1

Music Education. The following music education courses are required:

MUE	211	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 only)			4
BIO	201	Human Anatomy and Physiology I *S2*	3
PGS	101	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	
SOC	101	Introduction to Sociology *SB*	3
Total			19

Placement 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.

Placement 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	429	Canon and Fugue	2
MTC	430	20th Century Counterpoint	2
MTC	432	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.

Placement Examination. Four semesters of class piano (MUP 131, 132, 231, 232), unless waived by a diagnostic examination at the time of entrance, are required.

NOTE. For the General Studies requirement, codes (such as L1, N3, C, and H) and courses see pages 87–108. For graduation requirements, see pages 79–83. For omnibus courses offered but not listed in this catalog see pages 56–57.

Additional Requirements. MHL 447 Music Since 1900 should be used to satisfy the General Studies L2 requirement.

GRADUATE PROGRAMS

The faculty in the School of Music offer graduate programs leading to the following degrees: Master of Arts, Master of Music, and Doctor of Musical Arts. Refer to the "Graduate Degrees" portion of the "College of Fine Arts Degrees, Majors, and Concentrations" table, pages 246–247 for a list of majors and concentration. The Doctor of Education degree in Secondary Education with a concentration in music education is also offered in cooperation with the College of Education. A document on graduate degree programs in music may be obtained by writing to the School of Music. Consult the *Graduate Catalog* for information on all graduate degrees.

MUSIC HISTORY/LITERATURE (MHL)

MHL 142 Music Listening. (1) N
Aural perception of a variety of music traditions genres forms, and techniques Prerequisite: Music major

MHL 201 MacLiteracy for Musicians. (3) F S SS
nstruction in basic Macintosh computer literacy including general applications and music-specific programs with hands-on experience Lecture, ab *General Studies. N3*

MHL 341 Music History. 3) F, S
Western music from the Greeks to the present day Need not be taken in sequence with MHL 342 Prerequisite: MTC 221

MHL 342 Music History. (3 F, S
See MHL 341. Prerequisite: MTC 221.

MHL 344 Music in World Cultures. (3) F, S
Examination of the relations among music, dance, theatre religion, and social status in Asia, Africa Oceania Europe, and the United States. *General Studies· HU G.*

MHL 352 The Evolution of Jazz. 3) F 1998
Origin development, and styles of jazz music and its exponents Prerequisite MTC 223 *General Studies· H*

MHL 438 Music in the Classic Era. (3) F 1998
Development of the classic style of the 18th century major works of Haydn, Mozart and Beethoven Prerequisites MHL 341 342, MTC 327 *General Studies H*

MHL 439 Music in the 19th Century. (3) F 1999
European art music after Beethoven Prerequisites MHL 341 342 MTC 327 *General Studies· L2 H*

MHL 441 Music of the Baroque Era. (3) F 1999
Works of major composers and stylistic tendencies of the period. Prerequisites: MHL 341, 342, MTC 327 *General Studies. L2*

MHL 447 Music Since 1900. (3) F, SS
Survey of the works by major composers and stylistic trends Prerequisites MHL 341 342; MTC 327 *General Studies L2*

MHL 456 History of Opera. (3) S 1999
The development of opera from its creation c 1600 to present Emphasis placed on major stylistic developments and representative works Prerequisites MHL 341, 342, MTC 222

MHL 466 North American Indian Music. (3 S 1999
Various styles of Indian music in the United States Canada and Mexico Open to Music majors and nonmajors *General Studies: L2/ HU C*

MHL 532 Music Bibliography. (3) F
Major historical and analytical writings systematic and historical collections of music Reading knowledge of a foreign language recommended

MHL 535 Medieval Music. (3) S 1999
Music of Europe in the Middle Ages, Gregorian chant religious and secular monophony and polyphony to 1400

MHL 536 Music of the Renaissance. (3) S 2000
Music in Europe with emphasis on stylistic concepts and changes c 1400–1580

MHL 544 World Music I. 3) F 1999
Music of traditional folk and art music of the Pacific, Near East and Asia

MHL 545 World Music II. (3 F 1998
Traditional folk and art music of the Pacific, Near East and Asia

MHL 547 Topics in American Music. (3) N
Selected topics in the history of music Composers working in the Americas with emphasis upon music since 1900

MHL 557 Topics in Symphonic Literature. (3) S 2000
An examination of the evolution of the symphony and symphonic poem from the early classic era through the 19th century with emphasis on the analysis of selected works

MHL 566 Area Studies in Ethnomusicology. (3) S 2000
Study of the music of a particular culture country, or area (e g , music of Mexico, Latin America China Africa) May be repeated for credit

MHL 568 Introduction to Ethnomusicology. (3) F 1999
ntroduction to the theory and methodology of the discipline including bibliography field work transcription, analysis, and organology

MHL 575 History of Choral Music. (3) F
Major choral works

MHL 644 Notation of Polyphonic Music. (3) S 2000
Music notation from the 15th through 17th centuries including problems of transcription into modern notation.

MUSIC THEORY AND COMPOSITION (MTC)

MTC 125 Basic Music Theory. 3) F, S
For music majors Designed to develop aural and notational skills Meets daily

MTC 221 Music Theory: 18th Century. (3) F, S
Music from the 18th century with a view toward developing students' abilities to analyze theorize perform and create examples within the style Development of related aural, visual and keyboard skills Prerequisite MTC 125.

MTC 222 Music Theory: 19th Century. (3) F S
Musical compositions chosen from the late 18th and 19th centuries Harmonic progressions, melodic construction and rhythmic developments development of related aural visual and keyboard skills. Prerequisite MTC 221

MTC 223 Music Theory: 20th Century. (3) F S
Representative 20th-century compositions with particular emphasis on those elements of melodic harmonic and rhythmic treatment which break with past conventions Development of related aural visual and keyboard skills. Prerequisite MTC 222

MTC 315 Modern Arranging. (2) F
Techniques in arranging for the contemporary jazz, radio television, and studio orchestra. Prerequisite. MTC 223

MTC 316 Modern Arranging. (2) S
Continuation of MTC 315 Prerequisite MTC 315.

MTC 320 Modal Counterpoint. (2) F
Counterpoint based on 16th century vocal polyphonic style Prerequisite MTC 221

MTC 321 Tonal Counterpoint. (2) S
Counterpoint based on 18th-century polyphonic style Prerequisite MTC 221

MTC 323 Composition. (2 3) F, S
Writing music compositions with emphasis on basic techniques and small er structures. May be repeated for credit Prerequisite nstructor approval

MTC 327 Form and Analysis I. 3 F, S
Organizing elements in the most important contrapuntal and homophonic musical forms from the Renaissance through the 19th century Prerequisite: MTC 222

MTC 422 Musical Acoustics. 3) F
Properties of sound and tone Harmonic series, instruments the ear, auditorium acoustics, and the reproduction of sound A thorough knowledge of musical notation, intervals scales, and harmony or 2 years of music theory assumed

MTC 425 Studies in 20th-Century Theory. 3 F
Continued development of analytical techniques and aural skills, with an examination of theoretical systems applicable to 20th century music. Prerequisite MTC 223

MTC 428 Form and Analysis II. (3) S
Organizing principles of the large forms of musical composition in the 19th and 20th centuries Prerequisite: MTC 327

MTC 429 Canon and Fugue. 2) F 1999
Writing of canons and fugues in tonal style Prerequisite MTC 321

MTC 430 20th-Century Counterpoint. 2) S 2000
Counterpoint studies utilizing 20th-century idioms Prerequisite MTC 223

MTC 432 Instrumentation. (2 F 1998
Study of the characteristics and performance techniques of individual orchestral instruments Prerequisite MTC 223

MTC 433 Orchestration. (2) S 1999
Theoret ca and pract ca study of scor ng mu sic for orchestra Prerequ s te MTC 432

MTC 436 Electronic Studio Techniques I. (2) F
Principles of ana og e ectron c mus c systems and the r app cat on n the compos t on of e ectron c mus c A thorough know edge of mus c notation and ntervals s assumed

MTC 437 Electronic Studio Techniques II. (2) S
Princ ples of d g tal e ectron c mus c systems and the r app cat ons n the compos t on of e ectronic mus c. Prerequ s te MTC 436

MTC 440 Jazz Theory and Ear Training. (2 F
Advanced study of jazz harmon c systems Da ly ora dr s. Prerequ s te· MTC 223

MTC 441 Jazz Composition. 2) F
Creat ve wr ting n the sma ler forms and in the 'diom of jazz Prerequ s te MTC 321

MTC 495 Final Project. (0 F S
A half recita of composit ons or approva of a arge sca e compos t on or a research paper.

MTC 496 Theory Project. (3) F S SS
Superv sed nd v dua wr ting pro ect dea ng with mus c theory

MTC 516 Baroque Music. (3) S 2000
Detai ed ana ys s of selected examples from the Baroque period

MTC 519 Late 19th-/Early 20th-Century Music. (3) F 1999
Deta ed ana ys s of selected examples of mus c from the ate 19th and ear y 20th centur es

MTC 520 Analytical Techniques. 3 S SS
Ana ytical techn ques systemat ca ly appl ed to mus c Concentrat on on structura and com pos tional procedures.

MTC 523 Advanced Composition. 2 3 F S
Advanced mus c composit on nc ud ng complex techniques and larger structure May be repeated for cred t. Prerequ s te nstructor ap proval

MTC 525 Pedagogy of Theory. (3) F 1998
Pract ces and princ'p es of teach ng mus c theory Emphas zes most desirab e and pract ca offer ngs possible Comparat ve stud es of ex st ng practices

MTC 527 History of Music Theory. (3) F S
Theory from Pythagoras to the 16th century Need not be taken n sequence w th MTC 528.

MTC 528 History of Music Theory. (3) F S
Theory from the 17th century to the present Need not be taken n sequence w th MTC 527

MTC 555 Computer Music Notation. 2 N
Instruct on n prepar ng score and parts of mu sic compos t ons us ng var ous mus c notat on software packages Credit cannot be app ed toward the graduate theory requ rement Lec ture ab Prerequ site nstructor approva

MTC 647 Directions in New Music. (3 N
Stud es n contemporary 'd'oms and aesthet cs drawn from recent works of v s t ng com posers nvo ves analyt ca discourse cr t ca wr t ng, and app ed concepts n compos t on Lecture, discuss on exerc se Prerequ s te n structor approva

MTC 723 Advanced Composition. 3) F, S
Spec al prob ems in wr t ng n comp ex forms and textures May be repeated for cred t Stu d o.

MTC 755 Music Composition Technology. 3 N
Advanced study n d g ta samp ng, synthes s sequenc g comp ter generated sound and computer performer terfaces May be re peated for cred t Lecture ab Prerequ sites MTC 436 and 437 *or* equiva ents

MUSIC EDUCATION (MUE)

MUE 110 Introduction to Music Education. (1) S
Overv ew of mus c educat on Or entat on to student character st cs teacher ro es, and foundat ons f ph osophy and h story Sch ol observat ons requ red.

MUE 161 Introduction to Music Therapy. 2 F
Overv ew of the profession of mus c therapy and ts app cat ons n menta hea th rehab tat on and spec'a educat on.

MUE 211 Music in Recreation. (2 F
Mate a s methods and organ zat ona struc tures appropr ate for recreat ona mus c

MUE 261 Mus'c Therapy as a Behavioral Science. 2 F
Or entat on to prec n cal exper ence w th an emphas s on observat on k s assessment goa sett ng and profess ona eth cs Requ red off campus observat ons. Prerequ s te: MUE 161

MUE 310 Music in Early Childhood Education. 3) S
dent fy ng and understand ng mus cal needs of young ch dren Methods and mater a s for program deve opment for c assroom teachers

MUE 311 Music for the Classroom Teacher. (3) F S
Deve opment of the c assroom mus c program n the e ementary schoo No prev ous mus c exper ence or course work requ red Prereq u s te non Mus c ma or or m nor

MUE 313 Elementary Music Methods. (3) F
Methods of nstruct n, p ann ng and presen tat on of appropr ate contents n mus c For mus c educators and mus c therapists Pre requ s'te: Mus c major

MUE 315 General Music in the Secondary Schools. (2 F S
Curr cu um student character st cs and teach ng strateg es for genera mus c. Prereq u s te Mus c major

MUE 317 Educational Methods for Violin and Viola. 1) F, S
Teach ng and p ay ng sk s for mus c teach ers 3 hours per week

MUE 318 Educational Methods for Cello and String Bass. (1 F S
Teaching and play ng sk l s for mus c teach ers 3 hours per week

MUE 327 Educational Methods for Trumpet and Horn. 1) F S
Teach ng and play ng sk s for mus c teach ers 3 hours per week

MUE 328 Educational Methods for Trombone, Euphonium, and Tuba. (1) F S
Teach ng and p ay ng sk ls for mus c teach ers. 3 hours per week

MUE 335 Educational Methods for Guitar. (1) F S
Teach ng and play ng sk l s for mus c teach ers 3 hours per week

MUE 336 Educational Methods for Percussion. (1) F S
Teach ng and play ng sk l s for mus c teach ers 3 hours per week.

MUE 337 Educational Methods for Flute, Clarinet, and Saxophone. (1) F S
Teach ng and play ng sk l s for mus c teach ers 3 hours per week

MUE 338 Educational Methods for Double Reed Instruments. (1) F S
Teach ng and p ay ng sk l s for mus c teach ers 3 hours per week

MUE 361 Music Therapy Theory and Practice in Psychopathology. (3) F
Influence of mus c on behav'or· pr nc p es and pract ces of mus c therapy and psych atnc cl ents Prerequ s tes MUE 211 261 Mus c Therapy major

MUE 362 Music Therapy Techniques. (3) S
Organ zation adm n stration and use of music n rehab tat on with various c ient populations Prerequ sites· MUE 361, Music Therapy ma jor

MUE 381 Music Therapy Research. (3) S
Stat st cs and research des gn appropr ate for nvest gat'ons 'n mus c therapy. *General Stud ies L2*

MUE 384 Therapy Preclinical I. (1) F, S
Pa red students w l prov de mus c therapy for smal groups at a commun ty agency for men ta ly retarded geriatnc or physica y d sabled cl ents for a m nimum of 10 c ock hours Pre requ s tes MUE 211 261

MUE 385 Therapy Preclinical II. (1) F S
Ind v dua placement n ASU Mus c Therapy C n c

MUE 386 Therapy Preclinical III. (1) F, S
See MUE 385.

MUE 387 Therapy Preclinical IV. (1) F, S
Ind v dua c n ca work n a community menta health faci ty

MUE 388 Therapy Preclinical V. (1) F S
See MUE 387

MUE 389 Repertoire for Music Therapy. (3) S
Mus c sk s repertoire for music therapy, in c ud ng un ts on brass strings, woodw nds e ectron c nstruments computer music, and mprovisat on techn ques Lab Prerequ s tes MUE 211 Mus c Therapy major

MUE 441 Psychology of Music. (3) S
Psycho og ca and phys o og ca aspects of mus c emphas z ng mus ca behav or func tion perception and earning Prerequisites. jun or stand ng; Mus'c Therapy major (or n structor approva).

MUE 475 Group Process and Music Therapy. (1) F
Pr nc p es of group process verba counse ng profess ona writ ng, as re ated to mus c therapy pract ce. Prerequ s tes MUE 362, Mus c Therapy major.

NOTE. For the Genera Stud es requ rement codes (such as L1 N3 C, and H and courses see pages 87 108 For graduation requ rements see pages 79–83 For omn bus courses offered but not sted n this cata og see pages 56–57

MUE 476 Internship in Music Therapy. (1) F S
A full time, 6 month, off campus residency in an approved clinical institution

MUE 480 Choral Methods. 3 S
Methods of instruction organization and presentation of appropriate content in choral music classes Prerequisite: Secondary Education major

MUE 481 Instrumental Practicum/Methods. (5) F
Instrumental music as a means of developing musical skills, understandings and attitudes in elementary and secondary school students Prerequisite Secondary Education major

MUE 482 Instrumental Practicum/Methods. 5 S
See MUE 481 Prerequisites MUE 481 or 485 Secondary Education major

MUE 485 String Practicum/Methods. (2 F
For students preparing to administer a string program and teach strings at the elementary level Lecture, lab

MUE 548 Introduction to Research in Music Education. 3 F, SS
Survey of research methods and literature in music education Focus on interpretation and evaluation.

MUE 549 Foundations of Music Education. (3) A
A treatment of historical perspectives philosophy aesthetics identified with music education and learning theories applied to music teaching/learning Basic research and writing skills appropriate to graduate studies in music education

MUE 550 Studies in Music Curricula. (3) A
Scope and sequence of musical experiences Development of criteria for the evaluation of music curricula

MUE 551 Advanced Studies in Elementary School Music. 3 A
For experienced teachers organization and content of the general music classes in kindergarten and the first 6 grades of elementary school Emphasis on teaching music reading and eartraining to young children

MUE 552 General Music, Music Theory, and Music History Classes in the Junior and Senior High School. 3 A
Organization and content of school music classes which are not performance oriented

MUE 553 Contemporary Elementary Music. 3 N
Identification and development of materials and techniques for teaching special units of music study to elementary K–8) children

MUE 564 Instrumental Music, Advanced Rehearsal Techniques. 3) A
An in depth analysis of instrumental techniques in preparation for a thorough discussion of band tuning problems and solutions Discussion of productive conducting and rehearsal techniques for school music teachers

MUE 566 Instrumental Literature for Schools. 3) A
Comprehensive study and analysis of all types of instrumental music

MUE 568 Choral Music, Advanced Rehearsal Techniques. 3 A
Musical and vocal techniques necessary for presentation of choral literature Analysis and experimentation with psychological acoustical, and other problems of rehearsal and performance

MUE 570 Choral Literature for Schools. (3) A
Comprehensive study and analysis of choral music for the high school with special emphasis on octavo literature

MUE 579 Psychology of Music. (3 A
The nature of musicality and its evaluation A review of recent research

MUE 585 Vocal Acoustics and Production. (3) A
An in depth approach to the psychological/physiological workings of the vocal mechanism

MUE 733 Contemporary Issues and Research in Music Education. 3 A
Emphasis upon recent research relating to music instruction at all levels, current and historical issues in choral general and instrumental music

MUE 744 Higher Education Instruction. 3) A
Philosophical and psychological principles of college university teaching Patterns of music teacher education and a project on of course outlines

MUE 755 Philosophy and Aesthetics in Music Education. (3 SS
Philosophy and aesthetics as they influence curriculum content and teaching procedures

MUSIC PERFORMANCE (MUP)

MUP 100 Concert Attendance (0) F S
Required of all music majors for 6 semesters in each degree program with a minimum of 4 convocations attended each semester

MUP 111 Studio Instruction. 2 F S
For majors in Music degree program Basoon ce o clarinet contrabass cornet euphonium, flute guitar harp harpsichord horn oboe organ, percussion piano, saxophone trombone trumpet, tuba viola, violin, voice Minimum contact of 1 hour plus studio class weekly May be repeated for credit. May not be taken for audit. Prerequisites placement examination and audition

MUP 121 Studio Instruction. (1) F S SS
For secondary or minor instrument instruction and nonmajors in the university Bassoon, ce o clarinet contrabass, cornet euphonium flute guitar, harp harpsichord, horn oboe organ percussion, piano saxophone, trombone, trumpet tuba viola, violin, voice Minimum contact of 1 2 hour per week. May be repeated for credit May not be taken for audit. Prerequisites placement examination and audition

MUP 127 Studio Instruction. 4 F, S
For Performance majors in Bachelor of and Master of Music degree programs only. Basoon, ce o clarinet contrabass cornet euphonium, flute guitar harp harpsichord horn oboe organ percussion, piano, saxophone, trombone trumpet, tuba viola voice Minimum contact of 1 hour plus studio class weekly May be repeated for credit May not be taken for audit Prerequisites placement examination and audition

MUP 130 Beginning Group Piano. (1) F S
Provides a basic introduction to playing piano through music reading chords rhythmic and written activities Prerequisite non-Music major

MUP 131 Class Piano. (1) F S
A four-semester sequence (with MUP 132, 231, and 232 designed for those with little or no piano experience Emphasis on keyboard technique, sight reading simple accompaniments and improvisation. 2 hours per week. May not be taken for audit Prerequisite. Music major

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 all students. 2 hours per week May not be taken for audit.

MUP 134 Class Voice. (1) F S
See MUP 133 Prerequisite MUP 133 or instructor approval.

MUP 141 Jazz Fundamentals. (1) F
Principles methods, and theory of jazz performance especially designed for the small jazz ensemble 2 hours per week

MUP 142 Jazz Fundamentals. (1) S
Continuation of MUP 141. 2 hours per week.

MUP 209 Beginning Choral Conducting. (1) F S
Essential as of choral conducting techniques. 2 hours per week

MUP 210 Beginning Instrumental Conducting. 1 S
Essential as of instrumental conducting techniques 2 hours per week

MUP 217 Improvisation Workshop. (2) F S
Emphasis on basic jazz literature chord symbol reading melodic patterns, ear training, method concepts and analysis of improvised solos Must be taken in sequence with MUP 218. May not be taken for audit Prerequisites MTC 125 MUP 111 (1 semester)

MUP 218 Improvisation Workshop. (2) F, S
Continuation of MUP 217. Prerequisite 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 Prerequisite MUP 134 or instructor approval.

MUP 234 Class Voice. (1) F S
See MUP 133 Prerequisite MUP 233 or instructor approval

MUP 235 Jazz Piano. (1) F
A 2 semester sequence (with MUP 236) designed for jazz keyboard experience Emphasis on chord symbol reading, simple improvisation and voicing 2 hours per week Prerequisite: MUP 132

MUP 236 Jazz Piano. (1) S
See MUP 235 Prerequisite MUP 132

MUP 250 Diction for Singers. (1) F S
Use of phonetics in the study of song and opera literature Language emphasis differs each semester May be repeated for credit.

MUP 301 Advanced Class Piano. (1) F
Required for Choral General music majors. Open to other music majors who have completed MUP 232. Emphasis on accompaniments ensemble playing score reading, advanced harmonizations repertoire technique and improvisation 2 hours per week May not be taken for audit Prerequisites. MUP 232 (or proficiency) placement examination

MUP 302 Advanced Class Piano. (1) S
Requ'red for Chora -Genera majors. Open to other mus c majors who have comp eted MUP 301. A sequent'al cont nuation of MUP 301 sk lls that nc ude both group and studio n struct on. 2 hours per week May not be taken for aud t Prerequis tes MUP 301 (or profi c ency) placement exam nat on

MUP 311 Studio Instruction. (2) F S
See MUP 111.

MUP 319 Recording Studio Techniques. (2) S
Study of both analog and digita record ng methods Lab time on recording conso e and tape machines is nc uded Lab.

MUP 320 MIDI Workshop. (2) F
Presentation of hardware and software appl - cat'ons for sequenc ng and mus c printing 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 majors w th a concentration n p'ano accompany ng on y Rep ertoire to be se ected from voca and instru menta terature 1 hour esson per week May be repeated for cred t Prerequ s te: p acement exam nation

MUP 339 Choral Conducting. (2) F S
Elements of choral conducting technique and interpretat on 3 hours per week Prerequisite: MUP 209

MUP 340 Instrumental Conducting. (2) F
Fundamentals of score reading and nterpreta t'on of nstrumenta mus c. 3 hours per week. Prerequ s te· MUP 210.

MUP 344 Chamber Orchestra. (1) F S
mportant masterpieces from a per ods of mus c are performed throughout the year Membership by audit on. May be repeated for cred t.

MUP 345 Symphony Orchestra. (1) F, S
Open to al students who can qua ify on the bas s of aud t ons w th the d rector. Over a 4-year per od, the student s introduced to the masterp eces of symphony orchestra l tera ture. 3 t'mes per week May be repeated for credit.

MUP 350 Choral Union. (1) F, S
Open to a students n the un'vers ty and to n- terested s ngers n the commun ty by audit on Preparation and performance of the arger chora works. 2 hours per week May be re peated for cred t

MUP 352 Concert Choir. (1) F S
4 hours per week May be repeated for cred t Prerequis te nstructor approva

MUP 353 University Choir. (1) F S
4 hours per week May be repeated for credit. Prerequ s te instructor approva .

MUP 355 Men's Chorus. (1) F S
Open to a l male students n the un versity who can qua ify on the basis of aud t ons Re hearsa and performance of mus c for ma e vo ces 2 hours per week May be repeated for credit Prerequ site: nstructor approva .

MUP 357 Women's Chorus. (1 F, S
2 hours per week May be repeated for cred t Prerequ s te instructor approva

MUP 361 Marching and Concert Bands. (1 F, S
Open to a l students who can qua fy on the bas s of aud t ons w th the d rector Stag ng of format ons and dr ls for footba games and other events (fal masterp eces of symphon c band 'terature (spring) Meets da y. May be repeated for cred t

MUP 370 Music Theatre: Techniques. 1) F S
Exercises and mprov sat ons for the singer actor emphasizing body awareness bas c mu s c theater performance sk ls and freedom of the voca and breath mechan'sms Sect on 1 (Movement for S ngers , Sect'on 2 (Expres- s on) Sect on 3 (nterpretat on) Sect on 4 (Advanced Express on) Sect on 5 (Advanced Interpretat on). Sect ons 2 through 5 must be taken n sequence. Each sect on 3 hours per week May be repeated for credit

MUP 371 Music Theatre: Workshops. (1 F, S
Deve opment of spec f c sk s for mus ca dra mat c interpretat on Sect on 1 (Ar a Prepara tion) Sect on 2 Broadway l ; Section 3 (Broadway l) Each sect on 1 hour lecture, demonstration 1 lab per week May be re peated for cred t

MUP 372 Music Theatre: Orchestras. (1 F, S
Open to a l students who can qual fy on the bas s of audit ons w th the nstructor. Part ci- pation n Lyric Opera Theatre product ons Section 1 (Orchestra) Sect on 2 Chamber Orchestra) Sect on 3 (Chamber Ensemb e) May be repeated for credit. Prerequ s te in structor approva .

MUP 373 Music Theatre: Performance. (1) F, S
Open to a students who can qual fy on the bas s of aud t'ons with the nstructor. Part'ci- pat on n Lyric Opera Theatre product ons Section 1 Pr nc pa Ro es) Section 2 (Cho- rus). May be repeated for cred t Prerequ s te 'nstructor approva

MUP 374 Music Theatre: Production. 1 F, S
Part c pat on 'n Lyr c Opera Theatre produc- t'ons. Sect on 1 (Voca Performance); Section 2 (Technical Mus c Theatre); Section 3 (Prob- ems n Product on) to be taken concurrent y with MUP 373 Sect on 2 May be repeated for credit

MUP 379 Chamber Music Ensembles. (1) F, S
Brass, gu tar keyboard mixed, percuss on, str ng, vocal, and woodw nds ensembles. 2 hours per week. May be repeated for cred t. Prerequ's te 'nstructor approva

MUP 382 Collegium Musicum. (1) F, S
S ngers and nstrumental sts specia z ng in the performance of ear y and unusual mus c. 2 hours per week May be repeated for cred t Prerequ site: nstructor approval

MUP 383 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 Prerequisite nstructor approva

MUP 384 Brass Choir. (1 F S
Specia z ng n pub c performance of mus c written for brass nstruments 3 hours per week May be repeated for cred t Prerequi s te· nstructor approva

MUP 385 Percussion Ensemble. (1 F S
Rehearsa a d performance of standard and orig na reperto re for the percuss on ensem b e and re ated nstruments 2 hours per week May be repeated for cred t Prerequ s te n structor approva

MUP 386 Stage Band. (1 F S
Rehearsa and performance of terature for the stage band 4 hours per week May be re peated for cred t Prerequ s te nstructor ap prova

MUP 387 Ethnomusicology Ensembles. (1) F, S
Performance earn ng exper ence for the mu s c of var ous cu tures of the wor d May be re peated for cred t Prerequ s te know edge of nstrument or nstructor approva .

MUP 388 Piano Accompanying. 1 F S
Accompany ng majors others at the d'scret on of nstructor) P ano accompan ments found n voca and nstrumenta l terature d scuss on f sty es and performance pract ces; exper ence n pub c performance 2 hours per week May be repeated for cred t

MUP 417 Advanced Improvisation. 2 F S
Emphas s on analys s and performance of ad vanced jazz terature compos t'on n contem porary sty es. Must be taken n sequence w th MUP 418 May not be taken for aud t Pre requ site MUP 218.

MUP 418 Advanced Improvisation. 2 F, S
Cont nuation of MUP 417 Prereq s te MUP 417

MUP 440 Keyboard Harmony. 1 F
Performance-or ented class emphas z ng chord progress ons harmo zat on f gured bass rea zat on, sty st c mprov sat on trans- pos tion open score read ng and s ght read- ng Prerequ s te Performance ma or w th a concentrat on n keyboard or nstructor ap prova .

MUP 451 Reperto're. (2 F S
L terature ava lab e for performance n a per- form ng med a May be repeated for credit Prerequ s te jun or stand ng in major perfor- mance f e d

MUP 453 Song Literature. 2 A
Amer can, Russ an, Span sh Scand nav an and contemporary song

MUP 454 Song Literature. 2 A
Early Ita an, Engl sh, German, and French art song

MUP 481 Performance Pedagogy and Materials. 2 N
Pr nc ples and methods of performance tech niques for each performance f e d. May be re- peated for cred t Prerequ s te senior stand ng or nstructor approva

MUP 482 Piano Pedagogy II. (2 N
Cont nuation of MUP 481 P ano Prob ems and techn ques of teach ng ntermed ate to ad vanced p ano students Prerequ s tes jun or standing as p ano major, nstructor approva

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NOTE. For the Genera Stud es requ rement codes (such as L1, N3, C, and H), and courses see pages 87 108 For graduat on requ rements see pages 79–83. For omnibus courses offered but not l sted in th s cata og, see pages 56–57

MUP 487 Piano Accompanying. (1) F
Keyboard ma ors P ano accompaniments found n vocal and nstrumenta l terature, d s- cuss n 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 Solo Performance. (0) F S
F r cand dates of a Bache or of Mus c degree n Performance n wh ch 1 2 rec ta ıs a gradu at on requ rement.

MUP 496 Solo Performance. (0) F, S
For cand dates of a Bache or of Music degree n Perfo mance n wh ch a ful recita s a graduat on requirement Prerequ s te: MUP 495

MUP 507 Group Piano Practicum. (2 F
Curr u a mater a s, and teach ng techniques for group teach ng at the un versity and com- mun ty co ege leve s Observat on/supervised 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 an facu ty Paper as final requ rement Prerequ s te· M.M performance pedagogy p ano student

MUP 511 Studio Instruction. (2) F S
For major n Mus c degree program. Bas soon, ce o c ar net, contrabass, cornet, eu phon um f ute, gu tar harp, harpsichord horn, ob e organ percuss on p ano, saxophone, trombone trumpet, tuba v o a v o n vo ce M n mum contact of 1 hour plus studio c ass week y May be repeated for cred t May not be taken for aud t Prerequisites p acement exam nat on and aud t on

MUP 521 Studio Instruction. 1) F S, SS
For secondary r m nor nstrument nstruct on and nonmajors n the un vers ty Bassoon ce c ar et contrabass, cornet, euphon um, f ute, gu tar harp, harps chord horn, oboe, or gan, percuss o p ano saxophone trombone trumpet tuba v o a v o n vo ce M n mum contact of 1 2 our per week May be re- peated for cred t May not be taken for aud t Prerequ s tes p acement exam nation and au- d t on.

MUP 527 Studio Instruction. (2 or 4) F S
Fo Performance ma ors 'n Master of Music deg ee program on y. Bassoon ce o c arinet, trabass cornet euphonium, f ute gu tar, harp, ha ps chord horn, oboe, organ percus- s on p a o sax phone, trombone, trumpet tuba v o a, v o n vo ce. M n mum contact 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 tion

MUP 540 Advanced Conducting. (3 F
Score preparat on and conduct ng techn ques for strumenta mus c Concentration on study of stor ca sty es Required of D.M A students n nstrumenta Mus c

MUP 541 The Art Song. (3) N
So o ng from ts beginn'ng to the present day

MUP 544 Chamber Orchestra. (1) F S
mp rt nt masterp eces from a per ods of mus c w be perf rmed throughout the year May be repeated for credit Prerequ s te ın structor approva

MUP 545 Symphony Orchestra. (1) F S
Open on the basis of aud tion w th the d rec tor Masterpieces of symphony orchestra it- erature Three t mes per week May be re peated for cred t

MUP 550 Choral Union. (1) F, S
Open to al students ın the un vers ty and to n terested singers n the commun ty by audit on Preparation and performance of the larger chora works 2 hours per week May be re peated for credit

MUP 551 Repertoire. (2) N
Literature avai ab e for performance n a l per form ng 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 site: instructor approva

MUP 553 University Choir. (1) F S
4 hours per week May be repeated for cred t Prerequisite nstructor approva

MUP 555 Men's Chorus. (1) F S
Open to male students in the un vers ty who can qua fy on the bas s of aud t on. Rehearsal and performance of music for ma e vo ces 2 hours per week May be repeated for cred t Prerequ s te instructor approva

MUP 557 Women's Chorus. (1) F, S
2 hours per week May be repeated for cred t Prerequisite: nstructor approva

MUP 561 Marching and Concert Bands. (1) F, S
Open by aud tion only Staging of format ons and dr ls for footba games and other events (fal) masterpieces of symphon c band tera ture (spr ng). Meets da ly May be repeated for cred t

MUP 570 Music Theatre: Techniques. 1) F, S
Exerc ses and mprov sat ons for the s nging actor emphas z ng body awareness, isola t ons and freedom of the voca and breath mechan sms Section 1 (nterpretat on); Sec t on 2 (Express on) Sect on 3 (Movement for S ngers). Each Section 3 hours per week. May be repeated for cred t

MUP 571 Music Theatre: Workshops. (1) F S
Development of spec fic sk l s for the mus ca - dramat c nterpretation Sect on 1 (Ro e Prep arat on) Sect on 2 (Sty es) Sect on 3 (Opera Scenes); Section 4 (Mus ca Comedy) Sec- t on 5 (Revue Ensemb es) Each sect on 1 hour ecture, demonstrat on, 1 ab per week May be repeated for credit

MUP 572 Music Theatre: Orchestras. (1) F, S
Open to a students who can qua ify on the basis of aud tions with the nstructor. Part c - pat on in Lyr c Opera Theatre product ons Sect on 1 Orchestra), Section 2 (Chamber Orchestra); Sect on 3 (Chamber Ensemb e) May be repeated for credit. Prerequ s te n structor approva

MUP 573 Music Theatre: Performance. (1) F S
Open to a l students who can qua ify on the bas s of aud tions with the nstructor Part c pat on n Lyr c Opera Theatre product ons Section 1 (Princ pa Roles), Sect on 2 (Cho- rus) May be repeated for credit. Prerequ site. nstructor approva .

MUP 574 Music Theatre: Production. (1) F, S
Participation n Lyr c Opera Theatre produc- t ons Sect on 1 (Voca Performance) Sect on 2 (Technical Mus c Theatre), Sect on 3 (Prob- ems in Product on) to be taken concurrently w th MUP 373, Sect on 2 May be repeated for cred t

MUP 579 Chamber Music Ensembles. (1) F, S
Str ng brass woodw nd, percussion, key board, voca and m xed ensembles 2 hours per week May be repeated for credit Pre requisite: nstructor approval.

MUP 581 Performance Pedagogy and Mate- rials. (2) N
Princ'ples and methods of performance tech- n ques for each performance f eld May be re peated for cred t

MUP 582 Collegium Musicum. (1) F, S
Singers and instrumenta sts spec a z ng in the performance of ear y and unusua mus c. 2 hours per week May be repeated for cred t. Prerequ s te 'nstructor approval.

MUP 583 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 Prerequisite: nstructor approva

MUP 584 Brass Choir. (1) F S
Pub c performance of music written for brass instruments 2 hours per week May be re peated for credit Prerequ s te nstructor ap prova

MUP 585 Percussion Ensemble. (1) F S
Rehearsa and performance of standard and or g na repertoire for the percuss on ensem- b e and related nstruments 2 hours per week. May be repeated for cred t Prerequisite n- structor approval

MUP 586 Stage Band. (1) F S
Rehearsal and performance of ıterature for the stage band 4 hours per week May be re- peated for cred t Prerequ s te nstructor ap- prova

MUP 587 Ethnomusicology Ensembles. (1) F S
Performance learn ng exper ence for the mu s c of var ous cu tures of the world May be re peated for cred t Prerequisite know edge of nstrument or nstructor approval

MUP 588 Piano Accompanying. (1) F, S
Performance majors w th a concentration n p ano accompany ng (others at the d scret on of the instructor). P ano accompaniments found ın vocal and nstrumenta terature d s- cuss on of styles and performance pract ces experience in public performance 2 hours per week May be repeated for cred t

MUP 595 Solo Performance. (1) F S
For Master of Mus c cand dates in appl ed mu s c on y. May be fu l rec ta , major operat c role so o performance w th orchestra, ensem- b e or ecture recita

MUP 596 Solo Performance. (1) F S
See MUP 595

MUP 727 Studio Instruction. (2 or 4) F S
For D M A candidates only Minimum contact of 1 hour per week May be repeated for cred t

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NOTE For the General Stud es requirement codes (such as L1 N3, C, and H), and courses, see pages 87 108 For graduat on requirements, see pages 79–83 For omn bus courses offered but not sted n this cata og see pages 56–57

MUP 796 Solo Performance. (1–5) F, S
For D.M.A. candidates only. May be repeated for credit.

MUSIC (MUS)

MUS 100 Fundamentals of Music Notation. (3) F, S, SS
Provides non-Music majors with sufficient symbol literacy to begin work in the field of musical learning. Credit not applicable toward any Music degree.

MUS 340 Survey of Music History. (3) F, S, SS
Major composers, compositions, and periods in the history of music. Credit not applicable toward any Music degree. *General Studies: HU, H.*

MUS 347 Jazz in America. (3) F, S, SS
Current practices employed by contemporary jazz musicians; the historical development of jazz techniques. Credit not applicable toward any Music degree. *General Studies: HU.*

MUS 353 Survey of Afro-American Music. (3) A
Afro-American music traced from its origins in Africa to the present with emphasis on spiritual, blues, jazz, gospel, and classical styles. Credit not applicable toward any Music degree. *General Studies: HU.*

MUS 354 Popular Music. (3) A
Emphasis on historical, cultural, and performance patterns in a variety of popular idioms such as, but not limited to, rock, folk, jazz, and Afro-American music. May be repeated for credit. Credit not applicable toward any Music degree. *General Studies: HU.*

MUS 355 Survey of American Music. (3) F, S, SS
Growth and development of American music. Credit not applicable toward any Music degree. *General Studies: HU, H.*

MUS 356 Survey of the Musical Theatre. (3) A
Music's place in the theatre, viewed in terms of historical importance and relative function. Credit not applicable toward any Music degree. *General Studies: HU.*

MUS 363 Survey of Russian Music. (3) F 1999
Examines music and musical life in Russia and the Soviet Union from the Middle Ages to the present. Lecture, discussion. Credit not applicable toward any Music degree.

Department of Theatre

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www.asu.edu/cfa/theatre

PROFESSORS
BARKER, BARTZ, BEDARD, ECKARD, KNAPP, MASON, SALDAÑA, THOMSON, J. WILLS

ASSOCIATE PROFESSORS
ACKER, EDWARDS, ENGEL, HOLLOWAY, RISKE, SAKREN, VINING

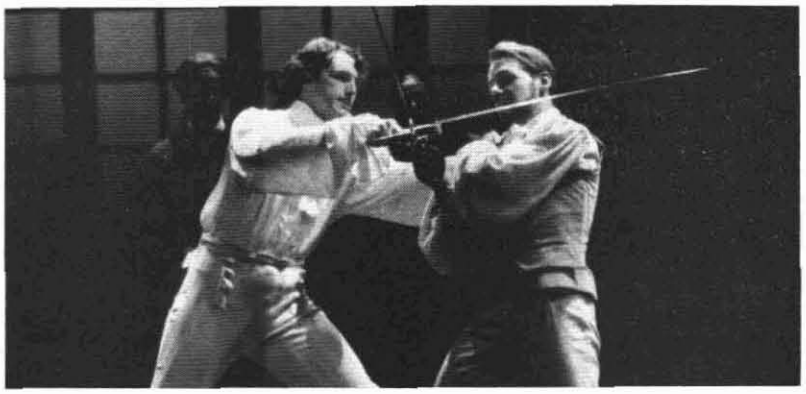
ASSISTANT PROFESSORS
REYES, THOMSEN

FINE ARTS SPECIALIST
SCHNEIDER

SENIOR LECTURERS
HILL, B. WILLS

LECTURER
IRVINE

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 requirements and suggested electives, are available in the Department of Theatre office for each degree program and area of concentration.



Stan Weightman and Joel Maurice do battle in the Department of Theatre's production of "Les Liaisons Dangereuses." ASU Department of Theatre photo

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. Students 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. Specific requirements are listed below for each area of concentration. The following core of courses is required of all B.A. degree candidates:

THE	220	Principles of Dramatic Analysis *L1*	3
THE	225	Orientation to Theatre	1
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	1
THP	213	Introduction to Technical Theatre	3
THP	301	Theatre Production (one semester hour in two different production options)	2
THP	315	Fundamentals of Directing	3
Total			25

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 considered 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 an emphasis area or remain in the general B.A. degree program.

Students may be accepted in an emphasis 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 an emphasis 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 emphasis 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 program in one of the areas of emphasis. Students may be admitted on a provisional basis to an area of emphasis for one semester, at which time they must audition or interview again. Admission and retention in all theatre areas of emphasis 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 General Studies courses or any courses in the College of Fine Arts. Lower-division courses in a foreign language may also be used as electives. See pages 247–248 for approved areas of study and the distribution of semester hours as required by the College of Fine Arts.

Areas of Emphasis. The requirements for each area of emphasis 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	3
		or THP 207 Introduction to Acting: The Creative Imagination (3)	
THP	370	Intermediate Voice and Movement for the Stage	2
THP	377	Stage Speech	2
THP	385	Acting: Intermediate Scene Study	3
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			25

In addition, students intending to audition for the acting emphasis are strongly encouraged to take THP 113 Techniques of Theatrical Makeup (three semester hours).

Students admitted to the acting emphasis are required to audition for designated subscription series productions.

Design/Technical Theatre

Students are admitted to the design/technical theatre emphasis 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
THE	225	Orientation to Theatre	1
THP	101	Introduction to the Art of Acting	3
		or THP 102 Beginning Acting (3)	
THP	213	Introduction to Technical Theatre	3
Total			10

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 electrics) 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	Special Topics	1–4
THP	498	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 abilities 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 emphasis 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
THE	225	Orientation to Theatre	1
THP	102	Beginning Acting	3
THP	213	Introduction to Technical Theatre	3
Total			10

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

NOTE: For the General Studies requirement, codes (such as L1, N3, C, and H), and courses, see pages 87–108. For graduation requirements, see pages 79–83. For omnibus courses offered but not listed in this catalog, see pages 56–57.

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 Production	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	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 emphasis 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 emphasis 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 emphasis 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 *LI*	3
THE	225	Orientation to Theatre	1
THP	102	Beginning Acting	3
THP	213	Introduction to Technical Theatre	3
Total			10

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	360	History of Film *HU*	4
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 Senior Project is also required.

GRADUATION REQUIREMENTS

In addition to fulfilling the major requirements, students must meet all university graduation requirements. See pages 79 83.

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 *LI*	3
THE	225	Orientation to Theatre	1
THE	320	History of the Theatre *HU, H*	3
THE	321	History of the Theatre *HU, H*	3
THP	102	Beginning Acting	3
THP	185	Acting Beginning Scene Study	3
THP	213	Introduction to Technical Theatre	3
THP	272	Introduction to Stage Movement	3
THP	277	Introduction to Stage Speech	3
THP	301	Theatre Production	2
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			38

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	311	Improvisation with Youth	3
THP	411	Methods of Teaching Drama	3
THP	481	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 *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, application for early admission of ASU freshmen are accepted toward the end of the second semester 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 page 167).

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
Total			10

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

Also required are two three hour courses in the same area of emphasis. Contact the department 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). All prerequisites for the minor courses must be met (see course listings).

Departmental Academic Specialization

Elementary Education. Students pursuing the Bachelor of Arts in Education degree in Elementary Education may select theatre as an academic specialization, consisting of 18 semester hours from the following courses:

THE	100	Introduction to Theatre *HU*	3
THE	424	Trends in Theatre for Youth	3
THP	101	Introduction to the Art of Acting	3
THP	213	Introduction to Technical Theatre	3
THP	311	Improvisation with Youth	3
THP	312	Puppetry with Children	3
THP	315	Fundamentals of Directing	3
THP	330	Introduction to Costuming	3

THP 411 Methods of Teaching Drama 3 is required.

Secondary Education. Students pursuing the B.A. in Education degree in Secondary Education may select theatre as a second teaching field. The second teaching field consists of 30 semester hours including the following courses:

THE	220	Principles of Dramatic Analysis *LI*	3
THE	325	Play Reading	1
THE	448	Methods of Teaching Theatre	4
THP	101	Introduction to the Art of Acting	3
THP	213	Introduction to Technical Theatre	3
THP	301	Theatre Production	1
THP	311	Improvisation with Youth	3
THP	315	Fundamentals of Directing	3
THP	448	Secondary School Play Production	3
Total			24

Two of the following three courses are also required:

THP	330	Introduction to Costuming	3
THP	345	Lighting Design	3
THP	411	Methods of Teaching Drama	3

GRADUATE PROGRAMS

The faculty in the Department of Theatre offer programs leading to the M.A. degree in Theatre; the Master of Fine Arts degree in Theatre with concentrations in acting, scenography, and theatre for youth; the Ph.D. degree in Theatre with a concentration in theatre for youth; and, in conjunction with the Department of English, an interdisciplinary Master of Fine Arts degree in Creative Writing (playwriting option). Consult the *Graduate Catalog* for details.

THEATRE (THE)

THE 100 Introduction to Theatre. 3 F S SS
Elements and principles of the theatre. Lecture/discussion. Prerequisite: nonmajor. *General Studies HU*

THE 220 Principles of Dramatic Analysis. 3 F S
Analysis, evaluation and interpretation of dramatic literature for theatrical production. Selected readings of classic contemporary and modern plays. Prerequisites: ENG 101 or 105, Theatre major. *General Studies L1*

THE 225 Orientation to Theatre. 1 F
Orientation to university and department resources and procedures. Career planning and guidance. Attendance and written responses to theatre productions. Required for B.A. Theatre majors. Prerequisite: Theatre major.

THE 300 Film: The Creative Process. 3 F S SS
Elements of the theatrical film: cinematography, sound editing, directing, acting, scriptwriting, production, and critic sm. 3 hours lecture, 2 hours lab. *General Studies HU*

THE 320 History of the Theatre I. 3) F
Traces major developments in theatre production and dramatic literature from its beginning to the mid-17th century. Lecture, student presentations. *General Studies HU H*

THE 321 History of the Theatre II. 3) S
Traces major developments in theatre production and dramatic literature from the mid-17th century to the end of the 19th century. Lecture, student presentations. *General Studies HU H*

THE 322 History of the Theatre III. 3 F
Traces major developments in theatre production and dramatic literature in the 20th century. Cooperative learning. *General Studies: HU, H*

THE 325 Play Reading. (1) F S
Assigned independent readings in plays for high school production. Prerequisite: theatre education concentration or instructor approval.

NOTE For the General Studies requirement codes (such as L1, N3, C, and H), and courses, see pages 87–108. For graduation requirements, see pages 79–83. For omnibus courses offered but not listed in this catalog, see pages 56–57.

THE 400 Focus on Film. (3) N
Specia zed study of prom nent f lm art sts techniques, and genres Emphas s s on the creative process May be repeated for credit. Prerequ site ENG 101 or 105

THE 401 Focus on Multiethnic Film. (3 F, S SS
Spec a zed study of major ethn c f lms and prominent fi m art sts Emphas s s on the cre ative process Lecture, f m v ew ng papers Prerequisite ENG 101. *General Stud es HU C*

THE 420 History of the American Theatre. (3) F
H story of the p ays art sts, and events in the deve opment of American theatre from co o- n al 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 development of Eng sh theatre from med eva t mes to the present Lecture group and nde pendent work *Genera Studies L2/HU.*

THE 424 Trends in Theatre for Youth. (3) N
A survey of the h story, terature and contem porary pract ces n theatre for youth

THE 425 History of Asian Theatre. (3) N
H story and product on techn ques of theatre forms n Ind a, Ch na and Japan Prerequ site 6 hours of theatre h story or instructor approval. *General Studies L2/HU*

THE 430 History of Costume: Western Tradition. (3) N
Study of major costume styles throughout h s tory of Western civ zation and how these fash ons ref ected soc ety. Explorat 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 Ind a, Asia Eastern Europe, and the Middle East and how these fashions reflected soc ety Exp orat on of how sty es can be used by theatr ca cos tumers.

THE 480 Methods of Teaching Theatre. (4) F
App cation of mater als techn ques and theo ries for theatre w th n nth through twe fth grade students Emphas s on curr cu um de ve opment and prax s Prerequ s te theatre educat on concentration or instructor approval

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 criticism and aesthetics from the c ass cal period to the 19th century. Re ated readings in dramat c terature. Prereq uisite Theatre major.

THE 505 Studies in Dramatic Theory and Criticism. (3) S
Dramat c theory, cr t c sm, and aesthet cs from the 19th century to the present Related read ngs n dramatic terature. Prerequ s te The atre major.

THE 510 Studies in Literature. (1) F S
Ass gned nd v dua read ng programs n stan dard sources and masterp eces n theatre t erature Topics may be selected from the fol lowing
(a) Act ng--D rect ng
(b) Crit c sm
(c Des gn Techn ca
(d) History
May be repeated for cred t in d fferent sec tions

THE 520 Theatre History and Literature I. (3) F
A survey of h storiograph cal ssues h storica per ods, and theatre terature through the 17th century

THE 521 Theatre History and Literature II. (3) S
A survey of histor ograph ca ssues, historical per ods and theatre iterature, from the 17th century to present

THE 524 Advanced Studies in Theatre for Youth. (3) F
An in-depth study of the h story l terature and contemporary pract ce of theatre for youth. Prerequis te instructor approval

THE 591 Seminar. (3) A
Selected top cs n ch ld drama commun ty theatre, and theatre history Prerequ s te. wr t ten nstructor approva

THE 700 Advanced Research Methods. (3) F
Critica rev ew of research deve opment and design of research in theatre and theatre for youth

THE 791 Seminar. (3) N
Selected top cs offered on a revo v ng bas s. May be repeated for cred t when top c changes.

THEATRE PERFORMANCE AND PRODUCTION (THP)

THP 101 Introduction to the Art of Acting. (3) F, S SS
Improv sations, term no ogy exerc ses, and projects n act ng Prerequ s te nonmajor

THP 102 Beginning Acting. (3) F, S
Actor awareness (personal and group) inter na act ng techniques, scene study with part ners, monologue preparat on Stud o Pre requ s te Theatre major Corequ site THP 113

THP 113 Techniques of Theatrical Makeup. (3) F, S
Techn ques of theatrica makeup age correc- t ve, masks, and specia effects. 1 hour lec- ture, 2 hours ab Lab fee required.

THP 200 Theatre Workshop. (1) F S
Attendance and/or part c pat on at a var ety of demonstrations, guest ectures, performances, and workshops May be repeated for credit Prerequ s te Theatre major.

THP 207 Introduction to Acting: The Creative Imagination. (3) F
Deve opment of the actor as an artist, ntro duc ng the use of the creat ve magination through sensory exper ence as ed by Stan slavski Stud o. Prerequ s te: instructor approval. Prerequ s tes w th a grade of "C" or h gher: THE 220; THP 102

THP 208 Introduction to Acting: Doing the Action. (3) S
Cont nuat on of the inner process, app y ng the techn ques of Meisner to discover the cre ativity n the spontaneous experience Stud o. Prerequ site nstructor approva Prerequisite w th a grade of "B" or h gher THP 207

THP 213 Introduction to Technical Theatre. (3) F, S
Procedures of technica theatre product on and demonstrat on. Topics nc ude design and construction of scenery, l ghting and proper ties 2 hours ecture 3 hours lab.

THP 272 Introduction to Stage Movement. (3) F S
Movement vocabulary and phys ca tra n ng n re axat on, al gnment, cond t on ng rhythm and po se Prerequ s te THP 101 r 102 or concurrent reg strat on n THP 102 *or* nstruc tor approval

THP 277 Introduction to Stage Speech. 3 F S
Exerc ses and techn ques to free the v ce and mprove project on Prerequ s tes THP 101 (or 102) and 272 *or* nstructor approva Prerequis te w th a grade of C" or h gher THE 220.

THP 285 Acting: Beginning Scene Study. (3 F, S
Character ana ys s, rehearsa , and perfor mance of modern plays with emphas s on re a st c acting sty es. Spec a sections f r ma jors Prerequ s tes w th a grade of 'C or h gher THE 220 and THP 102 *or* str ct r approva

THP 301 Theatre Production. 1–4 F S SS
Part c pat on in un vers ty theatre p oduct ns May be repeated for cred t Prerequ s te wr t ten nstructor approva

THP 307 Acting: The Inner Process. 3 F
An advanced class for nd v dua zed w rk on concentration persona zat on, se f aware- ness v sua zation subst tut on creat ng nner and outer characters. Exerc ses, mono ogues and scenes Prerequ s te act ng emphas s or nstructor approva

THP 308 Multiethnic Workshop. (3 F S
Project-or ented workshop; prov des the ethn c student and others the opportun ty to develop and present works or g nat ng from Amer ca s ethnic cu tures Lecture, ab

THP 311 Improvisation with Youth. 3 F, S
Bas c mater als techn ques and theor es for fac l tat ng mprovisat ona drama w th ch dren and youth Not open to freshmen

THP 312 Puppetry with Children. 3 F S
Construct on and manipu at on of p ppets pract ce in performance sk s Emphas s on educat ona and recreat ona uses f puppetry by and w th ch dren Lab fee requ red Pre requis te jun r stand ng or above requ red

THP 315 Fundamentals of Directing. 3 F S
Bas c too s of the d rector: cast ng f oor p ans, b ocking rehears ng D rector s approach to text and artcu at on of deas emphas zed Pre requ s tes. THP 101 (or 102 and 213 *or* structor approva Prerequ s te w th a grade of "C" or h gher THE 220

THP 317 Stage Management. 3 F
Read ngs n stage management and part c pa t on as a stage manager n a un vers ty theatre production Prerequ s te wr tten nstructor ap- prova Prerequisite w th a grade of 'C r h gher. THE 220

THP 330 Introduction to Costuming. 3 F S
Costume construct on survey of c stume h s tory, and bas c pr nc ples of costume des gn Costume des gn project and aboratory exper ence n construct on of costumes 3 hours ec ture, 2 hours ab Prerequ s te w th a grade of "C" or higher: THE 220

THP 331 Costume Construction. 3) N
Uses of materials and techn ques f r stage costumes w th actual construct on of pe od apparel Prerequ s te THP 330 or structor approva

THP 340 Scene Design. (3) F, S
Stud o projects n des gn ng rea st c scenery for the contemporary proscen um stage Pre requ s te· THP 213 or nstructor approva Pre requ site w th a grade of C" or h gher: THE 220

THP 345 Lighting Design. 3 F, S
Pr nc p es and theory of stage ghtng des gn, nc ud ng design process and execut on equ pment and ght plots Lecture ab Prerequ s te THP 213 or nstructor approva Prerequ s te w th a grade of C or h gher THE 220

THP 350 Sound Design. (3) F
Introduct on to the equ pment process and record ng techn ques used n sound des'gn for the theatre Lecture stud o Prerequ s te w th a grade of C or h gher THE 220

THP 370 Intermediate Voice and Movement for the Stage. 2 F
Concentrat on on deve op ng strong and ex press ve voca and phys ca nstruments for the stage Prerequ s tes THP 272 and 277 act'ng emphas s *or* nstructor approval Pre requ s te w th a grade of 'C or h gher THE 220.

THP 377 Stage Speech. (2 S
ntroduct on of phonet c a phabet and stan dard speech and d ct on 2 hours per week Prerequ s tes THP 370 and act ng emphas s *or* nstructor approva

THP 385 Acting: Intermediate Scene Study. 2) S
Scr pt analys s and performance of modern c assics Prerequ s tes THP 370 and acting emphas s *or* nstructor approva Corequ s te THP 377

THP 401 Theatre Practicum. (1 3 F, S, SS
Perf rmance and product on ass gnments for advanced students of act ng, techn ca product on stage and bus ness management, and des gn May be repeated for cred t Pre req s te· nstructor approva

THP 406 Scenography. (3) N
The process of product on co aborat on Taught n conjunct on w th THP 419. Prerequ s tes THP 330 and 340 and 345 *or* nstructor approva

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 partic pa tion w th ch dren Prerequ s te THP 311 or in structor approva

THP 414 Directing: The Production Concept. (2 A
P ay ana ys s deve opment and mplementa t on of the d rector s concept Stud o. Prerequ sites THP 315 nstructor approva .

THP 415 Directing the Actor. (3 A
Pract ca app cat ons of d rect ng for the stage Rehearsa and presentation of scenes and short p ays Prerequ s tes· THP 414, n structor approva

THP 419 Preproduction Workshop: Director/Designer Collaborat on. 3 A
Study and practice of the col aborat ve pro cess necessary for deve op ng a product on concept Var ous styles real sm nonreal sm theatre for youth) Taught in conjunct on w th THP 406 506 cannot be enro ed concurrent y w th THP 406 or 506 Prerequ s te THP 415 or wr tten nstructor approva .

THP 430 Costume Design. (3) N
Princ p es of costume des gn with projects n both modern and period sty es Prerequ s te: THP 330

THP 431 Advanced Costume Construction. (3) A
Spec a zed tra n ng n costume construct on problems and crafts w th projects n ta or ng m l nery and per od accessor es Prerequ s tes· THP 330 and 331 *or* nstructor approva

THP 435 Advanced Technical Theatre. (3) A
Se ect on f materia s, drafting of work'ng draw ngs, too operation and construct on techn ques 2 hours ecture 2 hours lab Prerequ s tes THP 340 and 345 *or* instructor ap prova

THP 440 Advanced Scene Design. (3) A
Advanced stud o projects n des gn ng scenery for a var ety of stage forms Prerequ s te: THP 340 or nstructor approva .

THP 441 Scene Painting. (3) N
Stud o projects n pa nting stage scenery. Pre requ s te THP 340 or nstructor approval.

THP 442 Drawing. 3 N
Techn ques n drawing and render ng for sce n c, costume and ght ng des gn. Prerequ s te nstructor approva

THP 444 Drafting for the Stage. (3) N
Fundamenta s of and pract'ce n graph c techn ques for the stage Introduct on to computer a ded des gn for the stage 2 hours lecture, 3 hours stud o Prerequis tes THP 213 nstruc tor approva

THP 445 Advanced Lighting Design. (3) N
Spec al zed techn ques n stage ght ng Ad vanced appl cat on of des gn process, graph c techn ques of design presentat on and use of qua t es of l ght Lecture, c ass workshops Prerequ site THP 345 or instructor approva

THP 450 Theatre Organization and Management. (3) N
Box off ce, house management procedures, product on budget ng and pub city. Prerequ s te w th a grade of "C" or h gher: THE 220.

THP 460 Playwrights Workshop. (3) F S
Pract ce and study of creat ng characters d a ogue scenes, plays and mono ogues for the stage May be repeated for credit. Stud o ec ture Prerequisite written instructor approva

THP 461 Scripts-in-Progress. (3) F, S
Stud o work w th the instructor centered on rev s ons of or g na p ays Preparing the script for product ons and rewr t ng wh e n produc t on May be repeated for cred t Stud o Prerequ s te: THP 460 or wr tten nstructor ap prova

THP 472 Advanced Movement for the Stage. 3 F
Movement techn ques for the c ass ca and nonrea st c theatre, stage combat and spec a sk s Prerequ s tes THP 385 and act ng emphas s *or* nstructor approva

THP 477 Advanced Voice for the Stage. (3) F
Exerc ses to deve op voca f ex bi ty and power mastery of e evated Amer can d'ct on and anguage sk s app ed to c ass ca and nonrea st c drama stage d a ects. Prerequ s tes THP 385 and acting emphas s *or* n structor approva

THP 481 Secondary School Play Production. (3) F
Methods of d rect ng des'gning and coordinating p ay product on experiences at the secondary school eve . Off-campus pract'cum. Prerequ s tes THP 315 and theatre educat on concentrat on *or* nstructor approva

THP 485 Acting: Advanced Classical Scene Study. (3) S
Rehearsal and performance of period, class cal, and nonrea st c p ays Emphas s on de v ery of poetic language Prerequis tes THP 385 and act ng emphasis *or* nstructor ap prova

THP 486 The Meisner Approach to Acting. (3 A
mprov sations and exerc ses deve oped by Sanford Me sner appl ed to scene work from selected texts Stud o Prerequ s te ntroduc tory act ng c asses

THP 488 Audition Techniques. (3) A
Techn ques and preparat on for stage commerc al, and TV f m aud t ons ut zing mono ogues, co d readings, and persona style Stud o Prerequ'site: ntroductory acting classes

THP 487 Acting for TV and Film. (3) A
Professiona telev s on and f m act ng tech niques, term nology and on-camera exper ence Prerequ s tes: THP 101 (or 102) 110 jun or stand ng

THP 489 Actor Career Development. (3) A
Fam iar zat'on w th the business of acting self-promot ona too s and techniques, market ng strateg es f nances, nterv ew sk l s, and actor unions Stud o Prerequ s te introductory act ng c asses

THP 494 Special Topics. (1–4) A
Top cs may be se ected from the fo lowing·
(a) Advanced Act ng Techn'ques
(b) Advanced Scene Paint ng
(c) Advanced Stage Management
(d) Curr cu um and Superv sion of Theatre in the School K 12
(e) Properties and Dressings Des gn and Construct'on
(f) Puppetry n Performance
(g) Storytel ng
(h) Techn ca Theatre l l
( ) V deo and ndustria Scene Design

THP 498 Pro-Seminar. (1–6) A
Top cs may be se ected from the fo ow ng
(a) D rect ng
(b) Projects
Costume Des gn
L ght ng Design
Properties Des gn
Scenery Des gn
Techn ca Direct on
(c) Stage Management
(d) Theatre for Youth Tour
(e) Theatre n Educat on
Prerequisite: written instructor approval.

THP 501 Acting: Personalization I. (8) F
Fundamentals: activat on, articu at'on ear tra n ng neutral masks phys ca -voca dynam cs Scene study contemporary real stic en semb e performance projects. Col aborat on w th p aywr ghts Stud o Prerequis te: admis s'on to M F A Act ng program or instructor ap prova

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NOTE For the Genera Stud es requ rement codes (such as L1, N3 C and H) and courses see pages 87 108 For graduat on requ rements, see pages 79–83 For omn bus courses offered but not sted in th s catalog see pages 56–57

THP 502 Acting: Personalization II. (8) S
Fundamentals for actor as creative artist. Scene study, poetic period, and style ensemble performance projects. Collaboration with directors, playwright. Studio. Prerequisite: THP 501 or instructor approval.

THP 503 Acting: Transformation I. (8) F
Fundamentals plus character and transformation, character masks-voices, dialects, extravagant language. Comedy of manners, new scripts scene study, ensemble performance projects. Studio. Prerequisite: THP 502 or instructor approval.

THP 504 Acting: Transformation II. (8) S
Fundamentals including combat, scansion, poetic language, acting style. Scene study, ensemble performance projects focused on Shakespeare, new scripts. Studio. Prerequisite: THP 503 or instructor approval.

THP 506 Scenography. (3) N
The process of production collaboration. Taught in conjunction with THP 419. Prerequisite: theatre graduate standing or instructor approval.

THP 508 Multiethnic Workshop. (3) F, S
Advanced workshop for development and presentation of works originating out of American ethnic cultures. Lecture, lab.

THP 509 Singing for Actors. (1) F, S
Introduction of the basics of singing technique. Breath control, resonance, articulation, exploration, and expansion of singing range. May be repeated for credit. Studio. Prerequisite: admission to M.F.A. Acting program or instructor approval.

THP 511 Improvisation with Youth Workshop. (3) S
Theories and techniques of drama with various populations of youth. Emphasis on how research informs practice. Practicum included. Prerequisites: THP 411 *or* graduate standing and instructor approval.

THP 512 Puppetry Workshop. (3) F, S
Survey of puppetry in education, puppetry as an art form in design and performance. Lab fee required. Prerequisite: graduate standing or instructor approval.

THP 515 Problems in Directing. (3) S
Analysis of common directing problems. Topics include: creating the ensemble, conceptual unity, metaphor, nonliteral strategies, and organizational responsibilities of the director. Prerequisite: instructor approval.

THP 517 Stage Management Practicum. (3) F
Readings and research in stage management and participation as a stage manager in a University Theatre production. Prerequisite: written instructor approval.

THP 519 Directing: Works in Progress. (3) F
Advanced projects in directing concentrating on a collaborative process between director, playwright, actors, and designers. Focus is primarily on new scripts or adaptations of literature. May be repeated for credit. Studio, on-site practicum. Prerequisites: graduate standing; written instructor approval.

THP 530 Advanced Costume Design. (3) N
Advanced studio projects in costume design for a variety of production forms. Prerequisite: instructor approval.

THP 540 Scene Design Applications. (3) N
Conceptual and practical application of the design process including graphic and sculptural projects. Practical design problems investigated in laboratory. Lab fee. Prerequisite: instructor approval.

THP 545 Lighting Design Applications. (3) N
Advanced studio projects in stage lighting design. Prerequisite: instructor approval.

THP 560 Playwright's Workshop. (3) F, S
Practice and study of creating characters, dialogue, scenes, plays, and monologues for the stage. Maybe repeated for credit. Studio. Prerequisite: written instructor approval.

THP 561 Scripts in Progress. (3) F, S
Studio work with the instructor centered on revisions of original plays. Preparing the script for productions and rewriting while in production. May be repeated for credit. Studio. Prerequisite: THP 560 or written instructor approval.

THP 562 Literary Management Workshop. (3) F
Advanced literary management for the contemporary theater, including trends in new play development, festivals and productions throughout the United Stated. Participation in Arizona Playwriting Competition. Prerequisite: THP 560 or instructor approval.

THP 584 Internship. (1–3) A
Field research and on-site training in theatre for youth, community theatre, and production techniques. Prerequisite: written instructor approval.

THP 593 Applied Projects. (1–12) A
Prerequisite: instructor approval.

THP 594 Conference and Workshop in Child Drama. (3) A
Prerequisite: instructor approval.

THP 598 Special Topics. (1–4) A
Topics may be selected from the following:
(a) Acting
(b) College Teaching:
  Acting
  Dramatic Analysis
  Improvisation with Youth
  Movement
  Puppetry
  Voice
(c) Directing
(d) Works in Progress:
  Actor
  Playwright.
Lecture and studio.

THP 611 Improvisation with Youth Seminar. (3) A
Examination of current research, theory, and practices in drama with youth. Development and execution of research projects. Prerequisite: instructor approval.

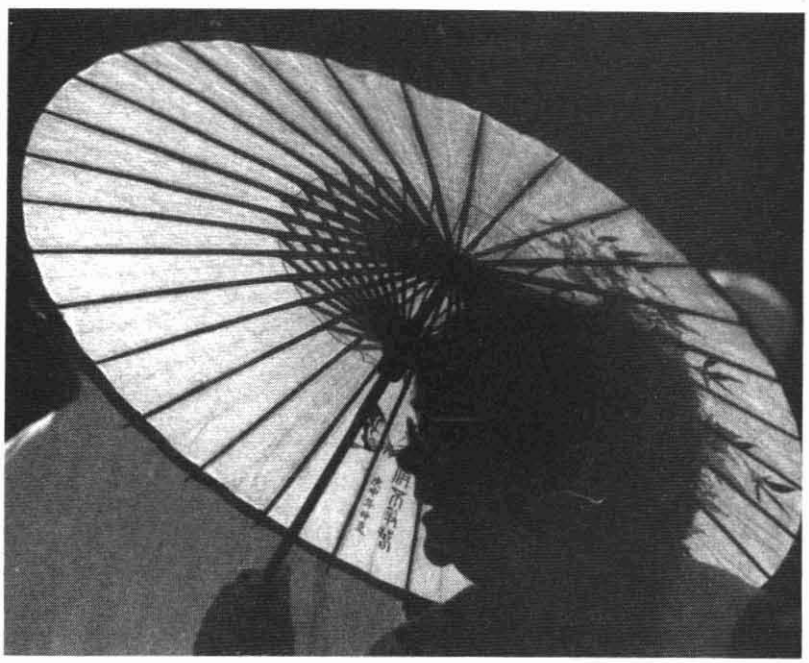
THP 618 Directing Practicum. (3) A
Practical experience in directing and producing an entire play or musical for young audiences. Prerequisite: instructor approval.

THP 649 Design Studio. (3) F, S
Projects include design of scenery, costume, lighting, or sound for laboratory or mainstage productions. May be repeated for credit. Prerequisite: instructor approval.

THP 684 Internship. (3–6) F, S, SS
Field research in acting, improvisation with youth, theatre for youth, puppetry, and scenography. Prerequisite: instructor approval.

THP 691 Seminar: Scenography. (3) N
Examination of and research into modern concepts and practices of scenography. Prerequisite: instructor approval.

THP 693 Applied Project. (1–12) F, S, SS
Final projects for M.F.A. Theatre candidates in acting, scenography, and theatre for youth. Prerequisite: instructor approval.



One creative solution for blocking the sun while enjoying an event near Hayden Lawn.

Pat Shannahan photo

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 90 master's and 46 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.

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. 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 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 Environmental Planning
Master of Fine Arts
Master of Health Services Administration
Master of Mass Communication
Master of Music
Master of Natural Science
Master of Public Administration
Master of Science in Design
Master of Science in Engineering
Master of Social Work
Master of Taxation
Master of Teaching English as a Second Language
Master of Technology
Doctor of Education
Doctor of Musical Arts
Doctor of Public Administration

Faculty members offering a specific graduate degree program may be members of a single academic unit (such as a department, school, or college), or they may form an interdisciplinary committee consisting of faculty from various academic units. The Graduate College awards degrees upon the recommendation of the faculty offering the graduate degree programs. For the lists of graduate degrees offered at ASU Main and ASU East, see pages 290–292. For ASU West graduate degree programs, see the *ASU West Catalog*.

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 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 Programs (Degrees, Majors, Concentrations, and Certificate) Overseen by the Graduate College" table on this page.

Creative Writing (M.F.A.)

The interdisciplinary Master of Fine Arts degree program with a major 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 interdisciplinary Doctor of Philosophy degree program with a major in Curriculum and Instruction is administered by the Interdisciplinary Committee on Curriculum and Instruction and overseen jointly by the Graduate College and the College of Education. Areas of concentration are available in 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, and special education. For more information, see the *Graduate Catalog.*

Exercise Science (Ph.D.)

The interdisciplinary Doctor of Philosophy degree program with a major in Exercise Science is administered by the Committee on Exercise Science. This individualized interdisciplinary degree integrates graduate courses from a variety of academic units to provide a sound foundation for research leading to a dissertation with concentrations in biomechanics, motor behavior/sport psychology, or physiology of exercise For more information, see the *Graduate Catalog.*

Interdisciplinary Graduate Programs (Degrees, Majors, Concentrations, and Certificates) 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
Gerontology	Certificate	Committee on Gerontology
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: solid state device materials design, high resolution nanostructure analysis	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
Transportation Systems	Certificate	Committee on Transportation Systems

Gerontology

An interdisciplinary, 24 semester hour Certificate in Gerontology, 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 concerns of older people. Students enrolled in the certificate program may simultaneously pursue a major in an academic unit offering a graduate degree or may enter the program as nondegree graduate students. The Certificate in Gerontology provides a broad academic foundation for students who wish to apply the knowledge and skills acquired in their major to a variety of aging related pursuits. For more information, see the *Graduate Catalog*.

For information on the undergraduate minor in Gerontology, see page 110, "Gerontology."

GERONTOLOGY (GRN)

GRN 494 Undergraduate Special Topics. (3 F, S

GRN 498 Undergraduate Pro-Seminar. (3) S

GRN 499 Undergraduate Independent Study. (3 F S SS

GRN 580 Graduate Practicum. (3 F, S

GRN 590 Graduate Reading and Conference. 3) F S, SS

GRN 591 Graduate Seminar. 3) F, S

Justice Studies (Ph.D.)

The interdisciplinary Doctor of Philosophy degree program with a major in Justice Studies is administered by the Committee on Law and Social Sciences. The degree program integrates historical, legal, and philosophical approaches with social science training. Areas of concentration include criminal and juvenile justice; dispute resolution; law, justice and minority populations; law, policy, and evaluation; and women, law, and justice. For more information, 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 public administrators for positions in the public sector and for university teaching. Ethics, modes of decision making, policy analysis, problem-solving skills in budgeting, program evaluation, public personnel management, theoretical assumptions, and value assessments are some of the areas of study available. For more information, see the *Graduate Catalog*.

Science and Engineering of Materials (Ph.D.)

The interdisciplinary Doctor of Philosophy degree program with a major in Science and Engineering of Materials is administered by the Committee on Science and Engineering of Materials. Areas of concentration are available in solid state device materials design and high resolution nanostructure analysis. Emphasis is placed on the applications of chemical thermodynamics, the mechanics of solids, quantum mechanics and transport theory for investigation of the relationships between microstructure and properties of solids, and the dependence of microstructures on processing. For 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 program with a major administered 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 environments. The unifying theme of the program is the influence of aging and changes in neurologic condition on human communication and its disorders. For more information, see the *Graduate Catalog*.

Statistics (M.S.)

The interdisciplinary Master of Science degree program with a major in Statistics is administered by the Committee on Statistics. The program involves faculty and resources from the School of Accountancy and Information Management and the Department of Mathematics. Areas of emphasis include applied statistics, mathematical statistics, statistical computing, statistical modeling, and statistical sampling and survey research. For more information, see the *Graduate Catalog*.

Transportation Systems

The interdisciplinary Certificate in Transportation Systems program is administered by the Committee on Transportation Systems. The objective of this program is to enable existing ASU graduate students and transportation professionals with advanced degrees to examine transportation related issues from a variety of perspectives and in the context of different travel modes. For more information, see the *Graduate Catalog*.

ADMISSION TO THE GRADUATE COLLEGE

ASU is one university with three campuses that are accredited by the North Central Association, a regional accrediting body, and by the professional accrediting agencies.

Applications can be submitted for admission as a nondegree student or degree seeking student at ASU Main or ASU East. For admission to ASU West, refer to the *ASU West Catalog*. Application for admission to a specific academic program must be reviewed by the desired campus and program. For more information, call or write

For ASU Main

Graduate College Admissions Office
Arizona State University Main
PO Box 871003
Tempe AZ 85287 1003
602/965–6113
www.asu.edu/graduate
asugrad@asuvm.inre.asu.edu

For ASU East

Arizona State University East
6001 S Power Road
Mesa AZ 85206
602/727–3278
www.asu.edu/east

Eligibility

Anyone who holds a bachelor's (or equivalent) or graduate degree from a college or university of recognized standing is eligible to apply for admission to the Graduate College. 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 (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 studies, that are similar to those required for the baccalaureate degree at ASU.

Requirements of the Academic Unit

Academic units (such as 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 Examination (GRE), Graduate Management Admission Test (GMAT), or the Miller Analogies Test (MAT). Some programs require the submission of a portfolio, letters of recommendation, or a statement of goals. Applicants should contact the academic unit regarding specific admission and application requirements

Submission of an Application

U.S. citizens and permanent residents should submit the following items:

1. application;
2. application fee,
3. a transcript from every college and university in which the applicant was previously enrolled;
4. appropriate test score reports (e.g., GRE, GMAT); and
5. Arizona Residency Form if the applicant is a resident of Arizona.

If all materials are not available, what is available ought to be submitted with the application and fee. The rest of the materials should be submitted as soon as possible. If an academic unit has a specific deadline, the applicant must submit all required application materials to the Admissions Office *in advance of the deadline* to allow processing.

To facilitate the application process, ASU accepts personal photocopies of transcripts and test scores. However, before registering for classes, every student must submit *official* transcripts.

The Graduate College accepts as *official* all transcripts submitted in sealed envelopes, stamped and verified by the issuing institution *or* transcripts sent directly from another college or university. The applicant must ask Educational Testing Service to send the test results directly to the Graduate Admissions office The process of providing all necessary official records may take two months or longer.

Portfolios, letters of recommendation, and statements of goals should be sent directly to the academic unit.

International applicants should submit the following items.

1 application;
2 application fee,
3. a copy of all college and university academic records;
4. translation of all college and university academic records,
5. TOEFL score;
6. appropriate test score report (e.g., GRE, GMAT); and
7 Financial Guarantee form (which may be submitted at a later time)

All applicants should submit the required items *in one envelope* clearly labeled "application" to

For ASU Main
GRADUATE COLLEGE ADMISSIONS OFFICE
ARIZONA STATE UNIVERSITY MAIN
PO BOX 871003
TEMPE AZ 85287 1003
602/965–6113
www.asu.edu/graduate
asugrad@asuvm.inre.asu edu

For ASU East
ARIZONA STATE UNIVERSITY EAST
6001 S POWER ROAD
MESA AZ 85206–0180
602/727 3278
www.asu.edu/east

Application Fee

Each application for entry to ASU graduate programs must be accompanied by a nonrefundable application fee. The fee is $45.00 to apply for admission to a degree program and $15 00 to apply for nondegree studies

For details concerning re entry, multiple applications, and other matters relating to the application fee, see the *Graduate Catalog.*

International Applicants

Applicants who will attend the university while holding F 1 or J 1 visas must meet the regulations of the Immigration and Naturalization Services in addition to the requirements of the Graduate College and the academic units to which they apply.

International applicants are also required to submit additional materials and should follow the procedures described in the *Application for Graduate Admission* booklet International applicants should read this booklet carefully to become familiar with all the requirements they must meet Applicants can also consult the ASU listings in *Peterson s Graduate Education Directory* and in the *Directory of Graduate Programs* (published by the Educational Testing Service

Among the additional materials required of international students are scores from English language examinations All applicants whose native language is not English must submit a score from the Test of English as a Foreign Language TOEFL) All international applicants who do not speak English as a primary language and who wish to apply for teaching assistantships must pass an examination that certifies their skill in speaking English—either the Test of Spoken English (TSE), which may be taken in the student's home country, or the SPEAK test, which is administered at ASU Some degree programs (e g , Business Administration) also require TSE or SPEAK scores of all applicants whose native language is not English. For specific information about TSE requirements, contact the head of the academic unit.

As required by the U S Immigration and Naturalization Service, international applicants must also verify that they have the financial resources to cover their expenses during graduate study at ASU. The Graduate Admissions office provides the Financial Guarantee form to international applicants, who then must see that the form, with a verification from a bank or sponsoring organization, is completed and returned to Graduate Admissions. The I 20 and the IAP66 documents needed to obtain a student visa) are issued only after the completed, properly verified Financial Guarantee form has arrived International students may enroll at ASU only if they have been admitted to a degree program and therefore may not pursue nondegree studies. They must meet all appropriate immigration standards and requirements.

Applications are processed when they are received However, international applicants should submit all materials by December or January in order to begin study the following fall semester and by August or September in order to begin study the following spring semester. An application fee of $45 00 (in U S funds must accompany the

formal application, which otherwise is not evaluated. (For details concerning multiple applications and other matters relating to the application fee, see the *Graduate Catalog.*)

All F 1 or J 1 visa students must have insurance coverage against illness and accident before being permitted to register. Insurance must be maintained throughout the student's enrollment in the university and may be obtained at the time of registration.

Upon arrival on campus, students must report to the advisor in the International Student Office.

Application Deadlines

The Graduate College does not have deadlines. Applications are processed as they are received. However, many academic units have specific and early deadlines; many units review applications once a year, usually in January or February for fall admission. Applicants are urged to contact the academic units regarding deadlines. If an academic unit has a specific deadline, the applicant must submit all required application materials to the Admissions Office *in advance of the deadline* to allow processing.

Application Procedures

When the Graduate Admissions office receives the application and supporting materials (the application, Arizona Residency Form, TOEFL [if required], application fee, and transcripts for an applicant), a file is forwarded to the academic unit. Academic units review the file and the supporting materials (such as applicable test scores, portfolios, and letters of recommendation) and, following admission policies established by the Graduate College and the faculty of the academic unit, make a recommendation (regular admission, provisional admission, or denial) to the Graduate College. All recommendations are reviewed and approved by admissions officers in the Graduate College.

If there are questions about the likelihood of a student succeeding in the designated program, the Graduate College admissions officers communicate with the academic unit, perhaps agreeing on a provisional admission or arranging for the student in question to have a special faculty advisor or an advanced graduate student assigned as a mentor. Other times they may suggest that the student take some preliminary courses as a nondegree student.

Academic units, which must indicate their willingness to admit applicants, frequently set higher standards than those established by the Graduate College. Many qualified applicants will be denied because each year only a limited number of students may be admitted.

Notice of Admission Decisions

Only the dean of the Graduate College can make formal offers of admission. The Graduate College notifies all applicants in writing of the admission decision.

All documents received by the university in connection with an application for admission become the property of 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 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 semester hours required for the degree program.

Provisional Admission. A student who does not meet minimum academic standards but has counterbalancing evidence to suggest the potential for success may be admitted on a provisional basis. Provisional admission provides an academic unit with more evidence on which to base its decision Normally, the academic unit reviews the student's status following completion of 12 semester hours of approved graduate study. At that time, the academic unit recommends to the Graduate College a change in status to either regular admission or withdrawal from the program. When students have completed their provisional requirements, they should check with their advisors to make sure that the change of status has been recommended

A provisional student may also be assigned deficiencies.

Nondegree Admission. A student not interested in earning a degree or not yet ready to apply to a particular degree program may enroll as a nondegree student. The application process is streamlined, does not require submission of transcripts or test scores, and can be completed during a single visit to the Graduate Admissions office. This process may also be completed by mail. A maximum of nine hours taken while in this category at ASU may be applied toward a 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 students.

Recognition of a Degree

Recognition of a degree is acknowledgment that the program leading to the degree is equivalent to a program offered by ASU or is an acceptable program for the proposed graduate major at ASU. A student who enters a graduate degree program is expected to have undergraduate educational experiences, including general education studies, that are appropriate for the program.

Definition of a Unit of Credit

See page 72.

GRADUATE COLLEGE PROCEDURES

Change in Graduate Degree Program

A change from one graduate degree program to another requires a new application to the Graduate College. The usual admission procedures are followed. For details on matters relating to the application fee, see the *Graduate Catalog.*

Re-entry to the Graduate College

Any former graduate student who has not been in attendance at the university for one or more semesters must

submit an application for re-entry to the Graduate 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 re entry and other matters re lating to the application fee, see the *Graduate Catalog*.

Determination of Catalog Requirements

The *Graduate Catalog* is published annually. Requirements for an aca demic unit or college, campus, or the university as a whole, may change and are often upgraded.

In determining graduation require-ments, a student may use only one edi tion of the Graduate Catalog.

A student graduates under the cur riculum, course requirements, and regu lations for graduation in effect at the time of admission to a degree program at the university. A student may choose to graduate under any subsequent cata log issued.

Some changes in policies and proce dures affect all students regardless of the catalog used by the student. These policies and procedures may appear in the catalog or in other university publi cations.

Registration

See pages 71 72.

Audit Enrollment

Graduate students may register as auditors in one or more courses with the approval of the supervisory com mittee chair and the consent of the in structor 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 stu dents who must take a minimum num ber of credits, e.g , teaching assistants or students receiving financial assis-tance. The mark of "X" is recorded for completion of an audited course, unless the instructor determines that the stu dent's participation or attendance has been inadequate, in which case a "W" may be recorded.

Enrollment Verification

General guidelines on page 72 are used only to verify enrollment for the purpose of loan deferments and eligi bility. The registrar is responsible for such verifications.

Course Withdrawal

During the first four weeks of a se mester, a student may withdraw with a mark of "W " From the f fth week to the end of the 1)th week of a semester, a student may withdraw with a mark of "W" only from courses in which the in structor certifies the student is passing at the time of withdrawal.

The *Schedule of Classes* lists the pro cedures for withdrawal Failure to with draw officially from a course results in a grade of "E," which is used in the computation of the GPA

An instructor may withdraw a stu dent from a class for disruptive class room behavior with a mark of "W" or a grade of "E." A student may appeal an instructor initiated withdrawa to the standards committee of the college in which the course is offered The deci sion of the committee is final.

Course Load

The course load is determined by the supervisory committee but is not to ex ceed 15 semester hours of credit during each of the two semesters, six semester hours during each five week summer session, or nine semester hours of credit during an eight week summer session. An audited course is counted in the student's maximum load

All graduate assistants and ass ciates must enroll for a minimum of six se mester hours during each fall and spring semester of their appointment The six hours cannot include audit en rollment. Enrollment in continuing reg istration (595, 695, or 795) does not fulfill the six hour requirement A half time (50%) graduate assistant or associ ate working 20 clock hours per week may not register for more than 12 hours of course work each semester, a third time (33%) assistant or associate for more than 13 hours, and a quarter time 25%) assistant or associate for more than 15 hours

All graduate students doing research, working on theses or dissertatic ns, tak ing comprehensive or final examina tions, or using university facilities or faculty time must be registered for a minimum of one hour of credit, not au dit, which appears on the program of study or which is an appropr ate gradu ate level course, such as continu ng registration (595, 695, or 795 .

For an explanation of summer ses sion semester hour load, see page 71

Assistantships and Commercial Services

All graduate students who are hired for class course support or who hold as sistantships or associateships *for a spe cific course* including teaching assis tants, research assistants, and graduate assistants may not take or provide notes for *that* course to commercia notetaking services or students. An ex ception may be made by the course instructor s on a case by case basis as an authorized support service for a dis abled student Th s po icy covers all commercial activities e.g notetaking or paid review sessions that m ght be associated with a course for which the assistant or associate has ass gned re sponsibilities. (Refer to the *Graduate Assistant Handbook.*)

GRADUATE COLLEGE DEGREE REQUIREMENTS

Graduate Advising

Advising is much more than techni cal support. t s an integral part of graduate educat on Students' programs of study are generally tailored to n eet individual needs, and students should seek advice from facu ty or advisors as they plan their course work examina tions, and other degree require ments.

Graduate College Advising Office. The Advising office serves prospect ve and enrolled students Informat n s provided concerning Graduate College adm ssions, nondegree status, programs of study, and policies and pi ocedures Academic and professi na advisement is available to nondegree students Ad visors assist n ndegree or prospect ve students in c ntacting appropriate fac ulty and advisors Students n ay call 602 965 3521 for an appointment or stop by the lobby of Wils n Hall.

Grading

The "Grades" table page 73 defines grades and gives their values.

A grade of ' P" (pass in a 400 leve course may not appear on a program of study. Grades or transfer w rk or ASU law credit are not included in comput ing 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 rece v ing a grade of "D" or "E" must repeat the course in a regularly scheduled not an independ nt study c ass if it is to be

Grades

Grade	Definition	Value	Notes
A	Excellent	4.00	
B	Good	3.00	
C	Passing	2.00	
D	No graduate credit	1.00	
E	Failure	0.00	
W	Withdrawal		This grade is given whenever a student officially withdraws from a class.
I	Incomplete		
X	Audit		
Y	Satisfactory		
Z	Course in progress		This grade is usually given pending completion of courses.

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 on the "Incomplete" form. The student may, however, repeat the course after the "I" has become permanent by reregistering, paying fees, and fulfilling all course requirements. The grade for the repeated course appears on the transcript but does not replace the permanent "I."

Scholarship

To be eligible for a degree in the Graduate College, a student must achieve two GPAs of "B" (3.00) or 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 designation of honors (*summa cum laude, magna cum laude,* and *cum laude*) is 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 page 71.

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% of the total minimum semester hours required for a master's degree unless stated otherwise for a specific degree program.

Transfer credit taken before admission to a graduate degree program at ASU is nondegree credit. Nondegree credit taken at ASU combined with nondegree credit taken at another institution may not exceed nine hours on the master's program of study. The date (month/day/year) on the Graduate College dean's letter of admission is the actual date of admission. If the student is enrolled in courses on the admission date, those courses if applicable may be considered part of a program of study. Courses taken the semester before this date are nondegree hours. The nine hour limit does not apply to the doctoral programs.

Transfer credits must be acceptable toward graduate degrees at the institution where the courses were completed. Certain types of graduate credits cannot be transferred to ASU, including the following:

1. credits awarded by postsecondary institutions in the United States that lack candidate status or accreditation by a regional accrediting association;
2. credits awarded by postsecondary institutions for life experience;
3. credits awarded by postsecondary institutions for courses taken at noncollegiate institutions (e.g., government agencies, corporations, and industrial firms);
4. credits awarded by postsecondary institutions for noncredit courses, workshops, and seminars offered by other postsecondary institutions as part of continuing education programs; and
5. credits given for extension courses.

Acceptable academic credits earned at other institutions that are based on a different unit of credit than the ones prescribed by the Arizona Board of Regents are subject to conversion before being transferred to ASU.

Only resident graduate courses with an "A" or "B" grade may be transferred. A course with the grade of pass, credit, or satisfactory may not be transferred.

Official transcripts of any transfer credit to be used on a program of study must be sent directly to the Graduate Admissions office from the office of the registrar at the institution where the credit was earned.

Independent Learning and Extension Courses. Independent 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 recommendation of the head of the academic unit, the dean of the Graduate College appoints a graduate student's supervisory committee, consisting of a chair and other resident fac

ulty members. The number of members serving on this committee depends on the degree program. Academic professionals (e.g., research scientists, research engineers), nontenure track faculty (e.g., adjunct professors, research professors), and individuals granted affiliated faculty status through established university procedures may serve as cochairs or members or extra members of thesis and dissertation committees upon approval by the Graduate College. Individuals who are recommended by an academic unit as eligible to serve as a 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 co-chairs 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. Co-chairs must meet the academic unit's criteria for chairing theses and dissertations.

Qualified individuals outside the university, upon the recommendation of the head of the academic unit and approval of the Graduate College, may serve as members of thesis and dissertation committees; however, such individuals may not serve as chairs or co-chairs (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 co-chairs. 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 examinations are administered three times each year by the Department 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 submit a dissertation, with the exception of the Doctor of Musical Arts with concentrations in choral music and solo performance, which requires three recitals and a research paper. The Doctor of Philosophy dissertation should be a valuable educational experience that demonstrates the candidate's mastery of research methods, theory, and tools of the discipline. The dissertation should demonstrate the candidate's ability to address a major intellectual problem and to propose meaningful questions and hypotheses. It should be a contribution to knowledge that is worthy of publication by an established press as a book or monograph or as one or more articles in a reputable journal.

For format, the Graduate College must review the final copy of the master's thesis, doctoral dissertation, and other final documents that are required to be placed in the library. Copies of the *Format Manual* are available in the Graduate College. The student is required to submit a complete copy of the thesis or dissertation for format review at least 10 working days before the oral defense (two weeks if there are no holidays during the time period). Doctoral students must submit a completed Survey of Earned Doctorates Awarded in the United States, conducted by the National Research Council.

Graduate students and their supervisory committee chairs jointly select a style guide or journal format representative of the field of study. The Graduate College allows some flexibility in the format of the manuscript, but Graduate College and library guidelines must be followed.

The student must submit two final copies of a thesis or dissertation to the ASU Bookstore for binding. Bound copies are placed in 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 page 74.

A master's or doctoral degree student who does not enroll for three calendar years is considered withdrawn and must reapply for admission to a degree program.

Summer Sessions

See page 431.

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*.

Graduate Degrees and Majors Offered at ASU Main and ASU East

Baccalaureate degrees and majors offered at ASU Main and ASU East are shown on pages 10–11.
Degrees, majors, and concentrations offered at ASU West are shown on page 534.

ASU MAIN

Master of Accountancy

Master of Architecture

Master of Arts
- Anthropology
  - Archaeology
  - Bioarchaeology
  - Linguistics
  - Medical anthropology
  - Museum studies
  - Physical anthropology
  - Social cultural anthropology
- Art
  - Art education
  - Art history
- Communication
- 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
- Educational Psychology
- English
  - Comparative literature
  - English linguistics
  - Literature and language
  - Rhetoric and composition
- French
  - Comparative literature
  - Language and culture
  - Literature
- Geography
- German
  - Comparative literature
  - Language and culture
  - Literature
- History
  - Asian history
  - British history
  - European history
  - Latin American history
  - Public history
  - U.S. history
  - U.S. Western history
- Humanities
- Learning and Instructional Technology[1]
- Mathematics
- Music
  - Ethnomusicology
  - Music history and literature
  - Music theory
- Philosophy
- Political Science
  - American politics
  - Comparative politics
  - International relations
  - Political theory
- Religious Studies
- Social and Philosophical Foundations of Education
- Sociology
- Spanish
  - Comparative literature
  - Language and culture
  - Linguistics
  - Literature
- Special Education[1]
- Theatre

Master of Business Administration

Master of Computer Science[1]

Master of Counseling

Master of Education
- Counselor Education
  - Counseling and student personnel
- 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

[1] Major offered toward more than one degree at the same level

[2] Applications are not being accepted at this time

Graduate Degrees and Majors Offered at ASU Main and ASU East (continued)

- Secondary education
- Social studies education
- Educational Administration and Supervision[1]
- Educational Media and Computers[3]
- Business education
- Educational Psychology[1]
- Higher and Postsecondary Education
- Higher education
- Learning and Instructional Technology[1]
- Special Education[1]
- Gifted
- Mildly handicapped
- Multiculturally exceptional
- Severely multiply handicapped

Master of Environmental Planning
- Environmental Planning
- Urban planning

Master of Fine Arts
- Art
- Ceramics
- Drawing
- Fibers
- Intermedia
- Metals
- Painting
- Photographic studies
- Photography
- Printmaking
- Sculpture
- Wood
- Creative Writing[4]
- Dance
- Theatre
- Acting
- Scenography
- Theatre for youth

Master of Health Services Administration

Master of Mass Communication

Master of Music
- Composition
- Music Education
- Choral music
- General music
- Instrumental music
- Performance
- Music theatre musical direction
- Music theatre performance
- Performance pedagogy
- Piano accompanying
- Solo performance (instrumental, keyboard, voice

Master of Natural Science
- Natural Science
- Biology
- Chemistry
- Geology
- Mathematics
- Microbiology
- Physics
- Plant biology

Master of Physical Education

Master of Public Administration
- Public Administration
- Public information management
- Public management
- Public policy analysis and evaluation
- Urban management and planning

Master of Science
- Aerospace Engineering[1]
- Bioengineering
- Biology[3]
- Ecology
- Building Design
- Computer aided design
- Energy performance and climate responsive architecture
- Facilities development and management
- Chemical Engineering[1]
- Biomedical and clinical engineering
- Chemical process engineering
- Chemical reactor engineering
- Energy and materials conversion
- Environmental control
- Solid state processing
- Transport phenomena
- Chemistry
- Analytical chemistry
- Biochemistry
- Geochemistry
- Inorganic chemistry
- Organic chemistry
- Physical chemistry
- Solid state chemistry
- Civil Engineering[1]
- Environmental/sanitary
- Geotechnical/soil mechanics
- Structures
- Transportation
- Water resources/hydraulics
- Communication Disorders
- Computer Science[1]
- Construction
- Construction science
- Facilities
- Management
- Economics
- Electrical Engineering[1]
- Engineering Science[1]
- Environmental Resources
- Exercise Science/Physical Education
- Family Resources and Human Development
- Family studies
- General family resources and human development
- Geology
- Industrial Engineering[1]
- Information Management
- Justice Studies
- Mechanical Engineering[1]
- Microbiology
- Molecular and Cellular Biology
- Nursing
- Adult health nursing
- Community health nursing
- Community mental health/psychiatric nursing
- Nursing administration
- Parent child nursing
- Physics
- Plant Biology[3]
- Ecology
- Photosynthesis
- Recreation
- Outdoor recreation
- Recreation administration
- Social/psychological aspects of leisure
- Tourism and commercial recreation
- Statistics[4]

Master of Science in Design
- Design
- Graphic design
- Industrial design
- Interior design

Master of Science in Engineering
- Aerospace Engineering[1]
- Chemical Engineering[1]
- Biomedical and clinical engineering
- Chemical process engineering
- Chemical reactor engineering
- Energy and materials conversion
- Environmental control
- Solid state processing
- Transport phenomena
- Civil Engineering[1]
- Environmental/sanitary
- Geotechnical/soil mechanics
- Structures
- Transportation
- Water resources/hydraulics
- Electrical Engineering[1]
- Engineering Science[1]
- Industrial Engineering[1]
- Mechanical Engineering[1]

Master of Social Work

Master of Taxation

Master of Teaching English as a Second Language

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

[1] Major offered toward more than one degree at the same level.

[2] Applications are not being accepted at this time

[3] Ma or with formalized concentration(s ; other areas of study are available.

[4] Students apply to this degree program through the Graduate College.

Graduate Degrees and Majors Offered at ASU Main and ASU East (continued)

- Mathematics education
- Multicultural education[2]
- Reading education
- Science education
- Secondary education
- Social studies education
- Educational Administration and Supervision
- Higher and Postsecondary Education
  - Higher education

Doctor of Musical Arts

- Music
  - Choral music
  - Composition
  - General music
  - Instrumental music
  - Solo performance (instrumental, keyboard, voice

Doctor of Philosophy

- Aerospace Engineering
- Anthropology
  - Archaeology
  - Physical anthropology
  - Social cultural anthropology
- Bioengineering
- Biology[3]
  - Ecology
- Business Administration
  - Accountancy
  - Finance
  - Health services research[2]
  - Information management systems
  - Management
  - Marketing
  - Supply chain management
- Chemical Engineering
  - Biomedical and clinical engineering
  - Chemical process engineering
  - Chemical reactor engineering
  - Energy and materials conversion
  - Environmental control
  - Solid state processing
  - Transport phenomena
- Chemistry
  - Analytical chemistry
  - Biochemistry
  - Geochemistry
  - Inorganic chemistry
  - Organic chemistry
  - Physical chemistry
  - Solid state chemistry
- Civil Engineering
  - Environmental/sanitary
  - Geotechnical/soil mechanics
  - Structures
  - Transportation
  - Water resources/hydraulics
- Communication
  - Communicative development
  - Intercultural communication
  - Organizational communication
- Computer Science
- Counseling Psychology
- Curriculum and Instruction[1, 5]
  - 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
- Economics
- Educational Leadership and Policy Studies
- Educational Psychology
  - Lifespan developmental psychology
  - Measurement, statistics, and methodological studies
  - School psychology
- Electrical Engineering
- Engineering Science
- English
  - Literature
  - Rhetoric/composition and linguistics
- Environmental Design and Planning
  - Design
  - History, theory, and criticism
  - Planning
- Exercise Science[4]
  - Biomechanics
  - Motor behavior/sport psychology
  - Physiology of exercise
- Family Science[3]
  - Marriage and family therapy
- Geography
- Geology
- History
  - Asian history
  - British history
  - European history
  - Latin American history
  - U.S. history
- Industrial Engineering
- Justice Studies[3]
  - Criminal and juvenile justice
  - Dispute resolution
  - Law, justice, and minority population
  - Law, policy, and evaluation
  - Women, law, and justice
- Learning and Instructional Technology
  - Instructional technology
  - Learning
- Mathematics
- Mechanical Engineering
- Microbiology
- Molecular and Cellular Biology
- Physics
- Plant Biology[3]
  - Ecology
  - Photosynthesis
- Political Science
  - American politics
  - Comparative politics
  - International relations
  - Political theory
- Psychology
  - Behavioral neuroscience
  - Clinical psychology
  - Cognitive/behavioral systems
  - Developmental psychology
  - Environmental psychology
  - Social psychology
- Science and Engineering of Materials
  - High resolution nanostructure analysis
  - Solid state device materials design
- Social Work
- Sociology
- Spanish
- Speech and Hearing Science
  - Developmental neurolinguistic disorders
  - Neuroauditory processes
  - Neurogerontologic communication disorders
- Theatre
  - Theatre for youth

Doctor of Public Administration[5]

Juris Doctor[6]

ASU EAST

Master of Science

- Agribusiness
  - Agribusiness management and marketing
  - Food quality assurance

Master of Technology

- Technology
  - Aeronautical engineering technology
  - Aeronautical management technology
  - Electronics and computer engineering technology
  - Graphic communications technology
  - Industrial management and supervision
  - Manufacturing engineering technology
  - Mechanical engineering technology
  - Welding engineering technology

[1] Major offered toward more than one degree at the same level

[2] Applications are not being accepted at this time

[3] Major with formalized concentration(s); other areas of study are available.

[4] 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.

[6] 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 Glendale, and ASU East (Williams Campus) in Chandler. 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, 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. The College of Engineering and Applied Sciences has the most complete engineering honors curriculum in the United States. 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 to fulfill 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. Still others 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 602/965 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 arrangements with ASU's International Programs Office that allow for more flexible course registration and transfer arrangements:

plans that allow Honors College students to earn honors credit while overseas.

Internships/Mentorships

Upper-division 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 Professor Janet Burke at 602/965–2359.

Cultural/Arts Programming

University Honors College students participate in a range of cultural enrichment activities which include deeply 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. The Honors College hosts the university's premier scholar-in-residence program, The Centennial Lecture, each year; past guests include novelist Carlos Fuentes, paleontologist Steven Jay Gould, psychologist Robert Coles, microbiologist Lynn Margulis, and intellectual historian Susan Sontag.

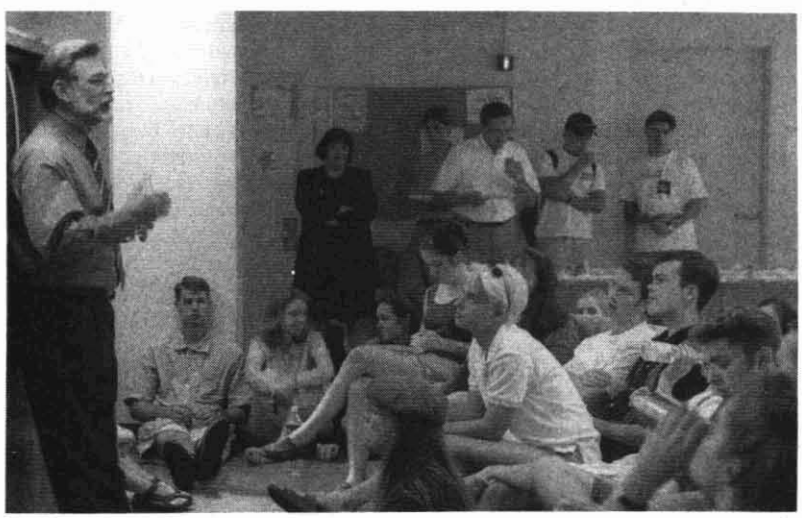
ADDITIONAL BENEFITS

The University Honors College and all its facilities and services are fully available to every student, regardless of where he or she lives; presently, designated honors housing exists only at ASU Main. There, McClintock Hall, the original Scholars' Residence, offers an integrated living-learning environment; faculty and academic advisors serve the students from ground-floor offices. Classrooms, recreational and study lounges, and a computing lab compose the principal facilities of the college. Students in the honors wing of nearby Best Hall enjoy the convenience of honors classes in their residence and have faculty and other sources of academic support available on-site.

Honors students have special advisors to help them plan individualized programs of study, and they receive priority at preregistration. Honors courses in disciplinary departments are normally limited to 22 students. Honors College courses (HON) are usually limited to 18.

Students can receive transcript recognition for lower-division honors studies. Students who meet all upper-division requirements of both their disciplinary college and the University Honors College receive transcript recognition of that accomplishment, as well as special acknowledgment in the graduation ceremonies and collegiate honors convocations.

Participants in the University Honors College have diverse interests and strong records of success. Many go on to the nation's finest graduate and professional programs, including Chicago, Cornell, Harvard, Michigan, MIT, Northwestern, Stanford, UC-Berkeley, Virginia, Wisconsin, and Yale, among others. Many students have published portions of their honors theses and have presented their work at the national and regional meetings of scientific and honors societies.



Dean Ted Humphrey meets with University Honors College students weekly as part of the "Lunch with the Dean" program. Tim Trumble photo

ADMISSION

All candidates for admission to the University Honors College must file an application. Only *one* of the following criteria must be met. An entering freshman is admitted if he or she

1. graduates in the top 5% of his or her high school class;
2. has a composite ACT score of 29;
3. has a combined SAT score of 1300; or
4. submits similar indications of academic achievement and aptitude.

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) may apply for admission to the college.

Community college transfer students who have graduated from their institution's honors programs are eligible to apply for Regents' Transfer Scholarships. Information about this award is available through the Student Financial Assistance Office at 602/965–3355.

Students not meeting the admission requirements, but who believe they can better succeed at the university and meet the college's academic standards, may apply for provisional admission. The dean of the college reserves the right to interview each such applicant.

Application forms and additional information about the college and its activities are available by calling the college's offices at 602/965–2359 or by writing to

University Honors College
Arizona State University
PO Box 873102
Tempe AZ 85287–3102

RETENTION

Honors students must maintain high standards of academic performance and show progress toward completion of graduation requirements in their disciplinary majors and the Honors College. Students normally register for at least one honors course each semester. Good standing in the University Honors College requires students to maintain the following 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 college if he or she does not make reasonable progress in raising the cumulative GPA during the following semester.

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, discussion, and writing.

Students entering the college after completing 45 semester hours must take HON 394, a junior level seminar that introduces them 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 to 22 students. Compared to their nonhonors equivalents, these courses are designed to offer a richer, more complex intellectual experience appropriate to the discipline and the level of the course for all students enrolled.

Departmental courses carrying footnote number 18 in the *Schedule of Classes* allow honors students to contract with the instructor of designated nonhonors courses to earn honors credit by pursuing enrichment activities, which may include supplemental sessions with the instructor. Footnote 18 contracts must be filed during the first three weeks of class and completed during the semester in which the course is offered. Each contract form offers guidelines to aid students 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 L2 General Studies 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.

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 division/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 honors work, students must complete 18 semester hours of honors coursework 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 which 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 coursework 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, students must

1 complete HON 171 and 172 The Human Event for continuing ASU or transfer students with less than 45 hours of credit; *or* HON 394 Selected Topics for continuing or transfer students with 45 or more hours of credit;
2. complete 18 additional semester hours of upper division honors course work for an earned letter grade (of which six semester hours must be outside the academic major ;
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).

Courses *must* include three to six semester hours of Honors Thesis. Courses *may* include graduate courses (500 level or higher).

University Honors College

Ted Humphrey
Dean
(MCL 112) 602/965–2359
www.asu.edu/honors

PROFESSOR
HUMPHREY

SENIOR LECTURERS
STANFORD WEIDEMAIER

LECTURERS
BURKE, DALTON, FACINELLI, RAMSEYER SUSSER

HONORS (HON)

HON 171 The Human Event. (3) F Landmarks in the social and intellectual development of the human race with emphasis on Western civilization Enrollment restricted to members of the University Honors College Consult the University Honors College for applicability to disciplinary college distribution requirements *General Studies L1 HU, H*

HON 172 The Human Event. (3 S Continuation of HON 171 with emphasis on the Renaissance through the modern period *General Studies L1/HU H*

College of Law

Alan A. Matheson
Interim Dean

PURPOSE

The prime function of the College of Law is to train men and women for the practicing legal profession and related professional assignments. In addition, the college has the responsibility to contribute to the quality of justice administered in our society.

ORGANIZATION

Law Building and Law Library

The John S. Armstrong Law Build ing is in the central campus near other colleges of the university and Hayden Library. The Law Building provides every modern facility for legal education and has been described by experts on planning law buildings as setting a new standard in functional design.

The award winning John J. Ross William C. Blakley Law Library, named in memory of two prominent Phoenix attorneys, is one of the finest law libraries in the Southwest with a collection of more than 351,000 vol umes and microform volume equiva lents The collection includes a broad selection of Anglo American case re ports and statutes as well as legal trea tises, periodicals, encyclopedias, digests, citators, and administrative materials. The collection includes growing special collections in the areas of international law, Indian law, Mexi can law, and law and technology. The library is also a selective U.S. govern ment depository.

The library is housed in a dramatic and functional building that opened in August 1993. The building provides accessible shelving for the expanding collections and comfortable study space at carrels, tables, and lounge seating located throughout the library. The library has a 30 station computer lab as well as LEXIS and WESTLAW rooms which contain 10 stations each; 27 meeting and study rooms; a micro forms facility; and a classroom.

Students also have ready access to the other campus libraries, including the Charles Trumbull Hayden Library, the Daniel E. Noble Science and Engi neering Library, the Architecture and Environmental Design Library, and the Music Library. The collections of the university libraries comprise more than 3 million volumes

Special Programs

Center for the Study of Law, Science, and Technology. The ASU Center for the Study of Law, Science, and Technology is a multidisciplinary research center founded by the Arizona Board of Regents in 1984. The center publishes research studies, sponsors seminars and symposia, and houses visiting scholars and teachers. Through these programs, the center seeks to contribute to the formulation and improvement of law and public policy affecting science and technology and to the wise application of science and technology in the legal system.

The College of Law offers a substantial number of courses in the law, sci ence, and technology area including bioethics, law and psychiatry, environmental law, health care law, intellec tual property, land use regulation, law and evolutionary biology, law and medicine, law and social science, 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 other less obvious courses that contain science and tech nology issues. 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 dis crimination litigation, and several courses offered by other departments on campus available for registration by law students In addition to regular course offerings, students can arrange independent studies with supervising faculty on topics 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 Section on Science and Technology and under the leader ship of a faculty editor, second- and third-year students edit the *Jurimetrics Journal of Law, Science and Technol ogy*. Student editors do both editorial work on submitted articles and original writing for publication in the journal.

Indian Legal Program. In the spring of 1988, the faculty of the College of Law voted to devote substantial new resources and energy to an Indian Le gal Program that would have a three part mission: education, legal scholarship, and public service to tribal governments. The College of Law pro vides its students with a quality legal

education and an opportunity to gain knowledge 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 understanding 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 environmental law are part of the curriculum Students may also participate in externships with the local tribal courts or spend a semester in Washington, D.C., working with the Senate Select Committee on Indian Affairs. This variety of academic and work experience provides the students an outstanding legal education with a firm grounding in both the theoretical and practical aspects of Indian law.

Law Journal. The College of Law publishes a professional law review, the *Arizona State Law Journal*, edited by students of the second and third year classes. Membership on the law journal is determined by grade performance in the first year and, for some, by submission of written work in a writing competition. Participation on the law review is hard but rewarding work. For those eligible, the review provides one of the finest avenues for legal education thus far developed, contributing to the student's intellectual advancement, to the development of law and the legal profession, and to the stature of the College of Law.

ADMISSION

First year students are admitted only for the fall semester The formal requirements for admission to the College of Law are (1) an undergraduate degree from an accredited four year college or university and (2) a score on the Law School Admission Test (LSAT), administered by Law Services, Box 2000, Newtown, Pennsylvania 18940, in centers throughout the country.

For more information regarding Admission, call 602/965 7207, or write

ADMISSIONS OFFICE
COLLEGE OF LAW
ARIZONA STATE UNIVERSITY
BOX 877906
TEMPE AZ 85287 7906

JURIS DOCTOR DEGREE

The College of Law offers a three-year program of professional studies at the graduate level leading to the degree of Juris Doctor.

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 program, the course of study is prescribed and incorporates the time-proven techniques of legal education. This first year gives students by the "case method," by the "problem method," by "moot court," and through other techniques an intensive exposure to the basic legal processes.

As a part of the program, first year students are assigned to small sections. In the Legal Research and Writing program, first year students prepare legal briefs and memoranda and receive feedback through the use of practice examinations. The program focuses on the development of writing and organizational skills necessary for success in law school and in the practice of law. The second and third years cover a wide range of courses varying in format as well as subject matter, allowing students to pursue both the basic subjects of law study and more specialized interests. By offering great freedom in the selection of subjects, the 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 externships.

Grading

College of Law courses are graded under the following numerical scale:

Grade	Definition
90–99	Distinguished
85 89	Excellent
80–84	Very Good
75 79	Good
70–74	Satisfactory
60–69	Deficient
59	Failing

A grade of 60 or above is required to receive credit for any course.

Retention Standards. To be eligible to continue in the College of Law, students must maintain a cumulative weighted GPA of 70 or 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 automatically placed on probation Continuation of enrollment by probationary students is upon such terms and conditions as the college may impose.

A student whose cumulative GPA falls below the required level or whose semester GPA is less than 70 in two consecutive semesters is dismissed but may apply to the Office of the Dean for readmission. The Office of the Dean refers the application to a faculty Committee on Readmission Where the GPA deficiency is slight and evidence of extenuating circumstances is convincing, readmission may be granted on a probationary status after a review of the reasons contributing to unsatisfactory performance and a finding that there is substantial prospect for acceptable academic performance. Continuation in school thereafter may be conditioned on achieving a level of performance higher than the overall 70 GPA. Further detailed information concerning the college's retention standards can be found in the *Bulletin of the College of Law.*

Special Honors at Graduation. At the time of graduation, students who have earned academic distinction in the study of law may be awarded the designations *cum laude, magna cum laude,* and *summa cum laude.* The college also bestows membership in the Order of the Coif upon students in the top 10% of the class. Recipients of these awards are selected by the law faculty on the basis of academic performance.

Honor Code. The legal profession, a self regulating association, depends on the integrity, honor, and personal morality of each member. Similarly, the integrity and value of an ASU College of Law degree depends on a reputation for fair competition. 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 available from the assistant dean in the college's Student Services Office.

ACCREDITATION

The college is fully accredited by the American Bar Association and is a member of the Association of American Law Schools.

INFORMATION

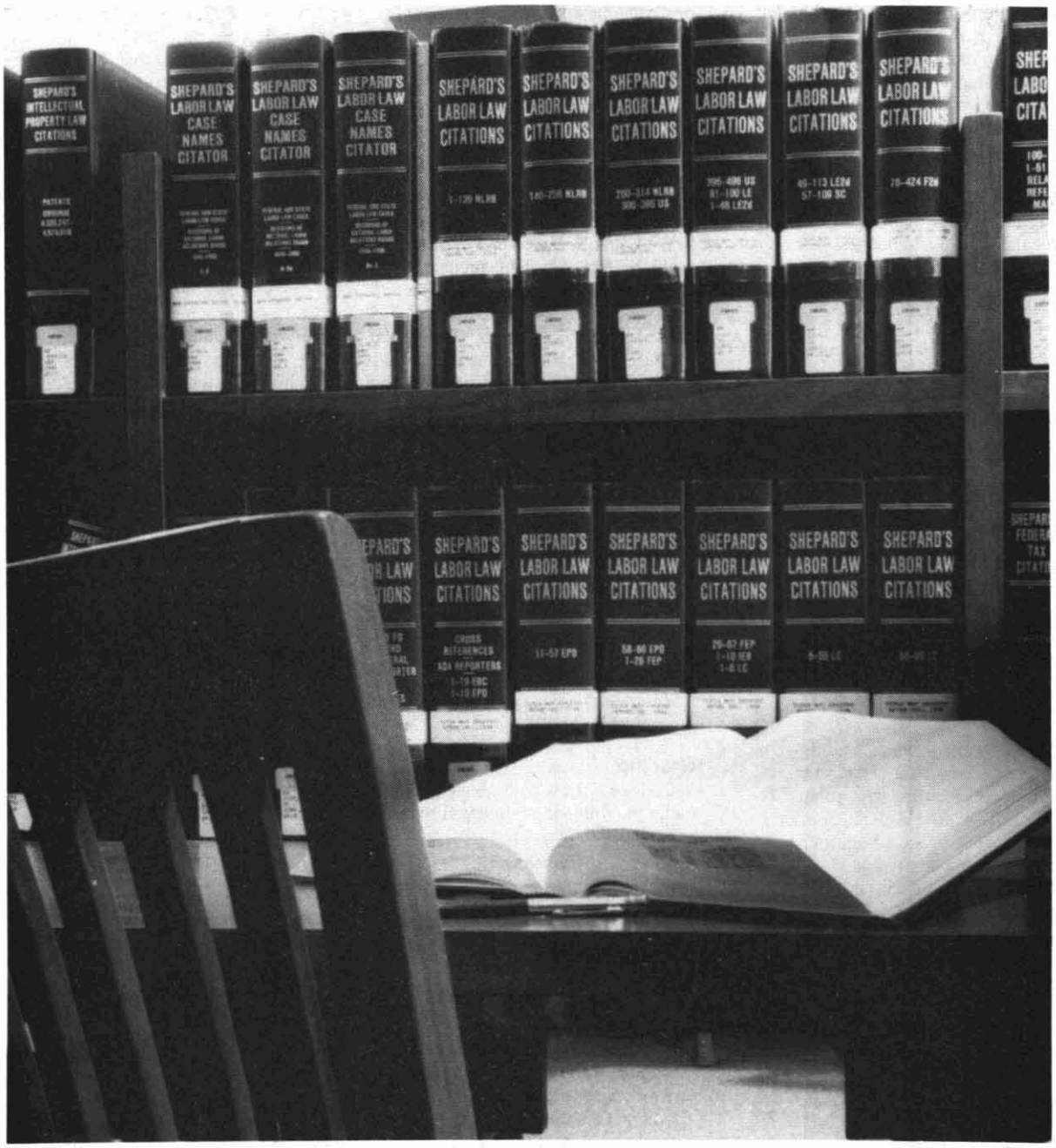
Further detailed information concerning the course of study, admission practices, expenses, and financial assistance can be found in the *Bulletin of the College of Law*. To request the bulletin or application forms, call 602/965–7207, or write

ADMISSIONS OFFICE
COLLEGE OF LAW
ARIZONA STATE UNIVERSITY
BOX 877906
TEMPE AZ 85287–7906

For general information about the College of Law, contact Catherine Hevia at 602/965–1474 or view the college's World Wide Web page located at www.law.asu.edu.

LAW (LAW)

See the *Graduate Catalog* for the LAW courses.



Just a few of the more than 310,000 volumes contained in the John J. Ross-William C. Blakley Law Library. Tim Trumble photo

College of Liberal Arts and Sciences

Gary S. Krahenbuhl, Ed.D.
Dean

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, six centers, and several research institutes and laboratories. The college offers 33 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 another 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 making application and being initially advised in the Office for Academic Programs, SS 111. Students admitted from other ASU colleges are under mandatory 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 on pages 63–64. All students who meet the university standards are admissible 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 to 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[1, 2]	Pre Health Professions, MCL 110B
Foreign service	Department of chosen major
Health physics	Pre Health Professions, MCL 110B
Law	Office for Academic Programs, SS 111
Medicine[1]	Pre Health Professions, MCL 110B
Ministry	Department of Religious Studies, LL B605
Occupational therapy[1]	Pre-Health Professions, MCL 110B
Optometry[1, 2]	Pre Health Professions, MCL 110B
Osteopathy[1]	Pre Health Professions, MCL 110B
Pharmacy[1]	Pre Health Professions, MCL 110B
Physical therapy[1]	Pre Health Professions, MCL 110B
Podiatry[1, 2]	Pre Health Professions, MCL 110B

[1] Students preparing for a career in these areas should register in the Pre-Health Professions office, 602/965–2365.

[2] No school in Arizona offers a program in dentistry, optometry, or podiatry. Students interested in pursuing these professions should confer with the Pre Health Professions advisor concerning out of state schools where they may complete their training

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 page 63).

"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 consult an academic advisor before any enrollment activity. Before or during the semester in which they earn 60 semester hours, students *must* select their major 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 result 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 in the following locations:

Student	Advising Location
Declared majors	Department of major
No preference, no preference, prelaw	Cross-college Advising Services, Undergraduate Academic Services Building (602/965–4464)
No preference, premedical	MCL 110B (602/965 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 less than a 2.00 cumulative GPA;
4. students who have admissions deficiencies;
5. other students with "special admissions" status; and
6. students who have been disqualified (these students are allowed to attend ASU summer 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 are 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 majors 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. Programs leading to the B.A and B.S. degrees are offered by CLAS, with majors in the subjects listed in the "CLAS Degrees, Majors, and Concentrations" table, pages 301 303. Each major is administered by the academic department indicated.

Minors. Although not required for graduation, special college approved minors are available in most departments. Check department program descriptions for details. Minors offered by departments must have at least 18 hours of designated courses, including 12 hours of upper-division work. The college requires a grade of at least "C" in all 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.

CLAS Degrees, Majors, and Concentrations

Major	Degree	Administered by
Baccalaureate Degrees		
Anthropology	B.A.	Department of Anthropology
Asian Languages (Chinese/Japanese)	B.A.	Department of Languages and Literatures
Biology Concentration: biology and society	B.S.	Department of Biology
Chemistry	B.A.	Department of Chemistry and Biochemistry
Chemistry Emphasis: biochemistry	B.S.	Department of Chemistry and Biochemistry
Chicana and Chicano Studies Concentrations: humanities/cultural sciences, social sciences/policy	B.A.	Department of Chicana and Chicano Studies
Clinical Laboratory Sciences	B.S.	Department of Microbiology
Computer Science	B.S [1]	Department of Computer Science and Engineering
Conservation Biology	B.S.	Department of Biology
Economics	B.A., B.S.[2]	Department of Economics
English	B.A.	Department of English
Exercise Science/Physical Education Concentrations: exercise and wellness, exercise science, physical education	B.S.	Department of Exercise Science and Physical Education
Family Resources and Human Development Concentrations: family resources and human development in business, family studies/child development, human nutrition—dietetics	B.A.[3], B.S.	Department of Family Resources and Human Development
French	B.A.	Department of Languages and Literatures
Geography Emphases: meteorology-climatology, urban studies	B.A., B.S.	Department of Geography
Geology	B.S.	Department of Geology
German	B.A.	Department of Languages and Literatures
History	B.A., B.S.	Department of History
Humanities Concentrations: architecture; architecture, culture, and society; business; design; film studies; humanities/liberal arts; justice studies; planning	B.A.	Interdisciplinary Humanities Program
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 Options: applied mathematics, computational mathematics, general mathematics, pure mathematics, statistics and probability	B.S.	Department of Mathematics
Microbiology	B.S.	Department of Microbiology
Philosophy	B.A.	Department of Philosophy
Physics Emphasis: astronomy Options: I, II	B.S	Department of Physics and Astronomy
Plant Biology Concentrations: environmental science and ecology, molecular biosciences/biotechnology, urban horticulture	B.S.	Department of Plant Biology
Political Science	B.A., B.S.	Department of Political Science

[1] The Department of Computer Science and Engineering is located administratively in the College of Engineering and Applied Sciences. The B.S. degree in Computer Science is offered by both CLAS and the College of Engineering and Applied Sciences. Requirements differ according to college (see pages 217 and 325). This major requires more than 120 semester hours to complete.

[2] The Department of Economics is located administratively in the College of Business. The baccalaureate degree in Economics is offered by both the CLAS and the College of Business Requirements differ according to college (see pages 154 and 325).

[3] Students are not being accepted to this program at this time

Major	Degree	Administered by
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
Graduate Degrees		
Anthropology Concentrations: archaeology, bioarchaeology, linguistics, medical anthropology, museum studies, physical anthropology, social cultural anthropology	M.A.	Department of Anthropology
Anthropology Concentrations archaeology, physical anthropology, social-cultural anthropology	Ph.D.	Department of Anthropology
Biology[4] 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.[5, 6]	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.[5]	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[4] Concentration marriage and family therapy	Ph.D.	Department of Family Resources and Human Development
French Concentrations: comparative literature, language and culture, literature	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

[1] The Department of Computer Science and Engineering is located administratively in the College of Engineering and Applied Sciences The B S degree in Computer Science is offered by both CLAS and the College of Engineering and Applied Sciences. Requirements differ according to college see pages 217 and 325 This major requires more than 120 semester hours to complete

[2] The Department of Economics s located administratively in the College of Business. The baccalaureate degree in Economics is offered by both the CLAS and the College of Business. Requirements differ according to college see pages 154 and 325).

[3] Students are not being accepted to this program at this time.

[4] Major with formalized concentration(s); other areas of study are available.

[5] This program is administered by the Graduate College. See "Graduate College," pages 282 292.

[6] 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.

Major	Degree	Administered by
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.[5]	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
Natural Science Concentrations:	M.N.S.	
biology		Department of Biology
chemistry		Department of Chemistry and Biochemistry
geology		Department of Geo ogy
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[4]	M.S., Ph.D.	Department of Plant Biology
Concentrations: ecology, photosynthesis		
Political Science Concentrations: American politics, comparative politics, international relations, political theory	M A , Ph D	Department of Political Science
Psychology Concentrations: behavioral neuroscience, clinical psychology, cognitive/behavioral systems, developmental psychology, environmental psychology, social psychology	Ph.D	Department of Psychology
Religious Studies	M A	Department of Religious Studies
Science and Engineering of Materials Concentrations: high resolution nanostructure analysis, solid state device materials design	Ph.D.[3]	Committee on the Science and Engineering of Materials
Sociology	M.A., Ph.D.	Department of Sociology
Spanish Concentrations: comparative literature, language and culture, linguistics, literature	M A.	Department of Languages and Literatures
Spanish	Ph D	Department of Languages and Literatures
Speech and Hearing Science Concentrations: developmental neurolinguistic disorders, neuroauditory processes, neurogerontologic communication disorders	Ph D.[5]	Committee on Speech and Hearing Science
Statistics	M.S.[5]	Committee on Statistics
Teaching English as a Second Language	M TESL	Department of English

[1] The Department of Computer Science and Engineering is located administratively in the College of Engineering and Applied Sciences The B S degree in Computer Science s offered by both CLAS and the Co ege of Engineering and Applied Sciences Requirements differ according to col ege (see pages 2 7 and 325 . This major requires more than 120 semester hours to complete

[2] The Department of Econon ics is located administratively in the C ege of Business The bacca aureate degree in Economics is offered by both the CLAS and the College of Business Requirements difler according to college (see pages 154 and 325

[3] Students are not being accepted to this program at this time

[4] Major with formalized concentration s , othe areas of study are ava lable

[5] This program s administered by the Graduate College See "Graduate Co lege," pages 282 292

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 de partment offering the minor or the Of fice for Academic Programs, SS 111.

Minors	Pages
Anthropology	311
Asian Languages (Chinese Japanese	350
Astronomy	373
Biology	316
Chemistry and Biochemistry	321
Chicana and Chicano Studies	324
Economics for Students Planning a Career in Law	325
English	326
Exercise Science Physical Education	331
Family Resources and Human Development	334
French	350
General Economics	325
Geology	341
German	350
History	343
Humanities	347
Italian	350
Mathematics	362
Microbiology	367
Philosophy	371
Physics	373
Plant Biology	378
Po itical Science	381
Psychology	384
Religious Studies	387
Russian	350
Sociology	390
Spanish	350
Women's Studies	395

UNIVERSITY GRADUATION REQUIREMENTS

In addition to fulfilling college and major requirements, students must meet all university graduation requirements. For complete information, see pages 79 83

General Studies Requirement

All students enrolled in a baccalaure ate degree program must satisfy a university requirement of a minimum of 35 hours of approved course work in General Studies, as described on pages 84–87. Note that all three General Studies awareness areas are required Consult your advisor for an approved list of courses.

General Studies courses are listed on pages 87 108 in the *General Catalog* following the section on "General Stud ies," in the course descriptions, in the *Schedule 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 require ment while fulfilling college degree re quirements. Students are encouraged to consult with an academic advisor in planning a program to ensure that they meet all necessary requirements. It is also important 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.

To graduate from CLAS, a student must satisfy separate requirements of three kinds in addition to the General Studies requirement. *proficiency re quirements* indicate a minimal level of competence in written communication, quantitative reasoning, and foreign lan guage; *major requirements* involve concentrated course work in one field; and *distribution requirements* ensure that the student is exposed to disci plines outside the major field.

I. Proficiency Requirements. Each student is required to demonstrate proficiency in First-Year Compo sition, 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 for eign students.

B. Foreign Language
   1. completion of foreign lan guage course work at the intermediate level (202 or equivalent; see Department of Languages and Litera tures listings for these equivalencies) or
   2. a foreign language course at the 300 level or above taught in the foreign lan guage and having 202 or its equivalent as a prereq uisite or
   3. completion of secondary education at a school in which the language of in struction 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 stu dent is required to select a major from among the fields of study of fered by CLAS The requirements for completion of the major are de scribed under departmental list ings.

A The major department may re quire up to 45 semester hours of course work The minimum is 30 hours. A maximum of 15 additional hours may be re quired 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 depart ments require calculus level mathematics; up to five of these semester hours may be excluded from the 60 hour

NOTE For the General Stud es requ rement codes (such as L1, N3 C and H) and courses see pages 84–108. For graduation requ rements, see pages 79–83 For omn bus courses offered but not listed n th s catalog, see pages 56–57

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
      - 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
      - Anthropology
      - Chicana and Chicano Studies
      - Economics
      - Exercise Science/ Physical Education*
      - Family Resources and Human Development*
      - Geography
      - History
      - Political Science
      - Psychology
      - Sociology
      - Speech and Hearing Science*
      - 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 carries an asterisk 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, Speech and Hearing Science, and Women's Studies must satisfy distribution requirements in social and behavioral sciences as well as in the other two divisions. Students majoring in Chicana and Chicano Studies satisfy either the humanities or social and behavioral sciences distribution requirements, depending on their concentration.

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.

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 Departments of Chicana and Chicano Studies (CSH courses only), English, Languages and Literatures, Philosophy, Religious Studies, and the Interdisciplinary Humanities 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)
   3. CSH (Chicana and Chicano Studies)
   4. ENG (Department of English; any literature course, including ENG 200 and 218)
   5. CHI, FLA, FRE, GER, GRK, HEB, IDN, ITA, JPN, LAT, POR, RUS, SPA, THA (Department of Languages and Literatures: FLA 150 or any literature or "civilization" course at the 300 level or above)
   6. HUM (Interdisciplinary Humanities Program)
   7. PHI, HPS (Department of Philosophy)
   8. REL (Department of Religious Studies)

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 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.

* Students majoring in this field must satisfy the distribution requirements in all three divisions.

2. Part B (six semester hours). Two courses to be taken from the Depart ments of Anthropology (ASM only), Biology, Chemistry and Biochemis try, Computer Science and Engineering, Geography (GPH only), Geology, Mathematics, Microbiol ogy, Physics and Astron omy, 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 math ematics course is a prereq uisite may be used to sat isfy natural sciences and mathematics distribution requirements. Mathematics courses for which MAT 117 is a prerequisite may be used to satisfy distribu tion requirements in natu ral sciences and mathemat- ics, even if they were also used to demonstrate math ematics proficiency.

C. Social and behavioral sciences (15 semester hours). Each stu dent 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 de partments.

   At least two courses must be at the 300 level or above.

   Course prefixes for the so- cial and behavioral sciences distribution requirement:

   1 ASB (Department of Anthropology)
   2. CSS (Chicana and Chicano Studies
   3. ECN (Department of Economics, College of Business)
   4. GCU (Department of Geography)
   5. HIS (Department of History)
   6. PGS (Department of Psychology)
   7 POS (Department of Political Science)
   8 SOC (Department of Sociology)
   9. WST (Women's Studies Program, only WST 100 or 300 but not both)

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. The program of study, 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 preregistra tion period for the subsequent semester. Students are expected to follow the ap- proved program of study or to receive early college approval for proposed changes to the program of study. Stu- dents should contact the Office for Academic Programs, SS 111, regarding college graduation rules and deadlines. Deadlines for filing a program of study 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 be fore registering for the next semester.

MAJOR REQUIREMENTS

Credit Requirement. All candidates for graduation in the B.A. and B.S. de gree curricula are required to complete at least 120 semester hours, of which at least 45 hours must consist of upper di vision courses. A minimum ASU cu mulative 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 se- mester. 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 Aca demic Programs, SS 111, before regis tration. Any petition for an overload in excess of 21 hours must be presented to the Standards Committee of the col lege.

Foreign Language Requirement. CLAS requires know ledge of one for eign language equivalent to the com pletion of two years' study at the col lege level. For purposes of meeting this requirement, American Sign Lan guage is considered a foreign language. For more information, see page 352

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" contrib utes 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 enrollment for pass fail needs the approval of the instructor and the college;
2. enrollment 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 re quirements,
2. those in the student's major or mi nor or certificate program;
3. those counted toward or required to supplement the major,
4. those counted as 499 Independent Study,
5. those taken for honors credits; or
6. those counted toward satisfying the proficiency and distribution re quirements 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," pages 72–76.

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 on pages 77–78, except that the disqualified student in CLAS is suspended for at least two regular semesters at the university. Students on probation normally have one semester in which to remove their probation. 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.

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 pages 293–295.

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 opportunities to pursue courses of studies that cut across departmental 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 several individual departmental programs 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, 602/965–6551.

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

Fourteen certificates are available from units in CLAS, as shown in the "Certificates" table, page 308. Areas of emphasis are also available in some of the same areas. The 14 certificate programs and areas of emphasis follow.

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 requirements may be selected from Chinese, Indonesian, Japanese, 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 Japanese 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

Certificates

Certificate Program	Administered by
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*	Center for Latin American Studies
Medieval and Renaissance Studies	Arizona Center for Medieval and Renaissance Studies
Medieval Studies	Arizona Center for Medieval and Renaissance Studies
Museum Studies	Department of Anthropology
Renaissance Studies	Arizona Center for Medieval and Renaissance Studies
Russian and East European Studies*	Russian and East European Consortium
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

* Emphases are also available in these programs

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 Studies, WHALL 105, 602/965 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 physics, 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, MCL 110B, 602/965 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 academic base.

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 Center for Latin American Studies 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 Center for Latin American Studies at SS 213, or call 602/965 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 602/965 1681.

See the *Graduate Catalog* for information about the Certificate in Medieval Studies and the Certificate in Renaissance Studies, and page 33 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 em phasis in Russian and East European studies. The requirements for the Russian and East European Studies certifi cate 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 cer tificate program is to encourage stu dents 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 602/965–4188.

Scholarly Publishing. See the *Gradu ate 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 complet ing degree requirements in any disci pline or professional program. The cer tificate program offers two options: (1) an area studies specialization em phasizing 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 South east 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 re gion, administered in accordance with the national American Council of Teachers in Foreign Languages (ACTFL) guidelines.

The ASU curriculum includes

1. language instruction in Indonesian, Thai, or Vietnamese;
2. ASB/GCU/HIS/POS/REL 240 In troduction to Southeast Asia;
3. HIS 308 Modern Southeast Asian History;
4. electives in the social sciences and humanities on the history, geogra phy, culture, politics, and religion of the region; and
5. a culminating capstone seminar in which the students share multi disciplinary approaches to the re gion and integrate knowledge of Southeast Asia with their respec tive 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 aware ness areas A two-year sequence in Southeast Asian language study meets the foreign language requirement for undergraduates in CLAS.

The Program for Southeast Asian Studies is a federally funded National Resource Center for Southeast Asia. For more information, contact the Pro gram for Southeast Asian Studies, LL C32, 602/965–4232.

Translation. See page 351 for information about the Certificate in Transla tion.

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 interdiscipli nary teaching and research;
3. to generate and facilitate research on women's experience;
4. to provide the university and the community with programs, courses, and research that acknowl edge and expand the potential of women; and
5. to stand as a visible example of the university's commitment 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 se mester hours from the list of approved women's studies courses, only six hours of which may also be applied to ward the student's major.

Inquiries about the program should be addressed to the Women's Studies Program, EC A209, 602/965 2358, where the current list of approved courses is available.

GENERAL INFORMATION

Research Centers. To expand educa tional horizons and to enrich the cur riculum, CLAS maintains the following research centers:

Arizona Center for Medieval and Renaissance Studies
Cancer Research Institute
Center for Asian Studies
Center for Latin American Studies
Center for Meteorite Studies
Center for Solid State Science
Center for the Study of Early Events in Photosynthesis
Hispanic Research Center

See pages 33 35 for a description of these research centers.

LIBERAL ARTS AND SCIENCES (LIA)

LIA 390 The Use of Research Libraries. (3) F S

nterd sc pl nary resources and serv ces of li branes, particu ar y this un vers ty s w th emphas s on research nformat on l teracy, and app ied cr tical thinking sk l s Lecture d scus sion s te vis ts. *General Studies L1*

For more information on LIA courses, see the current *Schedule of Classes* or contact the Office for Aca demic Programs, SS 111, 602/965 6506.

Department of Aerospace Studies

Air Force ROTC

Col. John J. Gorman Jr.
Chair
(MAIN 340) 602/965–3181
www.asu.edu/clas/afrotc

PROFESSOR
GORMAN

ASSISTANT PROFESSORS
OLSON, RIZZA, WARDEN

PURPOSE

The Department of Aerospace Studies curriculum consists of the general military course and history for freshmen and sophomores (AES 101, 103, 201, 203) and the professional 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 (non citizens 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
Introduction to U S Air Force and AFROTC Topics include the Air Force mission and organization customs and courtesies officer opportunities officership and professional sm

AES 102 Leadership Lab. (0) F
Emphasis on common Air Force customs and courtesies, dr and ceremonies, health and physical fitness through group participation. Corequisite. AES 101

NOTE: For the General Studies requirement codes (such as L1 N3, C, and H), and courses see pages 84–108. For graduation requirements see pages 79–83 For omnibus courses offered but not listed in this catalog see pages 56–57

AES 103 Air Force Today II. (2) S
Cont nuat on of AES 101 Top cs nc ude: the A r Force m ss on and organizat on customs and courtes es, officer opportun t es, off cer sh p and profess'ona sm Prerequis te AES 101 or department approval.

AES 104 Leadership Lab. (0) S
Cont nuat on of AES 102 with more n-depth emphas s on earn ng the env ronment of an A r Force off cer Corequ s te AES 103

AES 201 Air Force Way I. (2) F
Further preparat on of the AFROTC cand date. Top cs nc ude Air Force her tage and eaders commun cat on sk l s, eth cs leader sh p quality A r Force and values. Prerequ - site: AES 103 or department approval.

AES 202 Leadership Lab. (0) F
App cation of advanced dri and ceremon es ssu ng commands know ng flag et quette and develop ng d rect ng, and eva uating sk ls to ead others. Corequ s te AES 201.

AES 203 Air Force Way II. (2) S
Continuat on of AES 201 Top cs include: the A r Force miss on and organ zation customs and courtes es, off cer opportun ties 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 f e d tra n ng Corequ s te AES 203.

AES 301 Air Force Leadership and Management I. (3) F
Study of communicat on sk s eadersh p and qual ty management fundamenta s, leadersh p eth cs, and profess onal knowledge requ red of an A r Force off cer Prerequ'site· AES 203 or department approval *General Stud es· L2*

AES 302 Leadership Lab. 0 F
Advanced eadership exper ences app y ng eadersh'p and management pr nc p es to mo t vate and enhance the performance of other cadets Corequ s te AES 301

AES 303 Air Force Leadership and Management II. (3) S
Cont nuation of AES 301. Top cs nc ude· commun cation ski s, eth cs, leadersh p pro fess'ona knowledge, and qua ty management requ'red of an A r Force officer Prerequ s te AES 203 or department approva *General Studies. L2*

AES 304 Leadership Lab. 0) S
Cont nuat on of AES 302 w th emphas s on p ann ng the m tary act v t es of the cadet corps and app y ng advanced eadersh p methods Corequ s te AES 303

AES 401 Preparation for Active Duty I. (3) F
Examines advanced eth cs A r Force doc tr'ne, nat ona secur ty process, and reg ona stud es. Spec a top cs nc ude. civ an control of the mi tary, m tary ust ce, and off cership. Prerequisite· AES 303 or department ap prova *General Stud es. L2*

AES 402 Leadership Lab. 0) F
Advanced leadersh p experience demonstrat ing earned sk ls n plann ng and contro ng the mi tary act v t es of the corps Corequ s te AES 401.

AES 403 Preparation for Active Duty II. (3) S
Cont'nuation of AES 401 Top cs nc ude: civi an contro of the m tary doctrine, ethics mil - tary just ce the nat ona security process, and off cersh p. Prerequ site AES 401 or depart ment approval.

AES 404 Leadership Lab. (0) S
Continuation of AES 402 w th an emphasis on preparat on for trans tion from c v i an to m l tary l fe Corequ s te AES 403

African American Studies Program

Leanor Boulin-Johnson
Director
(AG 201) 602/965–4399

Inquires about the program should be addressed to the African American Studies Program, AG 201, 602/965 4399, where the current list of ap proved courses is available.

Department of Anthropology

Barbara L. Stark
Chair
(ANTH A124) 602/965–6213
www.asu.edu/clas/anthropology

REGENTS' PROFESSOR
TURNER

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ASSISTANT PROFESSORS
REED, STEADMAN, WELSH

SENIOR LECTURER
W NKELMAN

ANTHROPOLOGY—B.A.

The program consists of 45 semester hours, of which 36 must be in anthro pology and nine in related fields to be approved by the advisor in consultation with the student. Course requirements are distributed as follows:

1 ASB 102 and ASM 101;
2. six hours, including at least one course at the 300 level or above, in each of the following subfields· ar chaeology physical anthropology, and social cultural anthropology; and
3. three hours each in linguistics, an ethnographic area course, and an archaeology or physical anthropol ogy area course.

Three of the nine hours in related fields must be in statistics. Each stu dent's program of study must be ap proved by the advisor in consultation with the student. At least 18 semester hours must be in upper division courses For details see the departmen tal brochure. See "Foreign Language Placement," page 352.

Latin American Studies Certificate or Emphasis. Students 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 308, 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 in the upper division and represent at least two of the three *subfields of anthropology. For more* information, consult the department of fice.

SECONDARY EDUCATION—B.A.E.

Social Studies. The major teaching field consists of 63 semester hours, of which 30 hours must be in the anthro pology 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
Socia 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
Princ p es of cultural and soc a anthropology with i lustrative materia s from a var ety of cu - tures The nature of culture. Social, politica and economic systems· rel g on, aesthetics, and language *General Studies: SB, G*

ASB 202 Ethnic Relations in the United States. (3) F, S
Processes of intercu tura re ations; systems approach to history of U.S nterethn c re a t ons; psychocu tural ana ysis of contemporary U.S ethn c relat ons. *General Studies· C H*

ASB 210 Sex, Marriage, and Evolution. (3) F
Exam nat on of the sexual nature and behav or of humans from both a b o og ca and an anthropo ogical po nt of v ew

ASB 211 Women in Other Cultures. (3) N
Cross-cu tural ana ysis of the econom c so- c a po itical, and rel g ous factors that affect women's status in tradit'ona and modern soc eties *General Studies: G*

ASB 222 Buried Cities and Lost Tribes: Our Human Heritage. (3) S
Archaeology through ts most important dis coveries human orig ns Pompe , King Tut, the Holy Land, Southwest ndians, and methods of f e d archaeo ogy *General Stud es· HU.*

ASB 231 Archaeological Field Methods. (4) S
Excavation of archaeological s tes and record ing and interpretat on of data Includes loca fie d exper ence 2 hours lecture, 8 hours ab. Prerequisite: ASM 101 or instructor approva *General Studies: S2.*

ASB 240 Introduction to Southeast Asia. (3) F
An interdisc p inary ntroduction to the cul tures, re gions, political systems geography, and h story of Southeast As a Cross-l sted as GCU 240 HIS 240/POS 240 REL 240 *Gen eral Studies: G*

ASB 242 Asian American Experiences: An Anthropological Perspective. (3) F
The histor ca and contemporary experiences of As an Amer cans in terms of the anthropo logical concepts of culture, ethn c ty and ad aptation. *General Studies: L1 C*

ASB 250 Anthropology Topics. (3) S
Covers five areas of anthropolog ca nquiry Emphasizes brary research critica analys s, and commun cat on sk ls re evant to upper-d - v s on anthropo ogy course work Prerequ - s tes ASB 102 ASM 101 (or equ valent) comp etion of the F rst-Year Compos t on re- qu rement *General Stud es L1*

ASB 302 Ethnographic Field Study in Mexico. (3) SS
Fieldwork study of cultura adaptation Mex can cu ture, United States Mexican cu tura conf ct ethnograph c research methods and local culture Lecture, d scuss on, f e d re- search. Pre or coreqU s te SPA 101 or equ va ent *General Studies L1/SB G*

ASB 311 Principles of Social Anthropology. (3) S
Comparat ve ana ys s of domestic groups and econom c and po t ca organ zations in prim tive and peasant soc et es. *General Studies: SB.*

ASB 314 Comparative Religion. (3) F, S
Orig ns e ements, forms and symbol sm of rel g on, a comparat ve survey of rel g ous be ıefs and ceremon es the place of rel g on n the tota culture Prerequ s te ASB 102 or n structor approval.

ASB 319 The North American Indian. (3) A
Archaeology, ethno ogy and ingu stic re a tionsh p of the Ind ans of North Amer ca Does not nclude M dd e Amer ca. Prerequ s te ASB 102 or nstructor approval

ASB 320 Indians of Arizona. (3) F
The trad tional cultures and the deve opment and nature of contemporary pol tical eco nom c and educat ona cond t ons among An- zona Ind ans

ASB 321 Indians of the Southwest. (3) S
Cultures of the contemporary Ind ans of the Southwestern Un ted States and the r h storic antecedents Prerequisite ASB 102 or instruc tor approva *General Studies L2/SB C H*

ASB 322 Indians of Mesoamerica. (3) S
Historic tr bes and fo k cu tures Prerequisite: ASB 102 or instructor approva *General Stud es. SB G*

ASB 323 Indians of Latin America. (3) F
Ind genous cu tures of the Amazon the An dean region Centra Amer ca and southern Mexico Lecture, d scuss on. Prerequisite ASB 102 or nstructor approval. *General Stud ies: SB, G.*

ASB 324 Peoples of the Pacific. (3) N
Peop es and cu tures of Ocean a focus ng par t'cular y on societ es of Me anesia, Micrones a and Polynes a Prerequ s te ASB 102 or n structor approval *General Studies G*

ASB 325 Peoples of Southeast Asia. (3) F
A cu tural eco og ca perspect ve on the peo- ples of ma'n and and nsular Southeast Asia Subsistence modes, soc a organizat on and the impact of modern zat on. Prerequ s te ASB 102 or nstructor approva *General Stud- ies: G.*

ASB 326 Human Impacts on Ancient Environments. (3) S
A wor d survey of successful and unsuccess ful anc ent societ es and their impacts on the environment *General Studies. SB H*

ASB 330 Principles of Archaeology. (3) F, S
Methods and theor es for reconstruct ng and exp a ning the ifeways of preh storic peoples Prerequ s te 3 hours of archaeology *General Stud es SB*

ASB 333 New World Prehistory. (3) F
The var ety of archaeolog ca patterns encoun tered in the Western Hemisphere. Covers the period from the appearance of humans n the New World to European contact covers the area from Alaska to T erra del Fuego Pre requ s te comp etion of the First Year Compo- sition requirement Pre or corequisite. 1 up- per-division ASU course *General Studies· L2/ SB.*

ASB 335 Prehistory of the Southwest. (3) F S
Anthropo og ca understand ngs of major cu tura processes and events n the preh story of the Amer can Southwest us ng ev dence from archaeo ogy *General Studies SB C, H.*

ASB 337 Pre-Hispanic Civilization of Middle America. (3) S
Preconquest cultures and c v izations of Mex co The Aztecs, Mayas, and the r predeces sors Prerequ s te· ASM 101 or instructor ap- prova *General Stud es. H*

ASB 338 Archaeology of North America. (3) N
Or g n spread and development of the pre h stor c ndians of North America up to the his- tor c tribes Does not nc ude the Southwest Prerequ s te ASM 101 or nstructor approva .

ASB 350 Anthropology and Art. (3) A
Art forms of peop e in re at onsh p to the r so cial and cu tural setting Prerequisite: ASB 102 or instructor approva

ASB 351 Psychological Anthropology. (3) S
Approaches to the nterre ations between the persona ity system and the soc ocultura env ronment Prerequ s te ASB 102 or nstructor approva *General Studies. SB*

ASB 353 Death and Dying in Cross-Cultural Perspective. (4) F
Human'st c and sc ent f c study of aging, s'ck ness, dying death, funerals, and grief and the r ph losophy and eco ogy n non Western and Western cultures 3 hours ecture, 1 hour d scuss on *General Studies HU SB, G.*

ASB 355 Shamanism, Healing and Consciousness. (3) S
World v ews pract ces and roles of shamans and trad tiona and contemporary hea ers ex- p anatory biopsycho og ca models of con- sc ousness *General Studies HU/SB*

ASB 361 Old World Prehistory I. (3) F
Biosoc a evo ution n the P e stocene empha s z'ng techno og ca ach evements and the re lat onship between technology and environ- ment n western Europe, sub-Saharan Africa Prerequ s te· ASM 101 or nstructor approva *General Studies· H.*

ASB 362 Old World Prehistory II. (3) S
Transit on from hunting and co lect ng societ es to domesticat on econom es, estab'sh ment of sett ed vi age ife emphas z ng the Near East Egypt, Southwest Europe Pre- requis te. ASM 101 or nstructor approva *General Stud es H*

NOTE For the General Stud'es requirement codes (such as L1 N3, C, and H) and courses, see pages 84 108. For graduat on requirements, see pages 79–83. For omn bus courses offered but not sted n this cata og see pages 56–57

ASB 383 Linguistic Theory: Phonetics and Phonology. (4) F
Bas c art cu atory phonetics and contemporary theories of the sound system of language 3 hours lecture, 1 hour lab *Genera Stud es SB*

ASB 400 Cultural Factors in International Business. (3) S
Anthropological perspect ves on nternat ona bus ness re ations app ed princ p es of cross cultura communicat on and management, regiona approaches to culture and bus ness Cross- sted as IBS 400 *General Stud es G*

ASB 411 Kinship and Social Organization. (3) S
Meanings and uses of concepts referring to k nsh p, consanguinity, aff n ty, descent a ance, and residence in the context of a survey of the varieties of social groups, marr age, ru es, and kinsh p terminological systems. Prerequ s te 6 hours of anthropo ogy or n structor approval

ASB 412 History of Anthropology. (3 F
Historical treatment of the deve opment of the cu ture concept and ts express on in the ch ef theoretica trends n anthropo ogy between 1860 and 1950 Prerequ site. ASB 102 or n structor approval *General Stud es L2/SB*

ASB 416 Economic Anthropology. (3) F
Econom c behavior and the economy in pre n dustria soc eties descr ption and class f cation of exchange systems· relat ons between production, exchange systems and other so c etal subsystems. Prerequ'site: ASB 102 or instructor approval. *General Stud es. L2/SB*

ASB 417 Political Anthropology. (3) A
Comparat ve exam nation of the forms and processes of po t ca organizat on and act v ty in pr'm tive peasant and comp ex societ es Prerequisite: ASB 102 or nstructor approva

ASB 462 Medical Anthropology: Culture and Health. (3) F 1998
Role of cu ture in health, lness, and curing, hea th status, provider re at ons, and nd g enous hea ing practices in Un ted States eth n c groups. Lecture, discuss on *General Stud ies: C.*

ASB 471 Introduction to Museums. (3) F
History, philosophy, and current status of mu seums. Exp orat on of col ecting preservat on exh bition educat on, and research act v t es in different types of museums Prerequ s tes ASB 102 and ASM 101 *or* nstructor approva *General Studies: L2.*

ASB 480 Introduction to Linguistics. (3) F
Descriptive and h storical ingu st cs Survey of theories of human language, emphas z ng synchron c l ngu stics. *General Stud es. SB*

ASB 481 Language and Culture. (3) S
App cation of l ngu stic theories and f nd ngs to non inguist c aspects of cu ture anguage change; psychol ngu st cs Prerequ s te ASB 102 or instructor approva . *General Studies SB.*

ASB 483 Sociolinguistics and the Ethnography of Communication. (3) N
Re ationsh ps between l ngu st c and soc a categories; funct ona analys s of anguage use maintenance, and diversity nteract on between verba and nonverba commun ca tion. Prerequisites: ASB 480 and ENG 213 (or FLA 400) *or* nstructor approva *General Stud ies· SB*

ASB 501 Applied Medical Anthropology. (3) F
Overv ew of anthropo ogy s app ications n med c ne and ts adaptat ons to U S ethnic popu at ons Requ res research project n med ca sett ng Lecture, seminar Prerequ site graduate stand ng or nstructor approva

ASB 502 Health of Ethnic Minorities. (3) S
Preva ence of i ness risk factors hea th eco ogy and med ca and indigenous treatments. Lecture, seminar. Prerequ site graduate stand ng or nstructor approva

ASB 503 Advanced Medical Anthropology. 3) F
Theory n Med ca Anthropo ogy and cross cultural stud es that illustrate particular theo- r es Lecture sem nar Prerequis te graduate standing or nstructor approval

ASB 504 Ethnic Relations. (3) F
Structura processes of intergroup re at ons methods for nvest gating psychocu tura di mensions of ethn c ty w th 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 n d genous defin t ons and treatments of menta d sorders across cu tures Lecture sem nar Prerequ site: graduate stand ng or nstructor approval

ASB 506 Gender, Emotions, and Culture. (3) S
Re at onsh ps among gender and emotion across cu tures Lecture sem nar Prerequ - site graduate stand ng or nstructor approva

ASB 529 Culture and Political Economy. (3) N
Origin and spread of Western cap tal sm and ts impact on non Western soc et es Ethno graphic and h storica case stud es are ut zed. Prerequ s te graduate stand ng.

ASB 530 Ecological Anthropology. (3) A
Re at ons among the popu at on dynam cs, so cial organ zation cu ture and env ronment of human popu at ons w th special emphasis on hunter-gatherers and extensive agr cu tura - sts.

ASB 532 Graduate Field Anthropology. (2 8) S
Independent research on a spec f c anthropo og ca problem to be se ected by the student n consu tat on with the staff. May be repeated for cred t Prerequisites. ASM 338 or equiva lent, nstructor approval.

ASB 536 Ethnohistory of Mesoamerica. (3) N
nd genous societ es of southern Mex co and Guatema a at Spanish contact and the r post conquest transformation Emphas s is on the Aztec Emp re Prerequ's te: graduate stand ing

ASB 537 Topics in Mesoamerican Archaeology. (3) N
Chang ng organ zation of pre Co umbian civi zat ons 'n Mesoamer ca is explored through interpret ve ssues such as reg ona ana ys s, ch efdoms urban sm, and exchange. Pre requis te nstructor approva

ASB 540 Method and Theory of Sociocultural Anthropology and Archaeology I. (3) F
Bas c issues concerning concepts of soc'al and ethn'c groups cultural and socio og cal theory and the nature of anthropo og ca re search. Prerequ s te nstructor approval

ASB 541 Method and Theory of Social and Cultural Anthropology. (3) S
Continuat on of ASB 540 Prerequ site ASB 540 or nstructor approva

ASB 542 Method and Theory of Archaeology II. (3) S
Mode s of human evo ut on culture change and nterpretat on of hunter gatherer and tr ba societ es, ceram c ith c, and faunal materia s Prerequisite nstructor approva

ASB 543 Method and Theory of Archaeology III. (3) F
Covers concepts of soc a complex ty a ong w th economy demography and soc al dynam cs, fo owed by archaeo og cal research design Prerequ s te nstructor approva

ASB 544 Settlement Patterns. (3) N
Spat al arrangement of res dences, activity s tes and commun ties over andscape Em phasis on natura and cultural factors nfluenc ng sett ement patterns Prerequisite: nstruc tor approva

ASB 546 Pleistocene Prehistory. (3) F
Development of society and culture in the O d Wor d during the Ple stocene epoch, empha s z ng techno og ca change through time and the re ationsh p of peop e to the r environment Prerequis te ASB 361 or equivalent

ASB 547 Issues in Old World Domestication Economies. (3 S
Archaeological ev dence for trans tions n Old World subsistence econom es from hunt'ng and gather'ng to dependence on domesti cated p ants and an mals Prerequis te ASB 362 or equ va ent

ASB 550 Economic Archaeology. (3) N
Preh stor c econom es n hunter-gatherer tr ba and comp ex soc et es Subs stence strategies craft production and spec a zat on and exchange covered. Prerequ s te instruc tor approval.

ASB 551 Prehistoric Diet. (3) N
Inc udes (1) a critica rev ew of techn ques for recover ng d etary nformation and 2) theoreti cal mode s concerned w th explaining diet and nutrit on Prerequisite nstructor approval

ASB 555 Complex Societies. (3) S
Structura variations in h erarch'ca ly orga- n zed soc et es, along w th or g ns, dynam cs, and co apse are exam ned Sem nar

ASB 559 Archaeology and the Ideational Realm. (3) N
'Post-processua " and other v ews concern ng re evance of menta phenomena for under standing soc ocu tura change Various ap- proaches to nferring preh storic mean ngs

ASB 563 Hunter-Gatherer Adaptations. (3) N
Evolut on of preh stor c hunter gatherer soc et- es n the Old and New Wor ds from the most anc ent times through protoh storic ch efdoms Prerequ s te nstructor approval

ASB 567 Southwestern Archaeology. (3) S
Broad coverage of Southwestern cultural de velopments focusing on current debates and ngorous use of archaeolog'cal data in making cultura nferences

ASB 568 Intrasite Research Strategies. (3) F
Research ssues with n a s ngle s te context Topics nc ude quant tative spatia ana ys s, site def n tion, samp ing d stributiona ana y sis and substant ve interpretat on

ASB 571 Museum Principles. (3) F
H st ry ph sophy, and current status of mu seums Exp orat on of col ect ng, preservat on exh b t on educat on and research activities n d fferent types of museums Prerequ sites· ASB 102 and ASM 101 *or* nstructor approva

ASB 572 Museum Collection Management. 3 S
Pr nc p es and pract ces of acqu s t on, docu mentat on care, and use of museum co ec t ons reg strat on catalog ng and preserva- t on methods· ega and eth ca ssues. Pre- requ s te: ASB 571 or nstructor approva

ASB 573 Museum Administration. (3) S
Forma organ zat on and management of mu seums gover ance personnel matters, fund ra s ng and grantsmansh p, egal and eth ca ssues. Prerequ s te ASB 571 or nstructor ap prova

ASB 574 Exhibition Planning and Design. 3 S
Exh b t on ph osoph es and deve opment pro cesses of p ann ng, des gn ng stag ng nstal ng, eva uat ng and d sassemb ng temporary and ong term exh b ts Prerequ s tes ASB 571 and 572 *or* nstructo approva

ASB 575 Computers and Museums. (3) F
Bas cs of museum computer appl cat on, hard ware and s ftware, fundamenta s of database management ssues of research col ect ons management and adm n strat on

ASB 576 Museum Interpretation. 3) F
Processes of p ann ng, mp ementing docu ment ng and eva uat ng educat ona programs n museums for var ed aud ences—ch dren adu ts and spe a nterest groups Lecture, d scuss on. Prerequ s te ASB 571

ASB 577 Principles of Conservation. 3 S
Preservat on of museum ob ects nature of materia s env ronmenta contro s, and causes of degradat on recogn z ng problems dam age, and s ut ons proper care of objects. Prerequ s tes ASB 571 and 572 *or* nstructor approva

ASB 579 Critical Issues in Museum Stud- ies. 3 F
Current debates of n useum pract ce from an anthrop og ca perspect ve Issues of co ec- t on presentat on authent c ty and author ty are addressed Sem nar Prerequ s tes ASB 571 or nstructor approva

ASB 591 Seminar. 3 N
Se ected t p cs n archaeo ogy nguist cs and soc a cu tura anthropo ogy
- a Archaeolog ca Ceram cs
- b Archaeo ogy of North America
- (c Cu tura Anthr po ogy
- (d) Cu ture and Persona ty
- e) Ev ut on and Cu ture Cross sted as ASM 591
- f H stor ca Ar haeo ogy
- g nterdepartmenta Sem nar Cross sted as ASM 591.
- (h) L nguist cs
- ı Museum Stud es
- (j) Problems n Southwestern Archaeo ogy
- k Pr blems n Southwestern Ethno ogy Soc a Anthropology

ANTHROPOLOGY (ASM)

ASM 101 Human Origins and the Develop- ment of Culture. 3 F S
Phys ca anthropo ogy and archaeo ogy Ev dence and processes of human evo ution and of cu ture change Pr mates Foss hom nids and the r too s. Race, var ation and hered ty. Env ronment and human b o ogy Preh stor c cu ture and society *General Studies: SB*

ASM 241 Biology of Race. (3) F S
Human var at on and ts nterpretation n an evo ut onary context

ASM 301 Peopling of the World. (3) S
Course rev ews a evidence for human d s persa dur ng the ast 100,000 years or g ns of anguage cu tures races and beg nn ngs of modern humans Prerequ s te ASM 101 *Gen eral Stud es SB.*

ASM 338 Anthropological Field Session. 2–8 S
Anthropological f e d techn ques analys s of data and preparat on of f e d reports May be repeated f r credit Prerequ s te nstructor ap- prova

ASM 341 Human Osteology. 4 F
Osteo ogy human pa eonto ogy and osteom etry Descr ption and ana ys s of archaeo og ca and contemporary human popu at ons 3 hours ecture, 3 hours ab Prerequ s te ASM 101 or nstructor approval

ASM 342 Human Biological Variat'on. (4) S
Evo ut onary nterpretat ons of b olog cal vana t on n v ng human popu at ons w th empha- s s on anthropo og ca genet cs and adapta- t on Nutr tion and d sease and the r re at on to genet cs and behav or. 3 hours ecture 3 hours lab Prerequ'sites ASM 101 and MAT 106 (or equ va ent *or* nstructor approva *Genera Stud es S2*

ASM 343 Primatology. 3 F
Evo ut n and adaptat ons of nonhuman pn mates, emphas z ng soc al behav or ncludes mater al from foss ev dence and f e d and aboratory stud es n behav or and bio ogy Prerequ s te ASM 101 or nstructor approval

ASM 344 Fossil Hominids. 3) N
Anc ent Afr can, As'an and European human and pr mate skeleta , dental, and cu tura re- ma ns Human b o gica behav ora , and cu tura evo ut on Prerequ s te ASM 101 or n structor approva *Genera Stud es. H*

ASM 345 Disease and Human Evolution. (3) F
Interact on of peop e and pathogens from pre h storic t mes to the present with emphas s on d sease as an agent of genet c select on Pre requ s te ASM 101 or nstructor approva

ASM 346 Human Origins. 3) S
Human ty's p ace n nature foss ls h storic and recent concepts of human races, nf u ence of cu ture on human evo ut on

ASM 348 Social Issues in Human Genetics. 3) S
Mora and soc a mp cat'ons of deve opments in genet c science part'cu ar y as they affect reproduction med c ne, and evo ut on *Gen- eral Stud es SB*

ASM 365 Laboratory Methods in Archaeol- ogy. 4) N
Techn ques of artifact ana ys s Bas c ar chaeo og cal research techn ques methods of report wr t ng. May be repeated for cred t for tota of 8 hours Prerequ s te· ASM 101 or n structor approva

ASM 435 Archaeological Pollen Analysis. (3 F
Theory methodo ogy and pract ce of po en ana yt c techn ques Compares uses n bot any geo ogy and archaeology 2 hours ec ture 3 hours ab poss b e f e d tr ps Prerequ s te nstructor approva

ASM 450 Bioarchaeology. 3) S
Surveys archaeo ogical and phys ca anthro polog ca methods and theor es for evaluat ng ske eta and buna rema ns to reconstruct b ocu tura adaptat on and ifeways Prerequi s te ASM 101 or nstructor approva .

ASM 452 Dental Anthropology. (4) F
Human and pr mate denta morpho ogy, growth, evo ut on, and genet cs W th n- and between group var at on. Denta patho ogy and behaviora -cu tura dietary factors 3 hours ecture 3 hours ab Prerequ s te: n- structor approva . *General Stud es S2.*

ASM 454 Comparative Primate Anatomy. (4 S
Functiona anatomy of the cran al, dental, and locomotor apparatus of pr mates nc ud ng hu- mans, emphas z ng the re ation of morphology to behav or and env ronment 3 hours ecture, 3 hours ab d ssect ons demonstrat ons. Pre requ s te 'nstructor approva

ASM 455 Primate Behavior Laboratory. (3) N
nstruction and practice n methods of obser vation and ana ys s of primate behav or D s cuss on of the re ationsh p between c ass work on capt ve an ma s and f e d techn ques for studying free rang ng groups D rected read- ngs 6 hours ab Prerequisites ASM 343 n structor approva *General Stud es L2*

ASM 465 Quantification and Analysis for Anthropologists. 3) S
Stat stical quant tat ve, and geometnc strate g es for env s on ng and exp or ng archaeo og ca phys ca anthropolog ca b oarchaeo- og ca , and soc ocultural data. Univar ate and mu tivar ate methods. Prerequ s tes ntroduc- tory stat st ca course nstructor approva

ASM 472 Archaeological Ceramics. (3 N
Ana ys s and dent f cat on of pottery wares types and variet es Systems for ceramic c assif cation and cu tura nterpretat on. 2 hours ecture 3 hours lab Prerequ s te: n- structor approval

ASM 507 Anthropological Study of Dis- ease. (3 A
n depth ntroduct on to the study of disease processes from an anthropolog ca perspec tive Lecture, sem nar Prerequ s te graduate stand ng or nstructor approva

ASM 548 Geoarchaeology. 3) F
Geo ogic context re evant to archaeolog ca research Top cs nc ude sed ments depos t on env ronments, so s anthropogenic and b ogen c depos ts and quaternary chrono ogy Prerequisite nstructor approva

ASM 555 Advanced Human Osteology. (3) N
Laboratory and field techn ques in deal ng w th the human ske eton Emphasis on prepara t on, dent f cat on, rad ography sect on'ng mi- croscopy and data process ng 1 hour lecture, 6 hours ab Prerequ s te ASM 341 or nstruc- tor approva

ASM 565 Quantitative Archaeology. (3) S
Forma methods of structuring cod'fy ng, and analyz ng data for archaeo og ca problems Des gn ng research to y eld data amenable 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 ys s, e g Bayes an and Monte Car o approaches s mu at on, d vers ty May be repeated for cred t Prerequ s te ASM 565 or instructor approval

ASM 573 Lithic Analysis. (3) N
Analys s and interpretation of ch pped stone artifacts Focus on both techn'ques and un der y ng concepts and the r appl cat on to real col ect ons. Prerequ s te nstructor approval

ASM 591 Seminar. (3) N
Se ected top cs in archaeology and phys ca anthropo ogy
(a) B oarchaeo ogy
(b) Evolut on and Cu ture
Cross sted as ASB 591.
(c) Interdepartmenta Sem nar
Cross isted as ASB 591.
(d) Phys ca Anthropo ogy
(e) Primates and Behav or

Department of Biology

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FAGAN, FEWELL NEWFELD, ORCH NIK, RAWLS

ACADEMIC PROFESSIONALS
DOUGLAS, KAZ LEK

RESEARCH PROFESSOR
PEARSON

RESEARCH ASSOCIATE PROFESSOR
DAVIDSON

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 mathematics proficiency. 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	353	Cell Biology	3
BIO	360	Basic Physiology	4
		or MIC 360 Bacterial Physiology (3	
		or PLB 308 Plant Physiology (3)	
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* (3 [1]	
CHM	235	Elementary Organic Chemistry Laboratory *S1/S2* 1)[1]	
		or	
CHM	331, 332	General Organic Chemistry 6)	
CHM	335, 336	General Organic Chemistry Laboratory 2	
MAT	210	Brief Calculus *N1*	3
		or any calculus	
PHY	101	Introduction to Physics *S1/S2*	4
		or PHY 111, 112 General Physics *S1/S2* 6 [2]	
		and PHY 113, 114 General Physics Laboratory *S1 S2* (2 [2]	
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	217	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 two 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, 332	General Organic Chemistry (6)	
	CHM 335, 336	General Organic Chemistry Laboratory (2	
MAT	210	Brief Calculus *N1* or any calculus	3
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* or BIO 181 General Biology *S1/S2* 4) and BIO 182 General Biology *S2* (4)	4
BIO	311	Biology and Society	3
BIO	320	Fundamentals of Ecology or BIO 445 Organic Evolution (3)	3
BIO	340	General Genetics	4
BIO	419	Research Colloquium in Biology and Society	6
MAT	210	Brief Calculus *N1* or any calculus	3
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* 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	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* or PLB 310 The Flora of Arizona (4 or BIO 385 Comparative Invertebrate Zoology 4) or BIO 370 Vertebrate Zoology 4	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] or GLG 300 Geology of Arizona 3	3
HPS	330	History of Biology: Conflicts and Controversies *H* or BIO 316 History of Biology: Conflicts and Controversies *H* 3	3
MAT	70	Precalculus *N1*	3
PHY	101	Introduction to Physics *S1/S2* or PHY 111, 112 General Physics *S1/S2* 6)[2] and PHY 113, 114 General Physics Laboratory *S1/S2* (2)[2]	4
Total			22

[1] Both GLG 102 and 104 must be taken to secure S2 credit.

[2] Both PHY 111 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 sub disciplines 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) F, S
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
Bio ogica concepts emphasizing fundamenta princ p es and the nterp ay of structure and funct on at the mo ecular, ce u ar organismal, and popu ation eve s of organ zat on. Second ary schoo chem stry strong y recommended. 3 hours ecture 3 hours ab. Prerequ s te bio- og cal sc ences major or preprofess'onal stu dent n hea th-re ated sc ences. *General Stud ies. S1 S2.*

BIO 182 General Biology. (4) F S, SS
Cont nuat on of B O 181 Secondary schoo chemistry strong y recommended Prerequ - site BIO 181 *Genera Studies S2*

BIO 193 The Nature of Biological Science. (4) F
Creative and cr t cal th nk ng sk ls n biological research; nature of b o og ca know edge; ro e of experimentation, pred ctions hypotheses, theories va ues Lecture ab, d scuss on. Pre requ site. high schoo biology. *General Stud ies S1/S2*

BIO 201 Human Anatomy and Physiology I. (4) F, S, SS
Structure and dynam cs of the human mecha- n sm Cannot be used for major credit n the Department of B o ogy 3 hours lecture, 3 hours ab. *General Studies S2*

BIO 202 Human Anatomy and Physiology II. (4) F, S, SS
Continuation of BIO 201. Cannot be used for major cred t in the Department of B'ology 3 hours lecture, 3 hours ab. Prerequ site: B O 201 or nstructor approva

BIO 217 Conservation Biology. (3) F
The scient f c and techn ca means for man agement, ma ntenance protect on, and resto- rat on of b o og ca resources on th s p anet Prerequis'te: 8 hours of b o ogy

BIO 218 Medical History. (1) F
Br ef survey of humankind's mportant nven- t ons and d scoveries n the art and science of medicine, I ustrat ng nterrelat onships of med ca deas

BIO 241 Human Genetics. (4) F
ntroduct on to bas c concepts in genet cs as they are appl ed to human hered ty Cannot be used for major cred t n the Department of B - o ogy. 3 hours ecture 3 hours ab. Prerequ s te a course in the fe sciences *General Studies S2.*

BIO 280 Animal Behavior. (3) F
Evo ut onary genet c phys o og ca and eco logica bases of an ma behav or Prerequ s te 4 hours of B O or nstructor approva

BIO 300 Natural History of Arizona. (3) F, S
Plant and an ma communities of Ar zona Cannot be used for major credit in the bio og - ca sc ences Prerequ s te jun or stand ng.

BIO 301 Field Natural History. (1) F, S
Organisms and the r natural environment 2 weekend f eld trips, f e d project. Cannot be used for major credit in the b ological sc' ences. Pre or corequ s te B O 300

BIO 302 Cancer and Heart Disease. (3) F
ncidence and morta ty stat stics for cancer and heart d sease host and env ronmenta r sk factors diagnos s treatment and preven- tion strateg es Cannot be counted toward a Bio ogy major Prerequ s tes: 12 hours in ife sc ences and CHM 231 (or equiva ent) and an L1 course *or* nstructor approva *Genera Stud es L2*

BIO 303 Radiation and Life. (3) S
Benefits and r sks of radiat on exposure n so c ety, medica appl cat ons, food rrad at on, nuc ear power, so ar UV popu ation hea th ef fects. Cannot be counted toward a B o ogy major Prerequis'tes· 12 hours n fe sciences and CHM 231 (or equ va ent) and an L1 course *or* nstructor approva *General Stud 'es. L2*

BIO 304 Radiation Medicine and Biology. 3 F
Uses of rad at on in med c ne, nc ud ng CT, diagnost c x-ray, MRI, nuc ear med c ne, u tra- sound, bio og cal effects of rad at on w th em phas s on cancer Prerequ sites 12 hours n fe sciences and PHY 112 and an L1 course *or* instructor approva *General Stud es· L2*

BIO 310 Special Problems and Techniques. (1 3) F, S
Qual f ed undergraduates may nvestigate a spec f'c b o og ca prob em under the d'rect on of a faculty member May be repeated for a to- ta of 6 semester hours Prerequ s tes forma conference with the nstructor approval of the problem by the nstructor and department cha r.

BIO 311 Biology and Society. (3) S
Explores nteract ons between b o og'ca sc' ences and soc ety, e g , b omed ca environ- menta eth ca h stor ca ega ph osophical, pol tical, and soc a ssues Lecture, discus- sion Prerequ s te· B O 193 (or B O 100) *or* BIO 181 and 182.

BIO 316 History of Biology: Conflicts and Controversies. (3) N
Focuses on 19th and 20th centur es, cons der ng b ology as a disc pl ne, evo ut on, and prob ems of hered ty development, and ce l theory. Cross isted as HPS 330 *General Studies: H.*

BIO 318 History of Medicine. (3) N
Scient fic study of the human body changing theories of d sease evolut on of practical op n ons on treatment and the emerg ng 'nst tu t ona zation of medical pract ce Cross- sted as HPS 331 *General Studies H*

BIO 319 Environmental Science (Nonmajor). (3) F
Environmenta and bio og cal concepts used to understand eco og ca systems w th spec fic references to prob ems caused by humans Cannot be used for major cred t in the b ologi cal sc ences Cred t is al owed on y for BIO 319 or PLB 320. Cross l sted as PLB 320 *General Studies. G.*

BIO 320 Fundamentals of Ecology. (3) F S
Organ zation functioning and deve opment of ecological systems energy f ow b ogeochem- ca cyc ng· environmenta relat ons, popu a- t'on dynamics. Prerequ site: BIO 182 or n structor approva .

BIO 321 Introductory Ecology Laboratory. (3) S
Laboratory and field observations and exper ments to test current concepts and theor es n eco ogy Lab Pre or corequ s te B O 320 *General Studies: L2*

BIO 336 Sociobiology. (3) S
Survey of an ma and human soc a behavior exam ned from an evo ut onary perspective. Su table for nonmajors BIO 280 s recom- mended

BIO 340 General Genetics. 4) F S, SS
Sc ence of heredity and var at on 3 hours lec ture, 1 hour rec tation Prerequis te B O 182

BIO 343 Genetic Engineering and Society. (4) F
Introduct on to genet c eng neer ng, w th em phasis on appl cat ons (gene therapy, DNA fingerprint ng, b oremed ation transgen'c an ma s and p ants) Lecture, ab. Cross- sted as PLB 352. Prerequ site: B O 181 or equiva ent

BIO 351 Developmental Anatomy. (3) F
General deve opmental b o ogy (embryo ogy) and comparative structure of organ systems I ustrated ma nly by vertebrate examp es Pre requ site· BIO 182

BIO 352 Laboratory in Vertebrate Developmental Anatomy. (2) F, S
Morpho ogy of representative embryonic and adu t vertebrates 2 3 hour abs B O 351 rec- ommended Prerequ s te B O 182

BIO 353 Cell Biology. (3) F
Survey of major top cs in ce bio ogy, nclud ng structural, biochem ca and mo ecu ar as pects of cel funct on Prerequ s te B O 182

BIO 360 Basic Physiology. (4) F S
Physio og ca mechan sms of the h gher verte brates 3 hours ecture 3 hours ab Prerequ s tes B O 182; CHM 115; MAT 117

BIO 370 Vertebrate Zoology. (4 F S
Character stics c assif cation evolut on, and natural h story of the major groups of verte brate an mals 3 hours ecture, 3 hours ab. Prerequ s te B O 182

BIO 385 Comparative Invertebrate Zoology. (4) F
Character stics ife cyc es adaptat ons, and evo ut on of nvertebrate an ma s 3 hours lec ture, 3 hours ab. Prerequ site· B O 182 or n- structor approva

BIO 386 General Entomology. (4) S 2000
Form, act v ties and c assif cation of 'nsects 3 hours lecture, 3 hours ab. Prerequ s te B O 182.

BIO 394 Special Topics. (2 3) N
Top cs of current or spec a nterest n one or more aspects of an mal b o ogy. Top cs vary. Cannot be used for major cred t n fe sc - ences Prerequ s te jun or stand ng

BIO 406 Computer Applications in Biology. (3) F
Computer ana ys s techn ques n biology, em phas z ng data entry, graph c portrayal, and management and ana ys s Emp oys ma n frame and m crocomputers Credit s a owed on y for BIO 406 or PLB 432 Cross l sted as PLB 432 Prerequ s tes· BIO 182 and MAT 117 (or 210) *or* nstructor approva . *Genera Studies. N3*

NOTE. For the General Stud es requirement codes (such as L1, N3 C and H), and courses, see pages 84–108 For graduat on requ rements see pages 79–83 For omn bus courses offered but not l sted in th s cata og, see pages 56–57

BIO 410 Techniques in Wildlife Conservation Biology. 3) F
Fie d and analyt cal techn ques used in evalu at ng populat on structure, viab' ty and env ronmenta impacts Lecture ab. Prerequ sites B O 217 and 320 *or* nstructor approva *General Studies L2*

BIO 411 Advanced Conservation Biology I. (3) F
Princ p es of conservation sc ence b o ogy of threatened spec es, management pr nc p es that meet conservat on goa s emphas zing North American ecosystems. Prerequ s'tes: BIO 217 320

BIO 412 Advanced Conservation Biology II. (3) F
G obal b od vers ty patterns, processes and conservat on, globa env ronmenta change sustainab e use of natura resources; empha- s z ng nternat ona approaches to conservation biology. Prerequ s tes BIO 217 320.

BIO 415 Biometry. (4 F
Statist ca methods appl ed to b o og ca prob ems, des gn of exper ments estimat on, sig- n ficance ana ys s of var ance regression corre at'on ch square and b oassay; the use of computers. Does not sat sfy aboratory re qu rements for the f bera arts genera stud es program 3 hours ecture 3 hours ab Prerequ s te: MAT 210 or equ va ent *General Studies. N2*

BIO 416 Professional Values in Science. (2 3) A
Cons ders issues re ated to va ues n sc ence such as col aborat on, f nances, ega issues, media, mentor ng ownersh p of deas sc en tif c ntegrity D scuss on, student projects Cross sted as HPS 410 *General Studies L2*

BIO 419 Research Colloquium in Biology and Society. (3–6 F S
Deve ops cr t cal think ng ab l ties research methods, and wr t ng skl s for research 'n the interact ons between b o og ca sc ences and soc ety Discussion Prerequisite: BIO 311 or instructor approva

BIO 420 Field Zoology. (3) N
Exper ence n zoologica f eld techn ques Re qu res weekend or longer f e d tr ps Prerequ s te nstructor approva .

BIO 423 Population and Community Ecology. (3) N
Organ zat on and dynam cs of popu ation and communities, emphas z ng an mals Theoreti cal and emp rical approaches Prerequ s te BIO 320 or nstructor approva

BIO 425 Animal Ecology. (3) N
Phys o og ca and behav ora adaptations of nd v dual an ma s to both ab ot c and b otic env ronments Prerequisite. BIO 320

BIO 426 Limnology. 4) S
Structure and funct on of aquatic ecosystems, w th emphas s on freshwater lakes and streams 3 hours ecture, 3 hours lab or f e d trip. Prerequ s te: BIO 320 or instructor ap proval *General Stud es L2*

BIO 428 Biogeography. 3 F
Env'ronmental and h storical processes deter- m n ng d strbut ona patterns of an'ma s and plants emphas z'ng terrestria fe Prerequ s tes BIO 182 (or equ valent) jun or stand ng *Genera Stud es L2*

BIO 435 Research Techniques in Animal Behavior. (3) S 1999
Experimental and f e d stud es of an ma be hav or descr ption and quantf cat on of an ma behavior and nterpretat on of behav or w thin an evo ut onary framework. 1 hour ecture 6 hours lab Prerequisite: BIO 280 *General Stud es' L2.*

BIO 441 Cytogenetics. (3) F 1999
Chromosoma basis of nheritance Cross l sted as PLB 412. Prerequ s te B O 340

BIO 442 Cytogenetics Laboratory. (2) F 1999
Microscop c ana ys s of me os s m tos s and aberrant cel d v's on 6 hours ab. Cross- sted as PLB 413 Pre- or coreq u site B O 441 or PLB 412.

BIO 445 Organic Evolution. (3) F
Processes of adapt ve change and spec at on n sexua popu at ons. Prerequ s te B O 241 or 340

BIO 446 Principles of Human Genetics. 3) A
Genet cs 'n human popu at ons nc ud ng med ca aspects Prerequ s te BIO 340 *Gen eral Stud es L2*

BIO 450 Advanced Developmental Biology. (3) S
Current concepts and exper menta methods nvo v ng d fferentiat on and b osynthet c act v' t es of ce s and organ sms w th examples from microorgan sms plants and an ma s. Prerequ s te B O 351.

BIO 453 Animal Histology. 4) S
M croscopic study of an mal t ssues 3 hours ecture, 3 hours lab Prerequisite: BIO 182 or nstructor approva .

BIO 454 Aquatic Insects. (3) N
Systemat cs and ecology of aquat c nsects. Prerequ site B O 386.

BIO 464 Photobiology. (3) F 1998
Princ ples underlying the effects of ght on growth deve opment and behav or of p ants anima s, and m croorgan sms. Cross sted as PLB 440 Prerequis tes: CHM 231 (or 331) 12 hours of courses n fe sc ences

BIO 465 Neurophysiology. (3) S 2000
Deta ed treatment of ce u ar and organismal neurophys ology and nervous system function Prerequ s te B O 360.

BIO 466 Neurophysiology Laboratory. (2) S 2000
ntrace lular and extrace u ar e ectrophys olog ca record ng techn ques, histolog cal preparat ons and dye f ling techn ques. 6 hours lab Pre or coreq u s te B O 465

BIO 470 Systematic Zoology. (4) S 1999
Ph losophy theory pract ce of nterpret ng an mal divers ty nc ud ng spec es concepts spec at on, nomenc ature, and evo utionary and phylogenetic c ass f cat on emphas z ng phylogenetics 3 hours lecture, 3 hours ab. Prerequisites. jun or standing 18 hours n fe sc ences. *General Studies' L2.*

BIO 471 Ornithology. (3) S
The b o ogy of b rds 2 hours ecture 3 hours ab, weekend fie d trips Prerequ s te BIO 370 or nstructor approva

BIO 472 Mammalogy. (4) F 1998
C ass fcat on structure habits, eco ogy, and d str but on of mammals emphasizing North American forms 3 hours lecture 3 hours ab or f e d tr p weekend field tr ps Prerequis te BIO 370 or nstructor approva

BIO 473 Ichthyology. 3) S 1999
Systemat cs and b o ogy of recent and ext nct f shes. 2 hours ecture 3 hours lab or f e d trip weekend f e d tr ps required 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 repti es and amphib ans 2 hours lecture, 3 hours ab or fie d tr p Prerequ s te: B O 370

BIO 480 Methods of Teaching Biology. (3) S
Methods of instruct on, experimentation orga n zat on, and presentat on of appropriate con tent n b o ogy. Prerequ s te 20 hours in the b o og'ca sc ences

BIO 495 Undergraduate Thesis. (3) F, S, SS
Gu ded research culm nating n the prepara t on of an undergraduate thes s based on su pervised research done 'n th s and prev ous semesters Prerequisites at east 3 hours of B O 310 (or 499) forma conference with n structor nstructor and department chair ap prova

BIO 502 Transmission Electron Microscopy. 3) F
Theory, use, and methods of preparing b o- logica mater a s for transm ssion e ectron m croscopy Mater a s fee Lecture, ab. Pre requ site: nstructor approval.

BIO 505 Scanning Electron Microscopy. (3 S
Theory, use, and methods of preparing bio log'ca materia s for scann ng electron m cros copy Materia s fee 2 hours ecture, 3 hours lab Prerequ site: nstructor approva

BIO 508 Scientific Data Presentation. (2) S
Techniques necessary for presentat on of sci entif c data used in journa pub icat ons grant proposa s and v sua presentations Lecture ab Prerequ site: nstructor approva

BIO 520 Biology of the Desert. (2) N
Factors affect ng p ant and anima l fe in the desert reg ons and adaptat ons of the organ sms to these factors Prerequisite: 10 hours of b o ogical sc ences or nstructor approval

BIO 522 Populations: Evolutionary Ecology. 3 S
Pr nciples of popu at on biology and commu n ty eco ogy with n an evo ut onary framework 2 hours lecture, 2 hours rec tat on. Prerequ' s tes. BIO 320 415 (or MAT 210) 545

BIO 524 Ecosystems. (3) F 1999
Structure and function of terrestr a and aquat c ecosystems w th emphas s on pro duct v ty energet cs, biogeochem cal cyc ing and systems integration Prerequ'site: BIO 320 or equ va ent

BIO 526 Quantitative Ecology. (3) N
Samp ng strateg es, spatial pattern analys s spec es d vers ty, c ass f cat on, and app ca- tions of mu t var'ate techniques to ecology 2 hours ecture 3 hours lab Prerequis tes B O 415 (or equivalent); a course n eco ogy

BIO 529 Advanced Limnology. (3) N
Recent iterature, deve opments, methods, and mnolog ca theory' f eld and ab appl ca tion to some part cu ar top c in mno ogy Pre requ 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 Prerequ s tes B O 340, a course n organ c chem stry

BIO 545 Populations: Evolutionary Genetics. (3) F
Mathemat ca models n the descript on and ana ys s of the genet cs of popu at ons Pre requis tes BIO 320 and 415 and 445 *or* n structor approval

BIO 547 Techniques in Evolutionary Genetics. 4 S
Pract ca exper ence in modern techniques for the study of evo ut on. Lecture, ab Prerequ s tes BIO 340 445, 'nstructor approva

BIO 550 Advanced Cell Biology. 3 S
App icat ons of contemporary e ectro m cro scop'c and b ochem cal/mo ecu ar techn ques for study ng eukaryot c ce funct ons Mecha nisms of ntrace lular prote n traff ck ng. Pre requ's tes: BIO 353 or 360 or equ va ent or PLB 360) CHM 231 or 331 or equ va ent

BIO 551 Biomembranes. (3 N
Structure and funct on of b o og ca mem branes, emphas z ng synthes s f u d ty exocy tos s endocytos s and cel responses to hor mones and neurotransm tters Prerequ s tes B O 353 (or equ va ent); CHM 231 (or 331 or equ va ent

BIO 552 Developmental Genetics. (3 F 1998
Genet c approaches to the ana ys s of deve opment during the ! fe cyc e of eukaryot c or gan sms and the ro e of genes n the unfo d ng of the different ated phenotype Prerequ s te B O 340

BIO 560 Comparative Physiology. (3) S 1999
The ana ys s of funct on 'n nvertebrates and vertebrates emphas z ng evo ut onary trends n physiolog cal systems Prerequ s te B O 360 or equ va ent

BIO 566 Environmental Physio ogy. (3) S 2000
Phys olog ca responses and adaptat ons of an ma s to var ous aspects of the phys'ca en v ronment Prerequ s tes BIO 320 360.

BIO 568 Mammalian Physiology. (3 F 1999
Deta ed treatment of mamma an organ sys tem funct ons emphas z ng 'ntegrative mecha nisms Prerequis te BIO 360 or equ va ent

BIO 569 Cellular Physiology. (3 F 1998
Emphas z g the mo ecu ar basis for ce structure and funct on Prerequ s tes B O 360 organ c chem stry

BIO 584 Internship. (1 12 F, S

BIO 591 Seminar. (1 3) F S
Top cs such as the f ow ng are offered
(a) Adaptat ons
(b) Behav or
(c) Ce B o ogy
(d) Eco ogy
(e) Evo ut on
(f) Genetic Eng neer ng
g) Genet cs
h) Phys o ogy
May be repeated for cred t

Department of Chemistry and Biochemistry

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REGENTS' PROFESSORS
ANGELL, BUSECK, C. MOORE, O'KEEFFE PETTIT

PROFESSORS
BALASUBRAMAN AN, BIEBER, BIRK, BLANKENSHIP BROWN CRONIN, FUCHS GLAUNSINGER, GLICK, GUST, HOLLOWAY, LOHR, McMILLAN, A. MOORE, T MOORE, MUNK, PETUSKEY, ROSE, SKIBO, STEIMLE, WILLIAMS

ASSOCIATE PROFESSORS
ALLEN, WOLF, WOODBURY

ASSISTANT PROFESSORS
BLOOM, BOOKSH CAUDLE, HAYES, KOUVETAKIS PENA YAGH

CHEMISTRY—B.A.

The B.A degree in Chemistry consists of 46 semester hours Required courses are as follow s:

Choose between the two combinations of courses below		9
CHM 113	General Chemistry *S1/S2* (4)	
CHM 115	General Chemistry with Qualitative Analys s *S1/S2* (5	
	or	
CHM 117	General Chemistry for Majors I *S1/S2* (4)*	
CHM 118	General Chemistry for Majors II *S1/S2* 5)*	
CHM 325	Analytical Chemistry	3
CHM 326	Analytical Chemistry Laboratory	1
Choose between the two combinations of courses 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, 332	General Organic Chemistry (6)	
CHM 335, 336	General Organic Chemistry Laboratory (2)	
CHM 341	Elementary Physical Chemistry	3
CHM 343	Physical Chemistry Laboratory	1
CHM 453	Inorganic Chemistry	3
Total		29 or 28

* CHM 117, 118, 317, 318, 319, and 320 are strongly recommended for qualified students

Related courses must include the fol lowing·

MAT 270	Calculus with Analytic Geometry I *NI*[1]	4
MAT 271	Calculus with Analytic Geometry II[1]	4
PHY 11 , 112	General Physics *S1/S2*[2, 3]	6
PHY 113, 114	General Physics Laboratory *S1/S2*[2, 3]	2
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 two combinations of courses 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)[1]	
CHM 118	General Chemistry for Majors II *S1/S2* (5)[1]	

NOTE· For the General Stud es requ'rement, codes (such as L1 N3 C and H) and courses see pages 84–108. For graduation requirements, see pages 79–83 For omn bus courses offered but not sted n th s catalog see pages 56–57

Choose between the two combinations of courses below .. .. 9 or 8

CHM	317	Organic Chemistry for Majors I 3)[1]
CHM	318	Organic Chemistry for Majors II (3 [1]
CHM	319	Organic Chemistry Laboratory for Ma ors I (1)[1]
CHM	320	Organic Chemistry Laboratory for Majors II (2)[1]
		or
CHM	331, 332	General Organic Chemistry (6)
CHM	335, 336	General Organic Chemistry Laboratory 2)

Total .... 18 or 17

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 1
CHM	441, 442	General Physical Chemistry 6
CHM	444	General Physical Chemistry Laboratory *L2*[2] . 2
CHM	452	Inorganic Chemistry Laboratory *L2*[2] 1 2
CHM	453	Inorganic Chemistry 3

Total 20–21

[1] CHM 117, 118, 317, 318, 319, and 320 are strongly recommended for qualified students

[2] 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 ad visor. With the consent of the depart ment chair, selected advanced courses from other related scientific disciplines may be accepted in lieu of elective chemistry courses to complete the ma jor.

Additional required related field courses are as follows:

Choose between the two combinations of courses below 15 or 13

MAT	270	Calculus with Analytic Geometry I *N1* (4)
MAT	271	Calculus with Analytic Geometry II (4)
MAT	272	Calculus with Analytic Geometry III 4)
MAT	274	Ditferential Equations 3
		or
MAT	274	Differential Equations 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*- 1
PHY	294	University Physics III 3

Total . . .. 26 or 24

[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

Strongly recommended is an appro priate course in computer language, such as CSE 181 Applied Problem Solving with BASIC or CSE 183 Ap plied Problem Solving with FOR TRAN.

Transfer students are interviewed and advised of possible preparatory work. They must contact the depart ment to arrange for the interview in advance of registration. See "Major Re quirements," page 306.

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 under graduate professional training in chem istry Graduates meeting ACS guide lines can receive a certificate to indicate this fact

Emphasis in Biochemistry. The major in Chemistry with an emphasis in bio chemistry consists of 38 semester hours in chemistry plus work in related fields. Required courses are as follows:

Choose between the two combinations of courses 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)
		——*or*
CHM	117	General Chemistry for Majors I *S1/S2* (4)[1]
CHM	118	General Chemistry for Majors II *S1/S2* (5)[1]

Choose between the three combinations of courses 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 (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, 332	General Organic Chemistry (6)
CHM	335, 336	General Organic Chemistry Laboratory (2

CHM	325	Analytical Chemistry 3

Choose between the two combinations of courses below 8

CHM	341	Elementary Physical Chemistry (3)
CHM	463	Biophysical Chemistry (3)
CHM	464	Biophysical Chemistry Laboratory *L2* (2)[2]
		or
CHM	441, 442	General Physical Chemistry (6)
CHM	444	General Physical Chemistry Laboratory *L2* (2)[3]
CHM	453	Inorganic Chemistry 3
CHM	461, 462	General Biochemistry 6
CHM	467	General Biochemistry Laboratory *L2*[2] 2

Total . ... 38 or 40

[1] CHM 117 and 118 are strongly recom mended for qualified students.

[2] Both CHM 464 and 467 must be taken to secure L2 credit.

NOTE For the Genera Stud es requ rement, codes (such as L1 N3 C and H) and courses see pages 84 108. For graduat on requirements, see pages 79–83. For omnibus courses offered but not isted n th s cata og, see pages 56–57

[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 two combinations of courses below			12 or 10
MAT	270	Calculus with Analytic Geometry I *N1*	(4
MAT	271	Calculus with Analytic Geometry II	4
MAT	272	Calculus with Analytic Geometry III	(4)
		or	
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]	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 *S1/S2*[1]	4
CHM	115	General Chemistry with Qualitative Analysis *S1/S2*	5
		or CHM 116 General Chemistry *S1/S2* (4)	
CHM	421	Instrumental Analysis	3
CHM	422	Instrumental Analysis Laboratory	1
Choose between the two combinations of courses below			7 or 8
CHM	231	Elementary Organic Chemistry *S1/S2* (3[2]	
CHM	235	Elementary Organic Chemistry Laboratory *S1/S2* (1)[2]	
CHM	361	Principles of Biochemistry (3)	
		or	
CHM	331, 332	General Organic Chemistry	6
CHM	335, 336	General Organic Chemistry Laboratory	2
Choose between the two combinations of courses below			4 or 8
CHM	341	Elementary Physical Chemistry 3[1]	
CHM	343	Physical Chemistry Laboratory 1[1]	
		or	
CHM	441, 442	General Physical Chemistry (6	
CHM	444	General Physical Chemistry Laboratory *L2* 2[3]	
Minimum total			24

[1] 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	
CHM	331, 332	General Organic Chemistry	6
CHM	335, 336	General Organic Chemistry Laboratory	6
CHM	341	Elementary Physical Chemistry	3
		or CHM 441, 442 General Physical Chemistry	6
CHM	361	Principles of Biochemistry	3
CHM	480	Methods of Teaching Chemistry	3
		or PHY 480 Methods of Teaching Physics	3
Total			34

The remaining chemistry courses to complete the specialization 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	4
PHY	111, 112	General Physics *S1/S2**	6
PHY	113, 114	General Physics Laboratory *S1/S2**	2
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.

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 two combinations of courses below			10 or 12
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, 332	General Organic Chemistry 6	
CHM	335, 336	General Organic Chemistry Laboratory 6	
CHM	341	Elementary Physical Chemistry	3
Total			22 or 24

* 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 Bonnie Engel, PS D121, 602 965-0743.

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 students credit. Normally followed by CHM 231. 3 hours lecture, 1 hour discussion, 2 hours lab. Credit is allowed for only one of CHM 101, 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. *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 one of CHM 101, 113, 114, or 117. Prerequisite: MAT 106 or 3 semesters of high school algebra. 1 year of high school chemistry. *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 one of CHM 101, 113, 114, or 117, and for only one of 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. 3 hours lecture, 2 hours discussion, 4 hours lab. Credit is allowed for only one of 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 one of 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, 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. Prior or corequisite: CHM 231. *General Studies S1, S2 (if credit also earned in CHM 231)*

CHM 302 Environmental Chemistry. 3) S
Exploring 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, reaction mechanisms and kinetics, and systematic syntheses of organic compounds. Credit is allowed for *only* CHM 231, 317, or 331. Prerequisite: CHM 115 or 118. Corequisite: CHM 319

CHM 318 Organic Chemistry for Majors II. 3 S
Continuation of CHM 317. Credit is allowed for *only* CHM 318 or 332. Prerequisite: CHM 317. Corequisite: CHM 320.

CHM 319 Organic Chemistry Laboratory for Majors I. 1) F
Emphasis on mechanisms, kinetics, and products of organic reactions. 1 conference, 3 hours lab. Credit is allowed for *only* CHM 319 or 335. Prior or corequisite: CHM 317

CHM 320 Organic Chemistry Laboratory for Majors II. (2) S
Continuation of CHM 319. 1 conference, 7 hours lab. Credit is allowed for *only* CHM 320 or 336. Prerequisite: CHM 319. Corequisite: CHM 318

CHM 325 Analytical Chemistry. (3) F, SS
Principles and methods of chemical analysis. Prerequisite: CHM 115 or 116

CHM 326 Analytical Chemistry Laboratory. (1 F, SS
Experiments in chemical analysis. 4 hours lab. Corequisite: CHM 325

CHM 331 General Organic Chemistry. (3) F, S, SS
Chemistry of organic compounds. Credit is allowed for *only* CHM 231, 317, or 331. Prerequisite: CHM 115 or 116 or 118

CHM 332 General Organic Chemistry. (3) F, S, SS
Continuation of CHM 331. Credit is allowed for *only* CHM 318 or 332. Prerequisite: CHM 331

CHM 335 General Organic Chemistry Laboratory. 1) F, S, SS
Microscale organic chemical experiments in separation techniques, synthesis, analysis and identification, and reactivity. 4 hours lab. Credit is allowed for *only* CHM 319 or 335. Corequisite: CHM 331.

CHM 336 General Organic Chemistry Laboratory. (1) F, S, SS
Continuation of CHM 335. 4 hours lab. Credit is allowed for *only* CHM 320 or 336. Prerequisite. CHM 335. Corequisite· CHM 332.

CHM 341 Elementary Physical Chemistry. (3) F
Thermodynamics, equilibrium states of matter, solutions, and chemical kinetics. For students in premedical, biological, and educational curricula. Not open to students who have taken CHM 441. Prerequisites: CHM 115 (or 114 or 118 or 325) 231 (or 331) MAT 271, PHY 112

CHM 343 Physical Chemistry Laboratory. (1) F
Physical chemistry experiments. 1 hour conference, 3 hours lab. Credit is allowed for *only* CHM 343 or 444. Corequisite CHM 341 or 441

CHM 361 Principles of Biochemistry. (3) F, SS
Structures, properties, and functions of proteins, enzymes, nucleic acids, carbohydrates and lipids, the utilization and synthesis of these materials by living systems, and the relationship of these processes to energy production and utilization. Not open to students who have taken CHM 461. Credit is allowed for *only* CHM 361 or 461. Prerequisite. CHM 231 or 318 or 332

CHM 367 Elementary Biochemistry Laboratory. (1 F, SS
Qualitative quantitative analyses of constituents of biological systems, enzyme activity measurements and metabolic studies. 1 hour conference, 3 hours lab. Prior or corequisite CHM 361 or instructor approval

CHM 392 Introduction to Research Techniques. (1 3) F, S, SS
Instrumental methods and philosophy of research by actual participation in chemical research projects. May be repeated for a total of 6 semester hours. Prerequisites· approvals of advisor and research supervisor.

CHM 421 Instrumental Analysis. (3) S
Principles of instrumental methods in chemical analysis. Electroanalytical and optical techniques. Prerequisites. CHM 325, 326. Prior or corequisite. CHM 442

NOTE For the General Studies requirement codes (such as L1, N3, C, and H) and courses, see pages 84–108. For graduation requirements, see pages 79–83. For omnibus courses offered but not listed in this catalog, see pages 56–57.

CHM 422 Instrumental Analysis Laboratory. (2) S
Experiments n chem ca ana ys s by electro analyt 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 iq u d on-exchange, and gel permeation chromatographies and other mportant ndustr a and research techn ques 2 hours ecture 4 hours lab. Prerequ s te CHM 318 or 332 or 442 or nstructor approva .

CHM 431 Qualitative Organic Analysis. (3) S
Systemat c dentif cation of organic compounds 1 hour ecture 6 hours lab Prerequ - s tes CHM 118 (or 326) and 320 (or 336 *or* instructor approval

CHM 441 General Physical Chemistry. (3 F
Laws of thermodynam cs and the r app ica tions, propert es of gases sol ds l qu ds and so utions reaction kinet cs, wave mechan cs molecular spectroscopy, and statist ca ther modynam cs. Cred t s al owed for *only* CHM 341 or 441 Prerequ s tes MAT 272 (or 291 · PHY 241 Corequ s te: MAT 274

CHM 442 General Physical Chemistry. (3) S
Continuat on of CHM 441 Prerequisite CHM 441, MAT 274

CHM 444 General Physical Chemistry Laboratory. (2) S
Phys ca chem ca experiments 1 conference 5 hours ab. Cred t is al owed for *only* CHM 343 or 444 Prerequ s te. CHM 441 *General Studies L2 (if credit also earned in CHM 452)*

CHM 452 Inorganic Chemistry Laboratory. (1–2) S
Preparation and character zat on of typ ca n- organic substances emphas z ng methods and techniques. 1 conference 5 hours ab Prerequ s te: instructor approval *Genera Studies L2 (if credit also earned in CHM 444)*

CHM 453 Inorganic Chemistry. (3) S
Princ p es and app cat ons of inorganic chem stry Prerequ s te CHM 341 or 441.

CHM 461 General Biochemistry. (3) F
Structure, chem stry, and metabo sm of b o mo ecules and the r role n the b ochemica processes of l v ng organ sms Credit is a owed on y for CHM 361 or 461 Prerequisites: CHM 318 (or 332 and 341 (or 441) *or* nstruc tor approval.

CHM 462 General Biochemistry. (3) S
Cont nuation of CHM 461 Prerequ s te CHM 461 or instructor approval.

CHM 463 Biophysical Chemistry. (3) S
Principles of phys cal chem stry as appl ed to b o og ca systems Prerequ site CHM 341 or 441.

CHM 464 Biophysical Chemistry Laboratory. (2) S
Introduct on to phys ca methods n modern b ochemistry Prerequisite CHM 463 *General Studies: L2 (if credit also earned n CHM 467)*

CHM 467 General Biochemistry Laboratory. (2) S
The appl cat on of modern chemica and phys ca methods to biochem ca prob ems, purif cat on and character zat on of b o og ca macromo ecu es; quantitative measurement of enzyme activ ty and properties evaluat on of metabo ic processes 1 conference 5 hours ab. Prerequ'site· CHM 461 *General Studies L2 (if credit also earned n CHM 464)*

CHM 471 Solid-State Chemistry. 3) F
Crysta chem'stry, thermodynam cs and e ec trochem stry of solids nonsto ch ometr c compounds d ffus on and so d state react ons crystal growth, and se ected top cs Pre or corequ s te: CHM 441 or nstructor approva

CHM 480 Methods of Teaching Chemistry. 3 S
Organ zat on and presentation of appropr ate content of chem stry, preparation of reagents experiments, and demonstrat ons, organ za- t on of stock rooms and aboratories exper ence in prob em solving Prerequ s te. nstruc- tor approval

CHM 481 Geochemistry. (3) F
Origin and d str but on of the chemical e e ments. Geochem ca cyc es operating n the earth s atmosphere hydrosphere, and l thos phere Cross sted as 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 onship to the or'gin of the earth so ar system, and universe Cross l sted as GLG 485

CHM 501 Current Topics in Chemistry. (1) F, S
May be repeated for credit Prerequis te n structor approval.

CHM 521 Computer Enhanced Analytical Chemistry. (3) N
Overv ew of chemometric too s n ana yt ca chem stry nc ud ng multivariate ca brat on, spectra deconvolution, and experimental de s gn 2 hours ecture 4 hours lab

CHM 523 Advanced Analytical Chemistry. (3) A
Theoret ca pr nc p es of ana yt ca nstrumen tat on and measurements. Prerequ s tes· CHM 325 and 442 *or* instructor approval.

CHM 525 Spectrochemical Methods of Analysis. (4) N
Theoret ca and pract ca cons derations in- vo v ng the use of opt ca nstruments for chem cal ana yses. Emphasis on state of the art trends 3 hours lecture, 3 hours ab Prerequ s te: CHM 442 or nstructor approval

CHM 526 X-ray Methods of Analysis. (4) N
Theoret ca and pract ca cons derat'ons 'n vo v ng the use of X ray d ffraction and spectroscopy for chem ca and structural analyses. 3 hours lecture, 3 hours ab. Prerequisite CHM 442

CHM 527 Electrical Methods of Chemical Analysis. (4) N
Theoretical and practica cons derat ons of po larograph c, potentiometric, amperometric techn ques, inc ud ng modern e ectrochem ca methods 2 hours ecture, 6 hours ab. Pre requ site. CHM 442

CHM 531 Advanced Organic Chemistry I. (3) F
Reaction mechan sms, react on kinet cs linear free energy relat onsh ps trans tion state theory molecu ar orb ta theory, and Wood ward-Hoffmann ru es. Prerequ sites: CHM 318 (or 332 442

CHM 532 Advanced Organic Chemistry II. (2) S
Continuat on of CHM 531. Prerequis'te· CHM 531

CHM 537 Organic Reactions. (3) S
Important synthetic reactions of organ c chem- stry emphasizing recent y discovered reac- t ons of preparative va ue Prerequisite CHM 531

CHM 541 Advanced Thermodynamics. (3) F
Equi br um thermodynam cs, chem ca reac t ons, and phase equ ibria Introduct on to sta t st cal thermodynam cs crit ca phenomena and kinet cs. Prerequ site· CHM 442

CHM 545 Quantum Chemistry I. (3) F
Basic quantum theory, chem cal bonding and mo ecu ar structure Prerequ s te CHM 442

CHM 546 Quantum Chemistry II. (3) S
Quantum theory of rate processes Princip es of spectroscopy and nonlinear opt cs Pre- requ s te CHM 545.

CHM 548 Chemical Kinetics. (2) N
K netic theory and rate processes Prerequ - site CHM 545

CHM 553 Advanced Inorganic Chemistry. (3) S
Principles of modern norgan c chem stry and the r app cations over the entire periodic system Prerequisites· CHM 442 and 453 *or* equivalents.

CHM 556 Topics in Inorganic Chemistry. (3) N
May be repeated for cred t Prerequisites: CHM 553 instructor approva

CHM 563 Biophysical Chemistry. (3) N
Physical chem stry of macromolecu es, espe- c a ly proteins, nucleic acids and polysaccha- rides Thermodynam cs hydrodynamics and spectroscopy of and the r relat on to structure Prerequis'tes: CHM 442, 462.

CHM 568 Molecular Mechanisms of Photosynthesis. (3) N
Structure and funct on of photosynthet c com- p exes mechanism of energy convers on n p ants, bacteria and model systems Cross- isted as PLB 558 Prerequ s te nstructor ap prova .

CHM 579 Topics in Solid-State Chemistry. (3) N
May be repeated for cred t. Prerequisite: n- structor approva

CHM 582 Topics in Geochemistry and Cosmochemistry. (3) N
Top cs of current nterest for students n chem stry and other fields. Samp 'ng of data and thought concern ng phase equ l bria e e ment d stribution meteorites, the Earth, and other p anets May be repeated for cred t Pre- requisite: nstructor approva

CHM 583 Phase Equilibria and Geochemical Systems. (3) N
Natura react ons at h gh temperatures and pressures· s icate su f de and ox de equi b- r a. Cross l sted as GLG 583

Department of Chicana and Chicano Studies

Vicki L. Ruiz
Chair
(GHALL 212) 602/965–5091
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PROFESSORS
CANDELARIA, PADILLA RUIZ

ASSOCIATE PROFESSOR
ESCOBAR

ASSISTANT PROFESSORS
ALDAMA, HABELL-PALLAN, MAGAÑA

The Chicana and Chicano Studies program is an interdisciplinary 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 professions 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	Introduction to Chicana and Chicano Studies	3
CCS	111	Introduction to Chicana and Chicano Culture	3
CCS	498	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 humanities/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.

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
Historical and contemporary issues in the Chicana and Chicano community focus on economic, sociological, cultural, and political status of Chicanas and Chicanos in the U.S. *General Studies C*

CCS 111 Introduction to Chicana and Chicano Culture. (3) S
Interdisciplinary analysis of customs, values, belief systems, and cultural symbols; special attention is given to cultural continuity and change *General Studies C*

CCS 300 Chicana and Chicano Culture and Society. (3) F
Intensive analysis of how Mexican American writers, artists, film makers, entertainers, and academic ians have interpreted aspects of the Chicana and Chicano experience *General Studies: C.*

CCS 445 Teaching Chicana and Chicano Studies in Native Language. (3) A
Approaches/techniques for infusion of Chicana and Chicano Studies content into elementary and secondary bilingual curriculum Taught in Spanish Prerequisite: proficiency in Spanish

CCS 446 Teaching Chicana and Chicano Studies in the Schools. (3) A
Approaches/techniques for infusion of Chicana and Chicano Studies content into elementary and secondary curriculum designed for teachers who will work with Chicana and Chicano students

CCS 498 Pro-Seminar. (3) A
Required courses for majors on topic selected by instructor writing intensive course related to the development of interdisciplinary research skills

CHICANA AND CHICANO STUDIES (CSH)

CSH 220 Chicana and Chicano Cultural Expression. (3) A
Interrelation between economic social and political status and forms of artistic expression, e, music dance, drama, literature and graphic arts.

CSH 310 Chicana and Chicano Folklore. (3) A
Analysis of Chicana and Chicano folk beliefs, traditions and practices. *General Studies: HU, C*

CSH 350 Mexican and Mexican American Artistic Production. (3) A
Overview of Mexican and Mexican American artistic production from colonial times to present, emphasis on religious and folk art.

CSH 351 Contemporary Chicana and Chicano Art. (3) A
Intensive analysis of contemporary Chicana and Chicano art movement as appraised within the context of contemporary American art and the art of Mexico *General Studies: HU C*

CSH 363 Chicana and Chicano Literature. (3) F
Development of Chicana and Chicano literature study of genres and themes, attention to literary antecedents Cross listed as ENG 363 *General Studies: L2/HU C*

CSH 485 Chicana Writers. (3) A
Critical reading of Mexican American women authors, emphasis on contemporary (post 1970) poetry novels short stories, and essays *General Studies L2/HU, C*

CSH 498 Pro-Seminar. (3) A
Required course for majors on topic selected by instructor: writing intensive course related to the development of interdisciplinary research skills

CHICANA AND CHICANO STUDIES (CSS)

CSS 315 Chicano Family Structures and Perceptions. (3) A
Traditional and changing family relationships, emphasis on gender and intergenerational relations and impact of modern society on traditional family values.

CSS 330 Chicana and Chicano Politics. (3) A
Historical/contemporary analysis of Chicana and Chicano political ideologies, attitudes, strategies and movements relations with governmental agencies, participation in political process

CSS 331 Contemporary Issues in the Chicana and Chicano Community. 3 S
H stor ca demograph c and soc o og ca overv ew of the status of Ch'canas and Ch ca nos n the U S and of sal ent issues affect ng that community. *Genera Studies C*

CSS 336 Issues in Immigration and Migration. (3) A
Historical/contemporary overv ew of Mexican imm grat on into and with n the U.S , factors affecting populat'on movement sett ement patterns and migrants ncorporation nto soc ety. *General Studies C, H*

CSS 340 Chicanas and Chicanos in the U.S. Economy. (3) S
H storical/contemporary analys s of Ch canas and Chicanos' relationsh p with the Amer can econom c system; emphas s on mpact of changing American 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 socia construction of gender identities; emphas s on mpact of American and Mex can cu tura va ues on normat ve gender relat ons *General Studies. C.*

CSS 490 Field Studies in the Chicana and Chicano Community. (3) A
Introduction to pr nc p es and methods of qualitative research appl ed to the Chicana and Chicano commun ty

CSS 498 Pro-Seminar. (3) A
Requ red course for majors on top c se ected by instructor writing ntens ve course re ated to the development of nterd sc'pl nary research ski 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. Faculty and course descriptions appear on pages 216–221.

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

A B.A. or B.S. degree in Economics is offered in both the College of Liberal Arts and Sciences and the College of Business. Faculty, course descriptions, and the major requirements in the College of Business are listed on pages 154–156

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 *N1*	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 offered in sections taught via the "reform" calculus method. The relevant section line numbers are available from the Department of Mathematics. 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 "Major Requirements," page 306.

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 308, 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

NOTE: For the General Studies requirement codes (such as L1 N3, C, and H and courses see pages 84 108 For graduation requirements see pages 79–83 For omnibus courses offered but not listed in this catalog, see pages 56–57.

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 microtions 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 *L2*	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 *L2/SB*	3
ECN	480	Introduction to Econometrics *N2*	3
ECN	494	Public Choice	3
FIN	361	Managerial Finance	3

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 page 390.

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.

Faculty and course descriptions are listed on pages 154–156.

Department of English

Nancy A. Gutierrez
Chair
(LL B504) 602/965–3168
www.asu.edu/clas/english

REGENTS' PROFESSORS
N. DUBIE, R. OS

PROFESSORS
BENDER, BJORK, BOYER, BRACK, BRINK, BUCKINGHAM, CARLSON, DONELSON, HELMS, KEHL, LESTER, LIGHTFOOT, A. NILSEN, D. NILSEN, PARKER-RHODES, RICHARD, ROEN, SANDS, W. LKINS

ASSOCIATE PROFESSORS
ADAMS, BATES, CHANCY, CORSE, DeLAMOTTE, J. DUBIE, GOLDBERG, GREEN, GUTIERREZ, HORAN, JANSSEN, D. B. MAHONEY, MAJOR, M. LLER, MORGAN, NELSON, OJALA, RAMAGE, SCHWALM, SENSIBAR

ASSISTANT PROFESSORS
B. VONA, CASTLE, FUSE, GOGGIN, HARR S, JOHNSON, LUSSIER, McCABE, PERRY, PRITCHARD, STEVENS, TOHE, VAN GELDEREN

SENIOR LECTURERS
COOK, DUGAN

LECTURERS
COOPER, DWYER, KYBURZ, D.M. MAHONEY, OBERME ER, ORLICH, SUDOL, WHEELER

ACADEMIC PROFESSIONAL
GLAU

ENGLISH—B.A.

The B.A. degree in English consists of 45 semester hours in English. Required courses are as follows:

ENG	200	Critical Reading and Writing about Literature *L1/HU*	3
ENG	221, 222	Survey of English Literature *HU, H*	6
ENG	241, 242	American Literature *HU*	6
ENG	312	English in Its Social Setting *HU/SB* or ENG 314 Modern Grammar (3) or ENG 413 History of the English Language *HU* 3)	3
ENG	421	Shakespeare *HU*	3
Total			21

Also required are an upper division course in English literature before 1660, an upper division course in English literature between 1660 and 1900, an upper division course in 20th-century British or American literature, and an upper division course in women's literature or American ethnic literature. Twelve additional hours are free electives chosen from the department's offerings at the 200 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.* At least 18 hours must be in upper division courses.

MINOR IN ENGLISH

The English minor consists of 24 hours in English. Required courses are as follows.

ENG	200	Critical Reading and Writing about Literature *L1/HU*	3
ENG	221	Survey of English Literature *HU, H* or ENG 222 Survey of English Literature *HU H* 3)	3
ENG	241	American Literature *HU* or ENG 242 American Literature *HU* (3)	3
ENG	312	English in Its Social Setting *HU/SB* or ENG 314 Modern Grammar (3) or ENG 413 History of the English Language *HU* (3)	3
ENG	421	Shakespeare *HU*	3
Total			15

Also required is one upper division course in English or American literature. Six additional hours are free electives chosen from the department's offerings at the 200 level or above. A grade of "C" or higher is required in all courses taken for the minor.

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 *L1/HU*	3
ENG	212	English Prose Style *L1* or ENG 215 Strategies of Academic Writing *L1* (3 or ENG 216 Persuasive Writing on Public Issues *L1* (3) or ENG 217 Personal and Exploratory Writing *L1* (3	3
ENG	221, 222	Survey of English Literature *HU H*	6

ENG	241, 242	American Literature *HU*	6
ENG	312	English in Its Social Setting *HU/SB* 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* or ENG 215 Strategies of Academic Writing *LI* (3) or ENG 216 Persuasive Writing on Public Issues *LI* (3) or ENG 217 Personal and Exploratory Writing *LI* (3)	3
ENG	221	Survey of English Literature *HU, H* or ENG 222 Survey of English Literature *HU, H* (3)	3
ENG	241	American Literature *HU* or ENG 242 American Literature *HU* 3)	3
ENG	312	English in Its Social Setting *HU/SB* or ENG 314 Modern Grammar 3)	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 English with concentrations in literature and rhetoric composition and linguistics. Consult the *Graduate Catalog* for requirements.

ENGLISH (ENG)

ENG 101 First-Year Composition. 3) F S SS
Discovering, organizing, and developing ideas in relation to the writer's purpose, subject and audience Emphasis on modes of written discourse and effective use of rhetorical principles. Foreign students, see ENG 107 Prerequisite see pages 79 and 351 352

ENG 102 First-Year Composition. (3) F S, SS
Critical reading and writing emphasis on strategies of academic discourse Research paper required. Foreign students see ENG 108. Prerequisite with a grade of C" or higher. ENG 101

ENG 105 Advanced First-Year Composition. (3) F, S
A concentrated composition course for students with superior writing skills ntensive reading research papers; logical and rhetorical effectiveness Not open to students with credit in First Year Composition Prerequisite: see pages 79 and 351–352

ENG 107 English for Foreign Students. (3) F, S
For students from non-English speaking countries who have studied English in their native countries, but who require practice in the idioms of English ntensive reading, writing and discussion Satisfies the graduation requirement of ENG 101

ENG 108 English for Foreign Students. 3) F S
For foreign students; critical reading and writing strategies of academic discourse. Research paper required. Satisfies graduation requirement of ENG 102 Prerequisite with a grade of C" or higher ENG 107

ENG 114 English Grammar and Usage. (3) F S
The fundamentals of English grammar (word and phrase structure) and of English usage (punctuation grammatical correctness).

Completion of the First Year Composition requirement is a prerequisite for all English courses above the 100 evel

ENG 200 Critical Reading and Writing about Literature. (3 F S
Introduction to the terminology methods, and objectives of the study of literature with practice in interpretation and evaluation Prerequisite English major or minor *General Studies. L1 HU*

ENG 201 World Literature. (3 F
The classical and medieval periods Selections from the great literature of the world in translation and lectures on the cultural background *General Studies HU H*

ENG 202 World Literature. 3 S
The Renaissance and modern periods Selections from the great literature of the world in translation and lectures on the cultural background *General Studies HU H.*

ENG 204 Introduction to Contemporary Literature. 3) A
Poetry fiction drama and possibly other genres. *General Studies HU*

ENG 210 Introduction to Creative Writing. (3) F S
Beginning writing of poetry fiction and drama both stage and screen . Separate sections for each genre Each genre may be taken once

ENG 212 English Prose Style 3) N
Analysis and practice of writing in various classical and modern prose styles Prerequisite English major or approval of adviser and instructor Prerequisite with a grade of B or higher ENG 102 *General Studies L1*

ENG 213 Introduction to the Study of Language. 3 F, S
Language as code phonetics, phonology morphology and syntax the exception language acquisition, sociolinguistics

ENG 215 Strategies of Academic Writing. (3) F, S
Advanced course in techniques of analyzing and writing academic expository prose Writing is research based *General Studies L1*

ENG 216 Persuasive Writing on Public Issues (3 F S
Advanced course in techniques of analyzing and writing persuasive arguments addressing topics of current public interest Papers are research based *General Studies L1*

ENG 217 Personal and Exploratory Writing. 3) F S
Using writing to explore oneself and the world oneself ives in emphasis on exploratory writing as a means of earning *General Studies L1.*

ENG 218 Writing about Literature. 3 F S
Advanced writing course requiring analytical and expository essays about fiction poetry and drama For non English majors *General Studies L1*

ENG 221 Survey of English Literature. 3 F S
Medieval, Renaissance and 18th century literature Emphasis on major writers and the works in their literary and historical contexts *General Studies. HU H*

ENG 222 Survey of English Literature. 3 F S
Romantic Victorian and 20th century literature Emphasis on major writers and their works in their literary and historical contexts *General Studies HU H*

ENG 241 American Literature. 3 F, S
From colonial times to the Civil War including the growth of national consciousness and romanticism *General Studies· HU*

ENG 242 American Literature. 3 F S
From the Civil War to the present Development of realism naturalism and modernism and contemporary trends in prose and poetry *General Studies HU*

NOTE For the General Studies requirement, codes (such as L1 N3, C, and H) and courses see pages 84–108 For graduation requirements see pages 79–83 For omnibus courses offered but not listed in this catalog, see pages 56–57.

ENG 245 Popular Culture Issues. 3) F S
Se ected top cs n var ous forms of popu ar cu ture re ated to wr tten texts May be re peated for cred t when top c var es

A term paper or equ va ent out-of-c ass wr tten work s requ red n a l pper d v s on 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 ex pos tory prose Pr mar y for preprofess na majors *Genera Stud es L1*

ENG 303 Classical Backgrounds of Eng ish Literature. 3 N
Se ected read ngs of Greek and Lat n tera tu e n trans at on emphas z ng forms deas, and myths, as they re ate to l terature n Eng sh *Genera Stud es HU.*

ENG 307 Utopian Literature. 3) N
Se ected works from the present to the c ass ca per od nc ud g *Wa den Two, Wa den, Utop a* and *The Repub c. Genera Stud es 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 p etry once for f ct on. Lec tures, wr t ng ass gnments d scuss on cr t c sm Prerequ s te ENG 210 or nstructor ap prova

ENG 312 English in Its Social Setting. (3 F, S
ntroduct on to the soc o ngu st c study of the Eng sh a guage *General Stud es. HU SB*

ENG 314 Modern Grammar. 3) F, S
Modern descr pt ve mode s of Eng sh gram mar.

ENG 321 Introduction to Shakespeare. 3 F S
Shakespeare s major comed es h stor es and traged es *Genera Studies L2/HU*

ENG 331 American Drama. 3 A
Major works n the deve opment of Amer can drama from ts beg nn 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 n the r h storical and cu tura contexts *General 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 terature that dep ct Amer can ethn c gender and c ass sens b l t es *Genera 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 ab may carry 4 cred ts Repeat credit for d fferent top cs.

ENG 352 Short Story. 3 F, S
Deve opment of the short st ry as a terary form ana ys s f ts techn que from the work of representat ve authors *Genera Stud es HU*

ENG 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 Harlem Rena s sance *General Stud es. L2/HU C*

ENG 354 African American Literature: Post-Harlem Renaissance to the Present. 3 S
Themat c and cu tura study of Afr can Amen can terature s nce the Har em Rena ssance *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 d *Genera Stud es L2 HU*

ENG 356 Bib ical Backgrounds of Literature. 3 A
Read ngs n O d and New Testaments em phas z ng ideas terary types and sources as they appear terature *Genera Stud es: HU.*

ENG 357 Introduction to Folklore. (3 N
Survey of the h story genres and dynam cs of fo kl re, w th emphas s on ora trad t ons *Gen era Stud es HU*

ENG 359 American Indian Literatures. (3) N
Se ected ora trad t ons of Amer can Ind ans and the r nf uences on contemporary Nat ve Amer can terary works *General Stud es· L2/ HU C*

ENG 361 Silent F lm. (4 F
Deve opment of mot on p ctures from 1850 through 1930 3 hours ecture screen ngs *Genera 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 ec ture screen ngs *General Stud es· HU*

ENG 363 Chicana and Chicano Literature. (3 F
Deve opment of Ch cana and Chican tera ture, study of genres and themes attent on to terary antecedents Cross sted as CSH 363 *Genera Stud es· L2/HU C*

Eng sh majors and m nors are expected to have omp eted ENG 200 before tak ng 400 eve terature courses

ENG 400 History of Literary Criticism. (3) N
Major cr t cs and cr t ca trad t ons n the west ern 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 scourse

ENG 409 Advanced Screenwriting II. (3) N
App cation of the pr nc p es taught n a com p ete feature engh screenplay

ENG 411 Advanced Creative Writing. (3) F S
Separate poetry and f ct on workshops for ex per enced wr ters emphas z ng nd v dua sty e May be taken once for poetry once for f ct on Prerequisite: ENG 310 or nstructor ap prova

ENG 412 Professional Writing. (3) N
Lecture and c nferences concern ng tech n 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 est t mes to the modern per od Prerequ s te jun- or stand ng or nstructor approva *Genera Stud es HU*

ENG 415 Medieval Literature. 3) N
Med eva Eng sh terature n translat on, from *Beowu f* to Malory (exc ud ng Chaucer), em phas z ng cu tura and nte lectua back grounds nc udes cont nenta works Prerequi s te ENG 221 or nstructor approva *General Stud es HU*

ENG 416 Chaucer: *Canterbury Tales.* (3) A
Chaucer s anguage, h s ast work and ts re- lat onship to continenta and insu ar trad t ons Prerequ s te ENG 221 or nstructor approval *Genera Studies· HU*

ENG 417 Chaucer: *Troilus and Criseyde* and the Minor Works. (3) N
Chaucer s anguage, his major poem and h s ear y works n the r med eva context Pre requ s te ENG 221 or nstructor approval *General Stud es. HU.*

ENG 418 Renaissance Literature. (3) N
Poetry and prose 1485–1603, exc ud ng the drama Human sm and major genres, More S dney Spenser, and other representat ve wr ters Prerequ s te ENG 221 or nstructor approval. *General Studies L2/HU*

ENG 419 English Literature in the Early 17th Century. (3) N
Prose and poetry, exc us ve of M lton and the drama. Metaphys ca , Caval er and neoc ass ca verse Donne Jonson Bacon and other representat ve wr ters. Prerequ s te ENG 221 or nstructor approva *Genera Studies: L2/ HU*

ENG 421 Shakespeare. (3) F S
A se ect on of comed es h stories, and trag- ed es Prerequis te: ENG 221 or nstructor ap- prova *Genera Studies HU*

ENG 422 Studies in Shakespeare. (3) A
Top cs for c ose exam nat on n selected dra mat c and/or nondramat c works. May be re- peated for cred t when topics vary Prerequi- s te ENG 421 or nstructor approval *General Studies HU*

ENG 423 Renaissance Drama. (3 N
Drama of the Tudor and early Stuart periods exc us ve of Shakespeare nc udes Kyd Mar owe Jonson, and Webster. Prerequ s te ENG 221 or nstructor approva . *General Stud- ies L2/HU*

ENG 424 Milton. (3) A
Se ected prose and poetry, emphas z ng *Para d se Lost, Parad se Regained,* and *Samson Agonistes* Prerequ site. ENG 221 or nstructor approva *General Studies· HU.*

ENG 425 Romantic Poetry. (3 N
Poetry of Wordsworth Co eridge She ey, Keats, and Byron *General Studies· HU.*

ENG 426 Victorian Poetry. 3) N
Poetry of the second ha f of the 19th century Spec a study of Tennyson Brown ng and Arno d Prerequ s te ENG 222 or nstructor approva *Genera Stud es L2/HU*

ENG 427 Restoration and Early 18th Century. (3) N
Writers and movements in the nondramatic 't- erature of the Restoration and ear y 18th cen- tury. Prerequ s te. ENG 221 or nstructor ap proval. *General Studies· HU*

ENG 428 The Later 18th Century. (3) N
Wr ters movements, and books during the second ha f of the 18th century Prerequisite: ENG 221 or nstructor approva *General Stud es HU*

NOTE For the General St d es requ rement codes such as L1 N3 C and H and courses see pages 84 108. For graduation requ rements see pages 79–83 For omn bus courses offered but not isted n th s cata og see pages 56–57

ENG 430 Victorian Cultural Backgrounds. (3) N
Social, religious, and other cultural issues in prose by such writers as Carlyle, Ruskin, Darwin, Arnold, Pater, and Morris. Prerequisite: ENG 222 or instructor approval. *General Studies: L2/HU.*

ENG 435 19th-Century American Poetry. (3) N
Themes and developments in American poetry to 1900, including Poe, Whitman, and Dickinson. *General Studies: HU.*

ENG 439 Restoration and 18th-Century Drama. (3) S 1999
English drama 1600–1800. Prerequisite: ENG 221 or instructor approval. *General Studies: HU.*

ENG 440 American Literature to 1815. (3) N
Thought and expression from the time of the first English-speaking colonies to 1815. Prerequisite: ENG 241 or instructor approval. *General Studies: HU.*

ENG 441 20th-Century American Drama. (3) N
American drama since World War I, especially experimental techniques. Prerequisite: ENG 241 or 242 or instructor approval. *General Studies: HU.*

ENG 442 20th-Century British and Irish Poetry. (3) N
Theory and practice of poetry since 1900. Prerequisite: ENG 222 or instructor approval.

ENG 443 American Poetry, 1900–1945. (3) N
Developments in theory and practice of major poets. Prerequisite: ENG 241 or 242 or instructor approval. *General Studies: HU.*

ENG 444 Studies in American Romanticism, 1830–1860. (3) N
Cultural expression in works of representative writers. Prerequisite: ENG 241 or instructor approval. *General Studies: HU.*

ENG 445 American Realism, 1870–1900. (3) N
Writers and influences that shaped the development of literary realism. *General Studies: L2/HU.*

ENG 448 20th-Century British and Irish Novel. (3) N
Theory and practice of the novel since 1900. Prerequisite: ENG 222 or instructor approval. *General Studies: HU.*

ENG 451 The Novel to Jane Austen. (3) N
From origins of prose fiction through the 18th century. *General Studies: HU, H.*

ENG 452 The 19th-Century Novel. (3) N
From Scott to Conrad. *General Studies: HU.*

ENG 453 The American Novel to 1900. (3) N
The rise and development of the novel to Dreiser. Prerequisite: ENG 241 or instructor approval. *General Studies: HU.*

ENG 454 The American Novel, 1900–1945. (3) N
Developments in theory and practice of major novelists. Prerequisite: ENG 241 or 242 or instructor approval. *General Studies: HU.*

ENG 455 The Form of Verse: Theory and Practice. (3) N
Types, history, criticism, and schools of theory of metrical form. Analysis of lyric, narrative, and dramatic poetry.

ENG 457 American Poetry Since 1945. (3) A
Major American poets of the period. Developments in theory and practice. Prerequisite: ENG 241 or instructor approval. *General Studies: HU.*

ENG 458 American Novel Since 1945. (3) N
Major novelists of the period. Developments in theory and practice. Prerequisite: ENG 242 or instructor approval. *General Studies: L2/HU.*

ENG 460 Western American Literature. (3) A
Critical examination of ideas and traditions of the literature of the western United States, including the novel. *General Studies: L2/HU.*

ENG 461 Women and Literature. (3) N
Selected topics in literature by or about women. May be repeated for credit when topics vary. *General Studies: HU.*

ENG 462 20th-Century Women Authors. (3) N
Critical examination of literature by 20th-century women writers. May be repeated for credit when topics vary. *General Studies: HU.*

ENG 463 European Drama from Ibsen to 1914. (3) N
Chief continental and British dramatists of the period, emphasizing the beginnings and development of realism. *General Studies: HU.*

ENG 464 European Drama from 1914 to the Present. (3) N
Chief continental and British dramatists of the period, emphasizing experimental techniques. *General Studies: HU.*

ENG 471 Literature for Adolescents. (3) F, S
Prose and poetry that meet the interests and capabilities of junior high and high school students. Recent literature stressed. A passing grade of at least "C" required before students are permitted to student teach in English. *General Studies: HU.*

ENG 480 Methods of Teaching English. (3) F, S
Methods of instruction, organization, and presentation of appropriate content in English. A passing grade of at least "C" required before students are permitted to student teach in English. Prerequisite: ENG 312 or 314 or 413.

ENG 500 Research Methods. (3) A
Methodology and resource materials for research. Analysis of criticism and scholarship, including evaluation of sources.

ENG 501 Introduction to Comparative Literature. (3) N
Problems, methods, and principles, illustrated by selected critical essays and literary texts.

ENG 502 Contemporary Critical Theory. (3) A
An advanced survey of major schools of 20th-century literary and critical theory. Lecture, discussion. Cross-listed as HUM 549.

ENG 507 Old English. (3) N
Elements of Old English grammar with selected readings.

ENG 508 Old English Literature. (3) N
Intensive literary, linguistic, and cultural study of Old English literature. May be repeated for credit when topics vary. Prerequisite: ENG 507.

ENG 509 Middle English. (3) N
A study of the principal dialects of the language with selected readings. Prerequisite: graduate standing.

ENG 512 The Teaching of Composition. (3) N
The theory and practice of teaching writing at all levels. Emphasis on current research. Prerequisites: teaching experience; instructor approval.

ENG 515 Middle English Literature. (3) N
English literature from the 12th through the 15th centuries, exclusive of Chaucer. Prerequisite: ENG 509 or instructor approval.

ENG 517 Contemporary Rhetorical Theory. (3) A
Investigation of the work of such important rhetorical theorists as Burke, Toulmin, Perelman, Gates, and Cixous.

ENG 520 Renaissance Literature. (3) N
Poetry and prose of the English Renaissance, excluding drama.

ENG 521 Shakespeare. (3) A
A selection of comedies, histories, and tragedies presented in the context of literary history and critical theories, with an emphasis on classical and medieval backgrounds.

ENG 525 American Literary Criticism. (3) N
Analysis and discussion of leading historical and critical interpretations of American literature from the beginnings to the present.

Karen Adams, associate professor of English, conducts a lecture during a modern grammar class. Tim Trumble photo

ENG 530 Classical Rhetoric and Written Composition. (3) F 1999
Re at onship of major texts in c assica rhetor c to developments n compos tion theory, l ter ary theory and pract ce through the 19th century

ENG 531 Rhetorical Theory and Literary Criticism. (3) S 1999
Intens ve study of major rhetor ca theor sts of the 20th century n such areas as terary crit c'sm d scourse theory, and compos tion theory

ENG 532 Composition Theory. (3) N
Intens ve study in the rhetor cal categor es of nvention arrangement sty e a ms modes, and forms 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 issues and may be repeated for cred t

ENG 549 Studies in Comparative Literature. (3) N
This course offers selected authors or ssues and may be repeated for cred t.

ENG 550 Contemporary Comparative Literature. (3 N
Comparative studies n modern iterature n Eng sh and other iteratures n trans ation May be repeated for cred t when content var ies

ENG 560 Studies in Dramatic Forms. (3) F N
Selected top cs n dramat c and c nemat c it- erature h story crit c sm theory and cross d scipl nary study. May be repeated for credit when top c varies Lecture, stud o

ENG 571 Advanced Study in Literature for Adolescents. (3) N
H story and cr t c sm of adolescent terature Prerequisite ENG 471 or nstructor approva

ENG 573 Censorship and Literature. (3) N
The h story of censorship, pr mar y n the Un ted States, and s'gn ficant court dec s ons that affected wr ters and books.

ENG 591 Seminar. (3 F S
Selected top cs regu ar y offered in the various areas of Eng ish stud es

LINGUISTICS (LIN)

See the *Graduate Catalog* for the LIN courses.

WRITING ACROSS THE CURRICULUM (WAC)

WAC 101 Introduction to Academic Writing. (3) F, S
Comb nes c assroom and supp emental n struction to teach academ c genres of writ ng nc ud ng definit'on, summary, and ana ys s

WAC 107 Introduction to Academic Writing for International Students. (3) F, S
For students from non-Eng ish speaking coun tries Comb nes c assroom and supplementa instruction w th ntens ve read ng, writ ng and d scussion

Department of Exercise Science and Physical Education

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REGENTS' PROFESSOR
D M LANDERS

PROFESSORS
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ASSOCIATE PROFESSORS
DEZELSKY, H NRICHS, MATT, PAGLIASOTT , WILLIS

ASSISTANT PROFESSORS
CHEN, GERR TSEN, KELLEY PHILLIPS, SWAN, K THOMAS

SENIOR LECTURER
D M LANDERS

LECTURERS
JONES PR DE

EXERCISE SCIENCE/PHYSICAL EDUCATION—B.S.

The B S. degree in Exercise Science/ Physical Education consists of 42 se mester hours, including 21 semester hours of required EPE core courses (EPE 110 may be repeated for credit). The remaining 21 semester hours of EPE and other courses are prescribed by the specific concentration the stu dent selects

The required EPE core courses are as follows·

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 Act vity	3
Total			21

Each EPE core course has specific prerequisite courses that must be taken before taking the respective core course. These prerequisite courses in clude the following·

BIO	201	Human Anatomy and Physiology I *S2*	4
BIO	202	Human Anatomy and Physiology II	4
CHM	101	Introductory Chemistry *S1/S2*	4
MAT	117	College Algebra *N1*	3
PGS	101	Introduct'on to Psychology *SB*	3
PHY	111	General Physics *S1/S2**	3
Total			21

* Both PHY 111 and 113 must be taken to secure S1 or S2 credit.

All prerequisite and EPE courses must be completed with a minimum grade of "C." The requirements for the specific concentrations are described below.

Ma ors must elect either the exercise science, exercise and wellness, or phys ical education concentration.

Exercise and Wellness Concentration. Candidates for the exercise and wellness concentration must complete 21 semester hours beyond the required EPE core courses by taking the follow- ing.

EPE	300	Foundations of Exercise and Wellnes	3
EPE	320	P ogram Development and Leadership	3
EPE	420	Exercise Testing	3
EPE	425	Exercise Prescr ption	3
EPE	484	Internship	6
Total			18

Three semester hours must be se lected from an approved list of concen tration electives that includes EPE courses and courses from nutrition, computer science/statistics, and busi ness.

Exercise Science Concentration. Can didates for the exercise science concen tration must complete 21 semester hours beyond the core courses in the major field, at least 12 of which must carry EPE prefixes, be upper division courses, and concern the theoretical subjects of the core. The remaining nine semester hours may carry either EPE prefixes or prefixes from related disciplines selected with the advice and consent of a faculty advisor. Activity courses may not be used to fulfill part of the 21 semester hour requirement No more than six semester hours may be in independent study courses.

Physical Education Concentration. Candidates must complete 21 semester hours beyond the EPE core courses, 12 of which must carry EPE prefixes from the required course list below.

EPE	361	Physical Educat on in the Secondary School	3
EPE	376	Physical Education for the Elementary School	3
EPE	382	Phy sical Education for the Atypical Student	3
EPE	480	Methods of Teaching Phvsical Education	3
Total			12

The remaining nine semester hours of related coursework can carry either EPE, psychology, special education, child development, and/or education prefixes. Activity courses (EPE 110) may be used to fulfill part of the 21 se mester 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 semes ter hours may be in independent study.

EXERCISE SCIENCE/PHYSICAL EDUCATION MINOR

The minor in Exercise Science/Physical Education consists of the core se quence in exercise science and physical education as follows, plus all prerequi site 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 com plete 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
Total			12

Students must also complete a four semester professional sequence in the College of Education (34 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 require ments.

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 par ticipates 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 In struction with concentrations in exer cise 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 us'ng towel and ocker fac ities for physical educat on classes and intramural act vities.

Physical education activ ty classes (EPE 105, 205, 305, 310) may not be taken for au d t Excess ve absences and/or tardiness are considered d sruptive behavior

EPE 100 Introduction to Health and Wellness. (3) F S, SS
Current concepts of hea th and wel ness Cross listed as HES 100.

EPE 105 Physical Education Activity. (1) F, S SS
Beginn ng nstruction n a w de variety of sports such as aerob cs aquat cs racquet sports, phys ca cond t'on ng, and go f. 3 hours/week 'Y" grade only May be repeated

EPE 110 Movement Analysis Laboratory. (1 2) F, S SS
Pract ca appl cat on of b omechan ca , phys' o og ca , psycholog'cal, and earning pr ncip es n the analys s of sk acqu s t on and perfor mance. Prerequis tes· EPE 105 prof c ency; ESPE major.

EPE 200 Introduction to Exercise Science and Physical Education. (3) F, S, SS
ntroduction to the d sc p nes and profess ons associated w th ESPE nc ud ng an overview of h stor ca and phi osoph cal foundations

EPE 205 Physical Education Activity. (1) F S, SS
Intermediate leve s. Cont nuat on of EPE 105 3 hours/week May be repeated for credit.

EPE 283 Prevention and Care of Athletic Injuries. 3 F
Tap ng njury recogn t on, emergency care, and observat on procedures n ath et c tra n ing Prerequ s tes BIO 201, 202

EPE 290 Sports Officiating. (3) F
Rules and mechan cs of off c ating used in footba basketba l, and vo eyba

EPE 292 Sports Officiating. (3) S
Rules and mechan cs of off c at ng used in softba (s ow and fast p tch baseba l and track and f eld

EPE 300 Foundations of Exercise and Wellness. (3) F
Ana ys s of research n various d sc p nes wh ch contribute to health promot on and we lness.

EPE 301 Fitness for Living. (1) F S
App cation of pr nc p es of phys cal act v ty to persona f tness testing and program p ann ng for peop e of a ages. Telecampus course. Not open to Exerc se Sc ence and Phys cal Educat on majors or to students who have cred t for EPE 325.

EPE 305 Physical Education Activity. (1 F, S, SS
Advanced eve s Cont nuat on of EPE 205 w th nstructor's approva 3 hours a week May be repeated

EPE 310 Collegiate Sports. (1) F S
Part c pation n men s or women's ntercol e g ate compet tion May be repeated for 4 cred ts, 1 per year. "Y E" grade

EPE 320 Program Development and Leadership. (3 S
Pr nc p es of p anning organ zing promot ng and ead ng f tness and wel ness programs For majors only.

EPE 325 Fitness for Life. (3) F, S
Physical f tness and benefits of exerc se with emphas s on se f eva uation and persona zed program p ann ng for a fet me. Not open to students with credit in EPE 301.

EPE 334 Functional Anatomy and Kinesiology. (3) S 2000
Musc es, bones, jo nts, and nerves and how they produce movement. Emphas's on musc e or g ns, insert'ons, act ons and nnervat ons Lecture ab Prerequ s tes B O 201 202.

EPE 335 Biomechanics. (3) F S SS
Bas c anatomical and mechan ca pr nc p es app ed to human movement Emphas s is placed on k nematic and k net c concepts Prerequ s tes. BIO 201 MAT 117; PHY 111

NOTE: For the Genera Stud es requirement codes (such as L1, N3 C and H), and courses, see pages 84–108 For graduation requ rements, see pages 79–83 For omn bus courses offered but not isted n th s cata og, see pages 56–57.

EPE 340 Physiology of Exercise. (3) F S SS
Phys o og ca mechan sms of acute responses and chronic adaptat ons to exerc se. Prerequ sites. B O 202, CHM 101

EPE 345 Motor and Developmental Learning. (3) F, S SS
Pr nc p es of motor ski l acquisition across the ife span focus ng on the earner and the earn ng env ronment Prerequ s tes BIO 201; PGS 101

EPE 348 Psychological Skills for Optimal Performance. 3) F S, SS
App cation of psycho og ca techn ques and their use to mprove effect veness and perfor mance n sport and related areas

EPE 352 Psychosocial Aspects of Physical Activity. (3 F S SS
Interre at onsh ps between phys ca activity and psychosoc al var ab es nclud ng soc a zat on, cu tura va ues aggress on and mot - vat on nc udes the psycho og ca benef ts of phys cal act v ty and exerc se adherence Prerequ s tes: B O 201; PGS 101

EPE 361 Physical Education in the Secondary School. (3) F, S
Current trends and theories such as elective programs coed c asses, egal ssues contract teaching curriculum, and adm n stration

EPE 370 Advanced First Aid. (3) N
Assessment, management, treatment of wounds, njuries, shock, po son ng, burns sudden l ness emergency rescue, and car d opulmonary resusc tat on Lecture, lab

EPE 376 Phys'cal Education for the Elementary School. (3) F S
Scope and va ues of physical educat on n the e ementary school Methods, mater a s, and pract ce in teaching act v ties for pr mary, n termed ate, and upper grades

EPE 382 Physical Education for the Atypical Student. (3) F S SS
Teach ng ndividua s with hand capping cond - t ons phys ca sk' s and act v ties Prerequi s tes B O 201 202

EPE 412 Biomechanics of the Skeletal System. (3 F
B omechan cs of t ssues, structures, and ma jor jo'nts of the musculoske eta system Dis cussion of njury mechan sms Lecture, d s cussion some abs. Prerequ's'te: EPE 335 or nstructor approva

EPE 413 Qualitative Analysis in Sport Biomechanics. (3 S
Deve op ng systemat c approach for detect ng and correct ng errors n human performance us ng anatom ca and mechanical principles. Lecture ab Prerequ s te EPE 335.

EPE 414 Electromyographic Kinesiology. (3) F
Muscu ar contr but ons to human movement musc e mechan cs e ectrophys o og'cal bas s, and pract cal appl cat on of e ectromyography Lecture d scuss on Prerequ s tes: EPE 335, 340, nstructor approva

EPE 420 Exercise Testing. (3) F
Theoretica bas s and pract'ca app cation of screen ng, exerc se testing est mates of en ergy expend ture and nterpretation of resu ts Prerequ s te. EPE 340

EPE 425 Exercise Prescription. (3) S
Theoretical bases for and app cat on of gen eral principles of exerc se prescr pt on to van- ous ages f tness eve s, and hea th states. Prerequ s te EPE 420.

EPE 440 Exercise Biochemistry. (3) F
Study of b oenergetics and metabol sm of cel- lu ar (skeleta muscle heart and l ver) organ el es and proteins dur ng exerc se. Prerequ'- site EPE 340

EPE 441 Physiology of Women in Sport. (3) S
Phys o og ca aspects of women engag ng in phys ca activity. Factors affect ng perfor mance and hea th throughout l fe are empha sized Prerequisite: EPE 340. *General Stud- ies: L2*

EPE 442 Physical Activity in Health and Disease. (3) F
The role of physical act vity and phys ca f t ness in the deve opment of morb dity and mor- ta ity throughout the human life span Prereq- u s tes BIO 201 202, EPE 340 *General Stud ies L2*

EPE 443 Exercise Endocrinology. (3) S
D scuss ons of current research and theory concerning hormona changes during exer c se. Lecture d scuss on Prerequisite: EPE 340 or nstructor approva *General Studies L2*

EPE 448 Applied Sport Psychology. (3) S
Psycholog ca theories and techn ques app ed to a sport to enhance the performance and persona growth of ath etes and coaches Lec ture, discuss on Prerequ s tes EPE 345 and 352 *or* equ valents *General Stud es: L2*

EPE 460 Theory of Strength Training. (3) S
Research and theories on deve op ng muscu lar strength, programs for developing muscu lar strength Lecture d scussion Prerequ s tes EPE 335 340 *General Studies L2*

EPE 478 Student Teaching in Secondary Schools. (3–12 F, S
The pract ce of teaching The relat onship of pract ce and theory n teach ng. Prerequ s te: two comp ete semesters of block or equ va- ent.

EPE 480 Methods of Teaching Physical Education. (3) F, S
Methods of instruction organ zat on, and pre sentat on of appropr ate content n elementary and secondary phys ca educat on. Concurrent w th student teach ng or nstructor approval Prerequ s tes EPE 361 376

EPE 485 Advanced Techniques of Athletic Training. (3) S
An advanced course n athlet c tra n ng de- s gned for students seek ng NATA cert f ca t on Emphasis on therapeut c modal ties and rehab itation procedures Prerequ sites EPE 283 370, CPR certif cat on

EPE 500 Research Methods. (3) F
An ntroduct on to the bas c aspects of re search nc ud ng problem se ect on, terature rev ew nstrumentat on data hand ng, meth odology and the wr t ng of research reports and art c es

EPE 501 Research Statistics. (3) S
Stat stical procedures samp ng techn ques exerc se test ng exerc se prescr'pt on, hypoth- es s test ng, and exper mental designs as they re ate to research pub cat'ons.

EPE 505 Applied Exercise Physiology Techniques. (3) F 1999
nvestigat ve techniques used n the appl ed exerc se physiology laboratory. Emphas's on pu monary funct on, body composition and card orespiratory assessment Lecture lab. Prerequ s te EPE 340

EPE 510 Introduction to Biomechanics Research Methods. (3) F
Applicat on of mechan cs to human movement ana ys s Inc udes cons deration of two-d men- sional mag ng techn ques, force measure- ment, electromyography and data process'ng methods Lecture, d scuss on, some labs Pre requ s te EPE 335 or nstructor approva .

EPE 520 Sport Psychology. (4) F
Current research in sport psycho ogy In- cludes quest'onna're psychophys o og ca and behav oral research techn ques Lecture, d scuss on. Prerequ s tes EPE 448, 500.

EPE 521 Motor Development, Control, and Learning. (4) S 1999
Theory and research on motor sk acquis'- t on nc ud ng learn ng/control and deve op ment (e. growth ch dren and exercise, and development 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 behav or and health in an exercise setting Lecture d scuss on Prerequ s te EPE 500

EPE 530 Exercise Physiology. (3) F
mmed ate and long term adaptations to exer c se with specia reference to train'ng and the ro e of exercise n card ovascular health Pre requ site: EPE 340

EPE 531 Physiology of Women in Sport. (3) S
Phys o og ca aspects of women engag ng n physical act vity Factors affecting perfor- mance and hea th throughout life are empha s zed Prerequ s te. EPE 340

EPE 534 Sports Conditioning. (3) F
Bases of sports condit on'ng nc ud ng aerob c and anaerob c power strength f ex b ity, and ana ys s of cond t on ng components for sports.

EPE 535 Factors Influencing Exercise Performance. (3) S
Phys o og ca factors that can affect the abi ty to exerc se, and the body's response to exer- cise Lecture, sem nar Prerequisite EPE 530

EPE 544 Fitness/Wellness Management. (3) F
Deve opment of the fitness/we ness ndustry P anning, organizing promot ng, and manag ng f tness/we ness programs

EPE 561 Administration of Athletics. (3) N
Managing an ath etic program, including f nanc ng budget pol c es, staging, and promo- tion of athlet c contests, schedu es, travel n- surance and current ath etic trends

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NOTE For the General Stud es requ rement codes (such as L1, N3, C, and H) and courses, see pages 84–108. For graduat on requ rements, see pages 79–83. For omn bus courses offered but not sted n this cata og, see pages 56–57

EPE 570 Programs and Special Topics in Adapted Physical Education. (3) F
Contemporary adapted, deve opmental reme dial, and correct ve phys ca educat on pro- grams understand ng of princ p es prob ems and recent developments n th s area

EPE 571 Improving Sport Skills. (3 SS
Factors in successfu motor performance n ski 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 contem porary phys ca education inc uding f nances T t e IX, teaching and coach ng ph losoph es, schoo organ zat on, and nonteaching phys ca education programs

EPE 573 Curriculum and Instruction in Secondary Physical Education. 3 F
Current curricu um and instruct on pract ces and research n secondary schoo phys ca educat on Prerequis te· ESPE major or teach ing experience

EPE 574 Analysis of Teaching Behavior in Sport and Physical Education. 3 N
Use of systemat c d rect observat on tech n ques n ana yz ng and eva uat ng instruct on n sport and physical educat on Lecture, ab

EPE 575 Teaching Lifetime Fitness. 3 S
Organ z ng and mp ement ng phys ca f tness programs in the schoo s w th emphas s on n dividual prob em solving

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 pro grams.

EPE 610 Advanced Topics in Biomechanics. (3) S
Three d mens ona imag ng techn ques data analys s theory and integration of b omechan ics research too s nc udes or g nal research project Lecture d scussion some abs Prere- requ site: EPE 510 or nstructor approva

EPE 620 Developmental Motor Skill Acquisition. (3) S 1999
Cognit ve motor theor es of learn ng/perfor mance app ied to ch dren s motor sk acqu sit on. Study of knowledge deve opment and research analys s/techn ques. Lecture, d scus s on. Prerequisite EPE 521

EPE 621 Motor Learn ng/Control. (3) F 1999
D scussion of contemporary research issues n motor earning and contro nc udes behav oral and neurophys ological ssues Lecture d scuss on. Prerequ site EPE 521

EPE 642 Exercise Epidemiology. (3 S 1998
Phys ca act vity exerc se and phys ca f t- ness and the deve opment of chron c d sease Not open to students who have taken EPE 442 Prerequ 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 ness Cross isted as EPE 100.

Students who satisfactor ly comp ete se ected HES 494 courses are e ig b e to qua fy for a certificate of accomp shment from the Cen ters for Disease Control U S Department of Health and Human Services. See the footnote for information on 494 and other omn bus courses

Department of Family Resources and Human Development

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SENIOR LECTURERS
R MART N, WEIGAND

LECTURER
BODMAN

FAMILY RESOURCES AND HUMAN DEVELOPMENT—B.A. OR B.S.

For the B.S. degree in Family Re sources and Human Development (see "Major Requirements," page 306), students must select one of the following three concentrations shown in the "Family Resources and Human Development Concentrations and Options" table on this page. Students are not be ing accepted to the B.A. program at this time.

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 *L1*	3
FON	442	Experimental Foods	3
FON	445	Quantity Food Production	3
MGT	301	Management and Organization Behavior or MGT 394 Special Topics	3
MKT	300	Principles of Marketing or MKT 394 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]	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.

Family Resources and Human Development Concentrations and Options

Major	Concentration	Option
Family Resources and Human Development	Family resources and human development in business	Food service management
	Family studies/child development	
	Human nutrition dietetics	General dietetics Human nutrition

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	Pro Seminar	3
		or FAS 498 Pro Seminar	3
FAS	33	Marriage and Family Relationships *SB*	3
FAS	361	Introduction to Family/Child Research Methods *L1*	3
FAS	370	Family, Ethnic, Cultural Diversity	3
FAS	431	Parent Adolescent Relationships	3
FAS	435	Advanced Marriage and Family Relationships *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 six 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	498	Pro-Seminar	3
		or FAS 498 Pro Seminar (3) or FAS 499 Independent Study (3	
FAS	330	Personal Growth in Human Relationships *SB*	3
FAS	332	Human Sexuality	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 Chemistry	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

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	Pro Seminar	3
FAS	431	Parent Adolescent Relationships	3
FAS	432	Family Development	3

Foods and Nutrition in Business. The foods and nutrition in business emphasis requires that students take the following courses:

FON	100	Introductory Nutrition	3
		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

NOTE For the General Studies requirement, codes (such as L1, N3, C and H) and courses see pages 84–108. For graduation requirements, see pages 79–83. For omnibus courses offered but not listed in this catalog see pages 56–57.

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	34	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
POS	311	Arizona Constitution and Government or POS 417 The Arizona Political System *SB*	3

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. Prerequisite: 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 531 Theoretical Issues in Child Development. (3) S
Major developmental theories related research and their application to family interaction. Prerequisites 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 Applied Child Development. (3) S
Integration of child development research and theory to understand developmental problems and their relevance to intervention strategies Prerequisites CDE 531; FAS 500

FAMILY STUDIES (FAS)

FAS 301 Introduction to Parenting. (3) F, S
Integrated approach to understanding parenting and parent child interactions Television course Prerequisites: PGS 101 SOC 101 or equivalent).

FAS 330 Personal Growth in Human Relationships. (3) F, S
Personal development and behavior as related to competency in interpersonal relationships with in the family Processes of family interaction Prerequisites PGS 101; SOC 101 (or equivalent *General Studies: SB.*

FAS 331 Marriage and Family Relationships. (3) F, S
Issues, challenges and opportunities relating to present day marriage and family living. Factors influencing interrelations within the family. Prerequisite course in psychology or sociology *General Studies SB*

FAS 332 Human Sexuality. (3) F, S
Relationship of sexuality to family life and to major social issues. Emphasis on developing healthy positive and responsive ways of integrating sexual and other aspects of human living Prerequisite PGS 101

FAS 361 Introduction to Family/Child Research Methods. (3) S
Examines basic methods applied to family child research critiques current research literature, and applies methods in current topics. Prerequisites CDE 232, FAS 331 *General Studies L1.*

FAS 370 Family Ethnic and Cultural Diversity. (3) S
An integrative approach to understanding historical and current issues related to the structure and internal dynamics of diverse American families Prerequisite PGS 101 or SOC 101

FAS 390 Supervised Research Experience. (1–3) F, S, SS
Practica, firsthand experience with current faculty research projects in family studies or child development 'Y' grade only may be repeated for total of 6 hours. Prerequisites FAS 361 3.00 GPA in major approval of supervising faculty member before registration.

FAS 431 Parent-Adolescent Relationships. (3) F
Dynamics of the relationships between parents and adolescents Developmental characteristics of adolescence and the corresponding adult stage. Prerequisites CDE 232 FAS 331

FAS 432 Family Development. (3) N
Normat ve changes n fami es over t me from formation unt disso ut on. Emphas s on the mar tal subsystem in middle and ater years Prerequ s tes CDE 232 and FAS 331 *or* n structor approva

FAS 435 Advanced Marriage and Family Relationships. (3) F
Recent research ssues and trends re at ng to marriage and fam y nteract'on nf uence of fam ly compos t on physical environment fam ly patterns and values on fam y dynam cs. Prerequis tes FAS 331 361 *Genera Stud'es: SB*

FAS 436 Conceptual Frameworks in Family Studies. (3) S
Approaches to study fam l es focusing on sys tems nteractional, exchange, conf ct and deve opmenta frameworks App cations to d - verse nd v dua and fam y s tuat ons Prereq- u s tes: CDE 232; FAS 331 361

FAS 440 Fundamentals of Marriage and Family Therapy. (3) S
ntroduct on to the fundamenta or entat ons of marr age and fami y therapy

FAS 457 Third-World Women. (3) F
Economic sociopol tical and demograph c context for understand ng the ro es of th rd world women n hea th, fam ly work educa tion and commun ty Prerequisite 6 hours of social science cred t or instructor approva

FAS 500 Research Methods. (4) F
Purposes of research Exper menta design methods of data col ection and thes s pro- posal deve opment ncludes practical appl ca- tion research aboratory 3 hours ecture 3 hours lab

FAS 530 Introduction to Marriage and Family Therapy. 3) F
ntroduct on of major marr age and fami y therapy or entations Review h story theory appl cat'on and outcome research for each orientat on Prerequ site admiss on to gradu ate program in FRHD with a concentration n fami y studies or nstructor approva

FAS 531 Family Theory Development. 3) S
H stor ca and current approaches to theory development eva uat on, and appl cat on n fami y stud es Prerequ s te. FAS 435 or in structor approva

FAS 536 Dysfunctional Marriage and Family Relationships. (3) N
A cntical review of current theory and emp ri ca ev'dence connect ng mar tal and fam y n teract on patterns w th aberrant behav or. Pre requ site: PGS 466 or PSY 573 (or equ va ent) or nstructor approva

FAS 537 Interpersonal Relationships. (3) F
Cr t cal exam nat on of current theoret cal and research deve opments n the area of nterper sonal relat onsh ps App cat ons for research and ntervent on emphasized. Prerequ s'te: FAS 435 (or equ va ent) or nstructor approva

FAS 538 Advanced Techniques in Marriage and Family Therapy. (3) N
An 'n depth rev ew of assumpt ons and ad vanced techn ques assoc ated with contempo rary marriage and fam y therapy approaches Prerequisite. a graduate-leve course n mar r age and fam ly therapy or nstructor ap prova .

FAS 539 Research Issues in Family Interaction. 3 F
Cr tica rev'ew of current and past research in the area of fam ly dynam cs Emphas zes n teract ona processes w th n the fami y Pre requ site. FAS 435 or equ valent) or nstructor approva .

FAS 540 Assessment in Marriage and Family Therapy. (3) S
nstruct on in the assessment and outcome eva uat on of couples and fam l es nvolved n mar tal and fam y therapy. Lecture, ab Pre- requis tes: FAS 500 (or equiva ent) PSY 530, instructor approval

FAS 580 Marriage and Family Therapy Practicum. (3) F S
Supervised c n cal experience n marriage and fam y therapy, includes development of assessment and outcome eva uation ski s Lecture lab Prerequis te nstructor approval.
(a First semester (3)
b) Second semester (3)
(c Th rd semester (3)

FOOD AND NUTRITION (FON)

FON 100 Introductory Nutrition. (3) F, S, SS
Basic concepts of human nutr t on. Alternative d ets and how food cho ces affect persona health. Prerequ s te nonmajor

FON 142 Applied Food Principles. (3 F, S
Appl ed sc ent f c principles of food prepara- t'on and production 2 hours lecture, 3 hours ab.

FON 241 Human Nutrition. (3) F S, SS
Princip es of human nutr tion re at ve to hea th Emphasis on nutrients and the factors affect ng their ut ization n the human body. Pre requ 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 manual assessment of food compos t on. Rev ew of common ther- apeut c d ets Prerequis'tes: FON 142 and 241 (or equ va ent)

FON 344 Nutrition Services Management. (3) S
Organ zation adm n strat on and manage ment of food and nutrit on serv ces n hospita s and other inst tut ons F eld trips may be n c uded *Genera Stud es: L1*

FON 440 Advanced Human Nutrition I. (3) F
Metabo ic react ons and nterre at onsh ps of v tam ns minera s, and water CHM 332 rec ommended Prerequisites BIO 202; CHM 361, FON 241 (or equivalent)

FON 441 Advanced Human Nutrition II. (3) S
Metabo ic react ons and nterre at onsh ps of carbohydrate, l p d and prote n CHM 331 and 332 recommended Prerequ sites B O 202; CHM 361 FON 241 (or equiva ent).

FON 442 Experimental Foods. (3) F
Fo d product development techniques, food evaluat on and testing and nvest gat on of current research nto food composit on 2 hours ecture, 3 hours ab. Prerequ s tes CHM 231, FON 142

FON 444 Diet Therapy. 3) S
Pr nc'p es of nutrit ona support for prevent on and treatment of disease Prerequ's'tes: BIO 202; FON 241 (or equ valent)

FON 445 Quantity Food Production. (3) S
Standard methods of food preparat on n quantity operat on of nstitutiona equipment and menu p anning for nstitut ons. Experience n quant ty food serv ce 1 hour ecture 6 hours ab. May requ re field tr ps. Prerequ - s tes FON 241 (or equ valent) and 344 *or* in- structor approva

FON 446 Human Nutrition Assessment Lecture/Laboratory. (3) S
C nical and b ochemical eva uat on of nutri- tional status 2 hours ecture 3 hours lab Pre requ sites CHM 367 FON 440 (or 441)

FON 448 Community Nutrition. (3) F
Food re ated behav ors' commun ty organ za tion and del very of nutrit on serv ces; program design implementat on and eva uation strate- g es, nutr t ona assessment of popu at on groups PGS 100 and SOC 101 are recom mended Prerequ site FON 241 or equiva ent *General Stud es L2*

FON 450 Nutrition in the Life Cycle I. (3) F
Emphas s on nutr tiona needs and prob ems during pregnancy lactat on, infancy and ch dhood Prerequ site. FON 241 or equiva ent

FON 451 Nutrition in the Life Cycle II. (3) S
The nutr tional requ rements and nutr t on re lated d sorders of adolescence, m ddle adu t- hood and later ife Prerequis'te: FON 241 or equ va ent

FON 531 Recent Developments in Nutrition. (3) N
Survey of research Prerequ s tes: 1 course each n advanced nutr tion and b'ochem stry

FON 532 Current Research in Nutrition I. (3) S
Vitam ns and minera s. Prerequ s tes 1 course each n advanced nutrition and b o chem stry

FON 533 Current Research in Nutrition II. (3) F
Carbohydrates, 'pids and prote ns Prerequ s tes 1 course each n advanced nutrit on and biochem stry

FON 538 Recent Developments in Foods. (3) N
Discussion and cr t que of current research Prerequisite FON 142.

FON 540 Advanced Micronutrient Metabolism. (3) F
The metabo sm of vitamins and m nerals, pn- manly as appl ed to humans, with research lit- erature emphas zed Prerequisites: 1 course each n basic nutr t on and b ochemistry.

FON 541 Advanced Macronutrient Metabolism. (3) S
The metabol sm of protein, fat, and carbohy drate, pr mar y as app ied to humans, with re search l terature emphas zed Prerequisites' 1 course each n bas c nutr tion and b ochemis- try

FON 542 Experimental Foods. (3) F
Food product deve opment techn ques, food eva uation and test ng and nvestigat on of current research nto food compos tion. 2 hours ecture 3 hours ab Prerequisites: CHM 231 FON 142.

FON 544 Therapeutic Nutrition. (3) S
Current theories of the nutritiona prevent on or treatment of var ous d seases. Prerequ s tes. 1 course each in basic nutrit on and phys o ogy.

FON 545 Recent Developments in Institutional Feeding. (3) S
Current practices in institutional feeding, including supervised practicum with local quantity food operation 1 hour lecture 6 hours lab. Prerequisites FON 142 and 344 *or* instructor approval

FON 546L Laboratory Techniques in Nutrition Research. (1) S
Laboratory techniques required in nutrition research including spectroscopy chromatography and RIA Lab. Prerequisites. CHM 361, 367, FON 440 (or 441).

FON 548 Nutrition Program Development. (3) F
The planning development implementation, and evaluation of community nutrition programs, including the process of grant applications. Prerequisites 1 course each in basic nutrition and sociology

FON 550 Advanced Maternal and Child Nutrition. (3) F
Metabolic characteristics and nutritional needs of the pregnant woman lactating woman infant, and child are reviewed in-depth Prerequisites 1 course each in basic nutrition, physiology, and biochemistry.

FON 551 Advanced Geriatric Nutrition. (3 S
Metabolic characteristics and nutritional requirements of the elderly are reviewed in depth Prerequisites 1 course each in basic nutrition and physiology and biochemistry *or* instructor approval.

FON 580 Dietetics Practicum. (3–9) F S SS
Structured practica experience in the Preprofessional Practice Program AP4 supervised by practitioners with whom the student works closely. Practicum Prerequisite: acceptance into the AP4 program

FAMILY RESOURCES AND HUMAN DEVELOPMENT (FRD)

FRD 451 Field Experience. (1 12) N
Supervised field placement in the area of student's concentration with a community business or agency. Students must make arrangements with instructor 1 semester in advance of enrollment Prerequisites completion of 60 hours instructor approval

HOME ECONOMICS EDUCATION (HEE)

HEE 461 Presentations in Home Economics. (3) F
Presentation and demonstration techniques in teaching home economics Development of audiovisual materials for home economics content areas. Prerequisites junior standing, instructor approval.

HEE 480 Methods of Teaching Home Economics. (3–4) F
Instruction organization presentation, and evaluation of subject matter in home economics. HEE students register for 4 semester hours. Dietetic students register for 3 semester hours.

HEE 481 Teaching Occupational Home Economics. (3 S
Career orientation related to home economics cooperative work related instruction programs and youth club advisement associated with secondary home economics programs May include field trips Prerequisite Family Resources and Human Development major or minor

Department of Geography

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REGENTS' PROFESSOR
GRAF

PROFESSORS
ARREOLA, BRAZEL, BURNS
COMEAUX DORN
GOBER McTAGGART,
OhUALLACHAIN, PASQUALETT

ASSOCIATE PROFESSORS
ALDRICH BALLING, CERVENY,
FALL, KUBY, McHUGH

ASSISTANT PROFESSORS
SIERRA, WENTZ

GEOGRAPHY—B.A. OR B.S.

Both B A and B S. degrees in Geography consist of 45 semester hours The required courses are as follows:

GCU	102	Introduction to Human Geography *SB*	3
GCU	121	World Geography *SB, G*	4
GCU	495	Quantitative Methods in Geography *A2*	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	491	Geographic Field Methods	6
GCU approved elective			3
GPH approved electives			3–4
Approved electives			4–6
Minimum total			36

The remaining nine hours are to be made up of electives from related fields of study, chosen in consultation with an advisor At least 18 hours must be in upper division courses A grade of "C" or higher is required in all courses taken for the major

Asian Studies Certificate. Students majoring in Geography may elect to pursue an Asian Studies Certificate combining courses from the major with selected outside courses of wholly Asian content. For more information, see "Asian Studies," pages 307 308 and "Southeast Asian Studies," page 309

Latin American Studies Certificate. Students majoring in Geography 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 308, for more information

SPECIAL EMPHASIS PROGRAMS

Two special emphasis programs meteorology climatology and urban studies, are optional. Students who wish to graduate with a B.A. or B S degree in Geography are not obligated to choose one of these emphases

Meteorology-Climatology Emphasis. The required courses for the meteorology climatology emphasis are as follows

GCU	102	Introduction to Human Geography *SB*	3
GCU	121	World Geography *SB, G*	4
GCU	495	Quantitative Methods in Geography *A2*	3
GCU	496	Geographic Research Methods *L2*	3
GPH	111	Introduction to Physical Geography *S1 S2* or GPH 4 Physical Geography	4
GPH	213	Introduction to Meteorology II	3
GPH	215	Introduction to Meteorology Laboratory II	1
GPH	371	Cartography	3
GPH	409	Synoptic Meteorology I	4
GPH	410	Synoptic Meteorology II	4
GPH	412	Physical Climatology or GPH 413 Meteorological Instruments and Measurement or GPH 414 Climate Change	3
GPH	491	Geographic Field Methods	6
Total			41

NOTE. For the General Studies requirement, codes such as L1 N3 C and H , and courses, see pages 84 108 For graduation requirements see pages 79–83 For omnibus courses offered but not listed in this catalog see pages 56–57

Students must also choose one other three hour course in GCU Also required are the following related courses:

PHY	121	University Physics I: Mechanics *S1/S2*[1]	3
PHY	122	University Physics Laboratory I *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
GCU elective			3
Related courses			12 or 10
Choose between the two combinations of courses below)			
MAT	270	Calculus with Analytic Geometry I *N1* (4	
MAT	271	Calculus with Analytic Geometry II (4	
MAT	272	Calculus with Analytic Geometry III (4	
		or	
MAT	290	Calculus I *N1*	5
MAT	291	Calculus II	5
Total			23 or 21

[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

Urban Studies Emphasis. The required courses for the urban studies emphasis are as follows:

GCU	102	Introduction to Human Geography *SB*	3
GCU	121	World Geography *SB G*	4
GCU	357	Social Geography *SB*	3
GCU	361	Urban Geography *SB*	3
GCU	444	Applied Urban Geography	3
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			31

In addition, students must select two courses from the following:

GCU	351	Population Geography *SB*	3
GCU	359	Cities of the World I *G*	3
		or GCU 360 Cities of the World II *G* (3	
GCU	364	Geography of Energy	3
GCU	441	Economic Geography	3
GCU	442	Geographical Analysis of Transportation *SB*	3
GCU	453	Recreational Geography	3
GPH	481	Environmental Geography	3

If GPH 481 is not selected, a further three hour GPH course is required. Nine hours in fields related to geography must be in urban oriented course work

OFFICE OF CLIMATOLOGY

Dr. R.C. Balling is director of the Office of Climatology. The office performs pure and applied climatic research and supports undergraduate and graduate students at ASU. The office maintains an extensive archive of climatic and meteorologic information on Arizona and the western United States.

SECONDARY EDUCATION—B.A.E.

Geography. The major teaching field 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*	4
		or GPH 411 Physical Geography	3
Total			11

In conjunction with an advisor, students choose remaining hours from three groups of human, physical, and regional courses.

Social Studies. See page 390.

GRADUATE PROGRAMS

The faculty in the Department of Geography offer programs leading to the M.A. and Ph.D. degrees. Consult the *Graduate Catalog* for requirements.

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
Description and analysis of areal variations in social economic and political phenomena in major world regions. *General Studies SB, G*

GCU 141 Introduction to Economic Geography. (3 N
Production distribution and consumption of various types of commodities f the world and relationships to the activities of humans *General Studies SB*

GCU 240 Introduction to Southeast Asia. (3) F
An interdisciplinary introduction to the cultures regions political systems, geography and history of Southeast Asia. Crosslisted as ASB 240 HIS 240 POS 240 REL 240. *General Studies G*

GCU 253 Introduction to Cultural and Historical Geography. (3 N
Cultural patterns including such phenomena as language religion and various aspects of material culture Origins and diffusion and division of the world into cultural areas *General Studies SB, G*

GCU 294 Special Topics. 4 A
Topics including global awareness

GCU 322 Geography of U.S. and Canada. (3) A
Spatial distribution of relevant physical economic and cultural phenomena in the United States and Canada *General Studies SB*

GCU 323 Geography of Latin America. 3 F
Spatial distribution of relevant physical economic, and cultural phenomena in South Middle and Canbbean America *General Studies SB, G*

GCU 325 Geography of Europe. 3) A
Broad and systematic overview of Europe emphasizing physical economic and cultural phenomena *General Studies. SB G*

GCU 326 Geography of Asia. (3) F
Spatial distribution of relevant physical economic, and cultural phenomena in Asia, excluding the former Soviet Union *General Studies· SB, G.*

GCU 327 Geography of Africa. 3) N
Spatial distribution of relevant physical, economic and cultural phenomena in Africa *General Studies SB, G*

GCU 328 Geography of Middle East and North Africa. (3) N
Spatial distribution of relevant physical economic, and cultural phenomena in the Middle East and North Africa Prerequisite GCU 121 or instructor approval *General Studies SB, G.*

GCU 332 Geography of Australia and Oceania. 3 A
Spatial distribution of relevant physical economic and cultural phenomena in Australia New Zealand and Pacific Islands *General Studies G*

GCU 344 Geography of Hispanic Americans. 3 S
Examines the homelands migrations settlements, landscapes roles and selected cultural traditions of Hispanic Americans *General Studies C*

GCU 350 The Geography of World Crises. 3) F, S
Contemporary world crises viewed from a perspective of geographic concepts and techniques *General Studies. SB G*

NOTE For the General Studies requirement, codes (such as L1 N3, C, and H , and courses, see pages 84–108 For graduation requirements see pages 79–83 For omnibus courses offered but not listed in this catalog, see pages 56–57

GCU 351 Population Geography. 3 F
Demograph c patterns, spat'a , tempora and structura nvest gat on of the re atonsh p f demograph c var ab es to cu tura , econom c and env ronmenta factors *Genera Studies SB*

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 ronmental percept on of nd v dua s and groups. The spat'a aspect of soc a and phys ca env ronments s stressed *Genera Stud es SB*

GCU 359 Cities of the World I. 3) N
H stor ca evo ut on f urban patterns and structures n the M dd e East nd a Southeast As a, Ch na Japan a d 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 Sub Saharan Afr ca, and Austra as a *Genera Stud es. G*

GCU 361 Urban Geography. (3 F S
Externa spatia re ations of c t es nterna c ty structure and spat a aspects of urban pr b lems n var ous parts of the wor d part cu ar y n the United States *Genera 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 power n dustry and ts env ronmenta prob ems

GCU 421 Geography of Arizona and Southwestern Un'ted States. (3) F S
Geography of the Southwest w th an empha s s on Ar z na Div ded nto phys ca geogra phy h story, peop e and economy *Genera Studies· C*

GCU 423 Geography of South America. 3 S
Prerequ's te· GCU 323 or nstructor approva *General Studies SB, G*

GCU 424 Geography of Mexico and Middle America. 3 A
Central Amer ca and Mex co Prerequ s te GCU 323 or nstructor approva *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 re- g on Exam nat on of sett ement, boundary s sues ethnic subreg ons popu at on change, industr a deve opment and urban growth *General Stud es L2, G.*

GCU 426 Geography of Russia and Surroundings. 3) N
Exam nes the geography of Russ a and other post Sov et states Prerequ s te GCU 121 or nstructor approval *Genera Stud es SB G*

GCU 433 Geography of Southeast Asia. 3) S
Exam nes the biophys ca and soc a features of Southeast As an nat ons and peop es Prerequ s te GCU 326 r nstructor approva

GCU 441 Economic Geography. (3 A
Spat a d str but on of pr mary secondary and tert ary econom c and product on activ t es Prerequ site GCU 141 or instruct r approva

GCU 442 Geographical Analysis of Transportation. (3) S
Networks, modes econom cs and f ows at the urban nat ona and nternationa sca es Prerequ s te GCU 141 or 441 *Genera Stud es SB*

GCU 444 Applied Urban Geography. (3) S
Des gned to prepare the student for emp oy ment n p ann ng agenc es. Inc udes app ca- t on of urban geograph'c princip es to present-day p ann ng prob ems Prerequ s te GCU 361

GCU 453 Recreational Geography. (3) N
Exam nat on of prob ems surround ng the or gan zat on and use of space for recreat on In troducing geograph c f e d survey methods of data co ect on and ana ys s Saturday f eld tr ps may be requ red

GCU 455 Historical Geography of U.S. and Canada. (3) N
Geograph cal perspect ve on the evolut on of the United States and Canada from pre- Co umb an t mes to ear y 20th Century

GCU 474 Public Land Policy. 3 F
Geographic aspects of federal pub c ands pol cy management, and ssues. Emphasis on western wi derness and resource deve op- ment prob ems

GCU 495 Quantitative Methods in Geogra phy. (3) F S
Stat st cal techn ques app ed to the ana ys s of spat a d str but ons and re at onsh ps ntro duct on to mode s and theory n geography Prerequ s te MAT 119. *General Studies N2*

GCU 496 Geographic Research Methods. (3 F S
Sc ent f c techn ques used n geograph c re search Prerequ s tes GCU 495 GPH 371 491. *Genera Stud es· L2.*

GCU 515 Human Migration. 3) F
Econom c po t ca socia , and geograph c factors under y ng popula on movements. M - grat on select v ty streams and counter- streams abor m grat on, and m grat on dec - s on mak ng Lecture sem nar. Prerequ s te GCU 351 or nstructor approva

GCU 526 Spatial Land-Use Analysis. 3) N
Determ nat on, c ass f cat on and analys's of spat a varia ons n and use patterns Exam nat on of the processes affect ng and use change. Prerequ s te 15 hours of geography r instructor approva

GCU 529 Contemporary Geographic Thought. (3) S 1999
Comparat ve eva uat on of current ph osophy concern ng the nature and trends of geogra phy Prerequ s tes 15 hours f geography, n structor approva

GCU 585 Advanced Research Methods in Geography. 3) F
Spec a zed research techn ques and method- o og es in econom c po t ca , or cu tura geog- raphy

GCU 591 Seminar. 1 3 F S SS
Se ected top cs in economic po it ca or cu tura geography F e d tr ps may be required

GCU 596 History of Geographic Thought. (3 S 2000
H stor ca deve opment of geographic thought from pre Greek days t the early 20th Cen tury

PHYSICAL GEOGRAPHY (GPH)

GPH 111 Introduction to Physical Geography. (4) F S
Spat a and funct ona re ationsh ps among c mates, landforms, so s water and p ants. 3 hours ecture, 3 hours lab F eld tr ps are re qu red *General Stud es S1 S2*

GPH 210 Introduction to Environmental Geography. (3) F
Princip es of phys ca geography relating to environmenta prob ems pert nent to contem- porary soc ety Po lut on, ma adjusted land use and resource exp o tat on

GPH 211 Landform Processes. (3) S
Geograph c characterist cs of andforms and earth-surface processes, emphas z ng ero- sion transportation deposit on, and mp ica- t ons for human management of the env ron- ment Prerequ s te: GPH 111. *General Stud es L1*

GPH 212 Introduction to Meteorology I. (3) F
Fundamenta s of weather and cl mate nc ud ng bas c atmospheric processes and e e- ments Students whose curr cu a require a aboratory course must a so reg ster for GPH 214 Prerequ s te GPH 111 or nstructor ap- prova *General Studies: S2 (if credit also earned n GPH 214)*

GPH 213 Introduction to Meteorology II. (3) S
Fundamenta s of meteoro og cal/c imato og ca ana ys s, nc ud ng term nology and symbol ogy. Recommended for meteoro ogy/c matol ogy program students Prerequ site GPH 212 or instructor approval

GPH 214 Introduction to Meteorology Laboratory I. (1) F
ntroduct on to bas c meteoro og ca c imato- logical data and measurements 3 hours lab Suggested concurrent enrol ment n GPH 212 *General Stud es S2 (if credit also earned in GPH 212).*

GPH 215 Introduction to Meteorology Laboratory II. (1) S
Fundamentals of Meteoro og cal/cl matologica map ana ysis and nterpretat on. Recom mended for meteorology cl matology program students. May be taken concurrent y with GPH 213 Prerequis te GPH 214 or instructor ap prova .

GPH 271 Maps and Map Reading. 3) S
Map types uses l mitations and evo ut on Commun cat on v a paper and d g tal med um Nav gat on, interpretation projections, sources, symbols c assif cation case han dl ng

GPH 314 Global Change. (3) F
Response of Earth s natura systems (atmo sphere hydrosphere l thosphere biosphere) to past env ronmenta change and effects of potent'a future changes

GPH 371 Cartography. (3) F, S
Ph losophy and practical aspects of map pro duct on, commun cations, symbo ism, data man pulation, presentat on, dec s'on making genera ization l nework, etter ng, d g tal me d a employed Prerequ site: GPH 111.

GPH 372 Air Photo Interpretation. (3) S
Subset remote sens ng nc udes: photogra phy f ms aer a ge metry mage compo nents stere sc py ph togrammetry ground truth ng nterpret phys ca cu tural, econom c nte gence nf mat on Prerequ s te· GPH 211 or any Cu tura Geography (GCU) course or nstructor appr va

GPH 373 Cartographic Design. (3 F
Advanced des gn us ng desktop mapp ng. Cartograph c dec s on mak ng qua tat ve and quant tat ve symbo design project ons co or P erequ s tes GPH 371 or nstructor approva

GPH 381 Geography of Natural Resources. 3 A
Nature and d str but on of natura resources and the prob ems and pr nc p es assoc ated w th the r use

GPH 401 Topics in Physical Geography. 1 3 A
Open to students qua if ed to pursue ndepen-dent stud es F e d tr ps may be requ red Pre-requ s te nstructor approval

GPH 405 Energy and Environment. (3) S
Sources reg atory and techn ca contro s, d str but on a d consequences of the supp y and human use of energy Prerequ s te: courses n the physica or fe sc ences or n st uctor approva

GPH 409 Synopt c Meteorology I. 4) F 1999
D agnost c tec n ques and synopt c forecast ng nc udes techniques of weather ana ys s, map nterpretat on and sate te and radar ana ys s Prerequ s tes MAT 270; PHY 131 132

GPH 410 Synoptic Meteorology II. 4 S 2000
D agnost c techn ques and synopt c forecast ng nc udes techn ques of weather ana ys's map nterpretat on, and sate te a d radar ana ys s Prerequ s te: GPH 409

GPH 411 Physical Geography. 3 A
ntr duct on to phys ography and the physica e ements of the env ronment. Open on y to st dents wh have not taken GPH 111 F e d t ps

GPH 412 Physical Climatology. (3 A
Phys ca processes n the earth atmosphere system on reg na and g oba sca es, con-cepts and ana ys s of energy momentum and mass ba ances Prerequ s tes: GPH 212 and 213 o nstru tor approval

GPH 413 Meteorological Instruments and Measurement. 3 A
Des gn and operat n of ground base and aero g ca weather measurement systems. Co ect on reduct on storage retr eva and ana ys s of data F eld tr ps are required Pre-req s te GPH 212 and 213 *or* instructor ap prova

GPH 414 Climate Change. (3) S
Survey of three c mate research areas: pa eo c mato ogy theor es e g greenhouse warm-ng n mer ca mode ng Prerequ s te GPH 212 or instru tor approva

GPH 418 Landforms of the Western United States. 3 A
Study andforms and geomorphic processes n the western Un ted States, nc ud ng ecture topograph ca maps aer a photographs satel te magery and f e d trip Lecture, cr t cal n qu ry aboratory f e d wo k Prerequ s tes GPH 211 or equ va ent . complet on of L1 c ass *Genera Stud es· L2.*

GPH 425 Plant Geography. (3 F
P ant commun ties of the wor d and the r nter pretat on emphas z ng North Amer can p ant assoc at ons Cross l sted as PLB 422 Pre requ s te BIO 182 or GPH 111

GPH 433 Alpine and Arctic Environments. (3 N
Reg ona study of advantages and m tat ns of the natura env ronment upon present and future prob ems nvo v ng resource d str bu t on human act v t es and regiona and nter reg ona adjustments F e d t ps are requ red Prerequ site GPH 111 or nstructor approva .

GPH 471 Geographic Information Systems. 3 F S
G S as a bas s for m croc mputer spat a ana ys s and synthes s I c udes d g t z ng database organ zat on spat a retr eva and graphics Prerequ s te nstructor approva

GPH 474 Dynamic Meteorology I. 3 F 1998
Large scale atmospher c mot on k nemat cs Newton s laws w nd equation baroc n cs, vort c ty, and the m'd at tude depress on. Pre requ s tes GPH 213 215 MAT 271 PHY 131, 132

GPH 475 Dynamic Meteorology II. 3 S 1999
Top cs n c mate dynam cs Genera c rcu a t on numer ca mode ing teleconnect on phe nomena, and surface atmosphere nteract on Prerequ s te GPH 474 or nstructor appr va

GPH 481 Environmental Geography. 3 A
Prob ems of env ronmenta qua ty nc ud ng uses of spat a ana ys s research des gn and f e d work n urban and rura systems F e d trips are requ red Prerequ site nstructor ap prova

GPH 491 Geographic Field Methods. 6 S, SS 1999
F e d techn ques nc ud ng use of aer a pho tos large scale maps and fract ona code system of mapp g, urban and rura fie d ana ys s to be done off campus Trave fees re qu red Prerequ s tes GCU 102 121 GPH 111

GPH 511 Fluvial Processes. 3 A
Geograph ca aspects of processes of r ver eros on t ansportat on, sed mentat on em phas z ng spat a character st cs of forces, re s stance, andforms sed ment nc udes com puter app cat ons. Prerequ s tes GPH 111 or GLG 101) and 211 (or GLG 362 *or* nstructor approva

GPH 533 Snow and Ice. (3) S 1999
Processes d str but on c mat c nteract ons of snow ce emphas z ng mass ba ance snow strat graphy metamorph sm and g ac er snow pack c 'mato ogy Lecture f e d work Prereq u s te nstructor 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 geograph c data nc udes p otting surf c a d sp ay, compos t ng and graphics F e d tr ps Prerequ s tes GPH 371 nstructor appr va

GPH 575 Geographic Applications of Remote Sensing. (3) N
Use of mag ng and non mag ng methods of remote acqu s t on of data, ncluding sate te sensors, a rborne radar mu t band scann ng convent ona photograph c sensors, and ground based equ pment F e d tr ps are re qu red Prerequ sites GCU 585 or GPH 491 . GPH 372

GPH 591 Sem nar. 1 3 F, S
Se ected top cs n phys ca geog aphy F e d t ps may be requ red

Department of Geology

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ASSISTANT PROFESSORS
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SHARP, TANG

GEOLOGY—B.S.

The B.S. degree in Geology requires 39 semester hours including the following core courses or their equivalents

GLG	1 1	Int duct on t y C v l Ph si a S/ S2	3
GLG	102	Intr d tic n to Ge y II H storic l S2[2]	3
GLG	103	Intr duct on to Geol y Lab rat ry S S2[1]	1
GLG	1 04	Intr duct n to Geology II Labor t ry S2	1
GLC	31	Structural Geology	3
GLC	321	M neral y	3
GLG	400	Geol gy C llequ m . . .	1
GLG	424	Petr logy . .	3
G G	435	Sed m nt ology	3
GLG	45)	Geol gy F eld C p *L2*	6
Total		. . . .	27

[1] Both GLG 1 1 a d 1 03 ust be tak n to sec ire S1 r S2 red t

[2] Both GLG 1 a d 1 04 r ist be taken to secure S2 credit.

In addition, two of the following four branch courses must be taken:

GLG	335	Pa e nto o y	3
GLG	418	Geophysics	3
GLG	470	Hydrogeology	3
GLG	481	Geoch en stry	3

To complete the total required hours, other upper div sion courses in geology (exc ud ng G G 30), 30 ?, and 304 or courses in related fi lds listed as ap proved by the depa tment may be taken See "Major Requiren ents," page 306.

Supporting courses required in related fields include

CHM	113, 116	General Chemistry *S1/S2*	8
MAT	270	Calculus with Analytic Geometry I *A1*	4
MAT	271	Calculus with Analytic Geometry II	4
MAT	272	Calculus with Analytic Geometry III	4
		or MAT 274 Elementary Differential Equations	3
PHY	121	University Physics I Mechanics *S1 S2*[1]	3
PHY	122	University Physics Laboratory I *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			28

[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.

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 23 hours of geology courses Required courses are as follows.

GLG	101	Introduction to Geology I Physical *S1 S2*[1]	3
GLG	102	Introduction to Geology II Historical) *S2*[2]	3
GLG	103	Introduction to Geology I Laboratory *S1/S2*[1]	1
GLG	104	Introduction to Geology II Laboratory *S2*[2]	1
GLG	310	Structural Geology	3
GLG	321	Mineralogy	3
GLG	400	Geology Colloquium	1
Total			15

[1] Both GLG 10 and 103 must be taken to secure S1 or S2 credit

[2] Both GLG 102 and 104 must be taken to secure S2 credit.

The remaining eight semester hours may be chosen among other upper division geology courses, except GLG 300 and 400, after consultation with a department 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

GEOLOGY (GLG)

GLG 101 Introduction to Geology I (Physical). 3) F S SS
Basic principles of geology, geochemistry, and geophysics Rocks minerals weathering earthquakes mountain building, volcanoes water and glaciers Possible weekend field trips *General Studies: S1 S2 if credit also earned in GLG 103*

GLG 102 Introduction to Geology II (Historical). (3 S
Basic principles of applied geology and the use of these principles in the interpretation of geologic history Possible weekend field trips Prerequisite GLG 101 *General Studies S2 (if credit also earned in GLG 104)*

GLG 103 Introduction to Geology I—Laboratory. 1 F S SS
Three hours lab, some field trips. Corequisite GLG 101 *General Studies S1 S2 (if credit also earned in GLG 101)*

GLG 104 Introduction to Geology II Laboratory. 1 S
Laboratory techniques involving map interpretation cross sections and fossils 3 hours lab possible field trips Prerequisite GLG 103 or equivalent Corequisite GLG 102 *General Studies S2 if credit also earned in GLG 102)*

GLG 105 Introduction to Planetary Science. (4 S
Solar system objects and their geologic evolution surfaces interiors, and atmospheres weekly laboratory for data analysis and experiments weekend field trip Lecture lab *General Studies S2*

GLG 110 Environmental Geology. (3) F
Geological studies as they apply to interactions between humans and earth includes geologic processes and hazards resources, and global change *General Studies. S2 if credit also earned in GLG 111) G*

GLG 111 Environmental Geology Laboratory. 1 F
Basic geologic processes and concepts Emphasis on geology related environmental problems concerning Arizona Case histories and field studies. Lab Corequisite. GLG 110 *General Studies: S2 if credit also earned in GLG 110*

GLG 300 Geology of Arizona. (3 A
Basic and historical geology fossils, mining energy resources environmental problems andscape development, and meteorites, cast in examples from Arizona Majors who have take GLG 101 for credit may not e ro

GLG 302 Man and Geologic Environment. 3 N
Geologic hazards problems of waste disposal and land use planning and environmental problems related to soil earth

GLG 304 Geology of the Grand Canyon. (2 N
Review of the discovery history origin and geology of the Grand Canyon of the Colorado River in Arizona Six-day field trip down the river (first 6 days after commencement in May) required at student's expense Field research and term paper on trip also required

GLG 305 Geology of the Earth, Moon, and Planets. (3 S
Geological studies of the planets and satellites through the analysis of spacecraft data and field studies Weekend field trips. Prerequisites: GLG 101 and 105 and 300 *or* equivalents

GLG 310 Structural Geology. (3 S
Geologic structures and the mechanical processes involved in their formation 2 hours lecture, 3 hours lab Possible field trips Prerequisites GLG 101 MAT 270 or 290)

GLG 321 Mineralogy. (3 F
Crystal chemistry, crystallography, mineral identification origin and occurrence of minerals systematic mineralogy 2 hours lecture, 3 hours lab possible field trips Prerequisites: CHM 113 MAT 270 (or 290) Pre- or corequisite: CHM 116

GLG 335 Paleontology. (3 F
Introduction to concepts and analytical techniques biology paleobiology paleoecology and paleoenvironmental reconstruction from the fossil record. 2 hours lecture 3 hours lab. Prerequisites GLG 102 and MAT 270 or 290 *or* instructor approval.

GLG 336 Invertebrate Paleontology. 3) N
Biology skeletal morphology and systematics of fossil invertebrates One or two projects emphasizing population analysis and technique in paleontology Lecture, 6 hours lab, possible field trips Prerequisite GLG 102 or instructor approval Pre- or corequisite for Geology majors GLG 335.

GLG 362 Geomorphology. (3) N
Landforms and processes which create and modify them Laboratory and field study of physiographic features 2 hours lecture, 3 hours lab possible weekend field trips Prerequisite: GLG 101. Pre- or corequisite GLG 310

GLG 400 Geology Colloquium. (1) F S
Presentation of recent research by faculty and guests Written assignments required 1 semester hour required for Geology majors, may be repeated for a total of 2 semester hours. Prerequisite: 2 courses in the department or instructor approval

GLG 405 Geology of the Moon. (3) N
Current theories of the origin and evolution of the moon through photogeologic analyses and consideration of geochemical and geophysical constraints Possible weekend field trip Prerequisite GLG 105 or 305 or instructor approval

NOTE For the General Studies requirement codes such as L1 N3 C and H and courses, see pages 84–108 For graduation requirements, see pages 79–83 For omnibus courses offered but not listed in this catalog see pages 56–57

GLG 406 Geology of Mars. (3) N
Geological evolution of Mars through analyses of spacecraft data, theoretical modeling, and study of terrestrial analogs; emphasis on current work. Possible weekend field trip to Northern Arizona. Prerequisite: GLG 105 or 305 or instructor approval.

GLG 412 Geotectonics. (3) F
Earthquakes, earth's interior, formation of oceanic and continental crust, and plate tectonics. Emphasis on current work. Prerequisite: GLG 310.

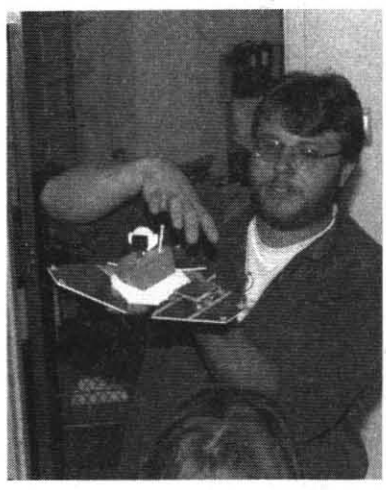
GLG 416 Field Geophysics. (3) S
Methods of applied geophysical exploration; seismic refraction, gravity, electrical resistivity, geomagnetics. Includes survey planning, data acquisition, processing, analysis, and interpretation. Lecture, field exercises. Prerequisite: one course in geology or instructor approval.

GLG 418 Geophysics. (3) F
Solid earth geophysics; geomagnetism, gravity, seismology, heat flow. Emphasis on crust and upper mantle. Prerequisites: GLG 310 and MAT 272 and PHY 131 *or* instructor approval.

GLG 419 Thermal-Mechanical Processes in the Earth. (3) F
Emphasis on applied mathematical techniques, heat conduction problems in geology, thermal convection, stresses in the lithosphere, and viscoelastic processes in the Earth. Prerequisite: PHY 131.

GLG 420 Volcanology. (3) A
Distribution of past and present volcanism, types of volcanic activity, mechanism of eruption, form and structure of volcanoes, and geochemistry of volcanic activity. Possible weekend field trips. Prerequisite: GLG 424.

GLG 424 Petrology. (3) F
Origin of igneous and metamorphic rocks. Optical mineralogy, hand specimen identification, and thin-section analysis. 2 hours lecture, 3 hours lab, possible weekend field trips. Prerequisite: GLG 321.



Kenneth Edgett, director of the Mars Global Surveyor education program, uses a model to explain the Pathfinder to students. Tim Trumble photo

GLG 435 Sedimentology. (3) S
Origin, transport, deposition, and diagenesis of sediments and sedimentary rocks. Physical analysis, hand specimen examination, and interpretation of rocks and sediments. 2 hours lecture, 3 hours lab, possible weekend field trips. Prerequisites: GLG 102, 321.

GLG 436 Principles of Stratigraphy. (3) N
Principles of interpreting lithostratigraphic, magnetostratigraphic, biostratigraphic, seismostratigraphic, and chronostratigraphic units; correlation and facies relationships in stratified rocks. Applied stratigraphy project(s). Lecture, possible field trips. Prerequisites: GLG 102; instructor approval.

GLG 441 Ore Deposits. (3) N
Origin, occurrence, structure, and mineralogy of ore deposits. Possible weekend field trips. Prerequisite: GLG 424 or instructor approval.

GLG 450 Geology Field Camp. (6) SS
Geological mapping techniques on aerial photos and topographic maps. Field based with excursions. Prerequisites: GLG 310, 321. *General Studies: L2.*

GLG 455 Advanced Field Geology. (3–4) F, S
Geologic mapping in igneous, sedimentary, and metamorphic terrains of the Basin and Range province of Arizona. Weekend field trips. May be repeated for credit. Prerequisite: GLG 450 or instructor approval.

GLG 456 Cordilleran Regional Geology. (3) F
Systematic coverage through space and time of the geological development of western North America, emphasizing the western United States. Prerequisite: senior major or graduate student in Geology or instructor approval.

GLG 470 Hydrogeology. (3) S
Geology of groundwater occurrence, aquifer and well hydraulics, water chemistry and quality, contaminant transport, remediation. Emphasis on quantitative methods. Prerequisites: GLG 101 (or 103); MAT 270; PHY 121.

GLG 481 Geochemistry. (3) S
Origin and distribution of the chemical elements. Geochemical cycles operating in the earth's atmosphere, hydrosphere, and lithosphere. Cross-listed as CHM 481. Prerequisite: CHM 341 (or 441) or GLG 321.

GLG 485 Meteorites and Cosmochemistry. (3) N
Chemistry of meteorites and their relationship to the origin of the earth, solar system, and universe. Cross-listed as CHM 485.

GLG 490 Topics in Geology. (1–3) F, S, SS
Special topics in a range of fields in geology. May be repeated for credit. Prerequisite: instructor approval.

GLG 500 Geology Colloquium. (1) F, S
Presentation of recent research by faculty and invited guests. 1 semester required for all geology graduate students. May be repeated for total of 2 semesters. Research paper required. Prerequisite: instructor approval.

GLG 501 Geology of Arizona. (3) A
Basic and historical geology, fossils, mining, energy resources, environmental problems, landscape development, and meteorites, cast in examples from Arizona. Research paper required.

GLG 504 Geology of the Grand Canyon. (2) S
Review of the discovery, history, origin, and geology of the Grand Canyon of the Colorado River in Arizona. 6-day field trip down the river (first 6 days after commencement in May) required at student's expense. Field research and term paper on trip also required.

GLG 510 Advanced Structural Geology. (3) N
Mechanics of rock deformation, emphasizing relationship between field observation, theory, and experiment. Stress, strain, simple constitutive relationships, failure criteria, and the basis of continuum methods. Possible field trips. Prerequisites: GLG 310 and 424 *or* instructor approval.

GLG 520 Advanced Physical Volcanology. (2–3) A
Selected volcanologic topics, including explosive eruption processes, lava flow mechanics, and intrusive mechanisms. Field trips possible. Prerequisite: GLG 420 or instructor approval.

GLG 524 Advanced Igneous Petrology. (3) N
Theoretical and practical aspects of the genesis of igneous rocks. Study of selected sites. Modern laboratory techniques. 2 hours lecture, 3 hours lab, possible weekend field trips. Prerequisite: GLG 424.

GLG 525 Advanced Metamorphic Petrology. (3) N
Theoretical and laboratory study of metamorphic rocks. Processes of contact and regional metamorphism. Advanced methods and instrumentations. 2 hours lecture, 3 hours lab, possible weekend field trips. Prerequisite: GLG 424.

GLG 562 Quaternary Geology. (3) N
Geology of the Quaternary Period in both glaciated and unglaciated areas. Stratigraphy, correlation, and environmental application of Quaternary deposits. Special reference to the Southwest. 2 hours lecture, 3 hours lab, some field trips during lab, possible weekend field trips. Prerequisite: GLG 362 or instructor approval.

GLG 581 Isotope Geochemistry. (3) N
Geochemistry and cosmochemistry of stable and radioactive isotopes; geochronology; isotope equilibria. Cross-listed as CHM 581. Prerequisite: instructor approval.

GLG 582 Physical Geochemistry. (3) N
Application of thermodynamic and kinetic principles to geochemical processes. Prerequisite: CHM 341 (or 441) or GLG 321.

GLG 583 Phase Equilibria and Geochemical Systems. (3) N
Natural reactions at high temperatures and pressures; silicate, sulfide, and oxide equilibria. Cross-listed as CHM 583. Prerequisites: GLG 582; instructor approval.

GLG 591 Seminar. (1–3) F, S, SS
Topics in a range of fields in geology. May be repeated for credit. Prerequisite: instructor approval.

GLG 598 Special Topics. (1–3) F, S, SS
Special topics in geology. May be repeated for credit. Prerequisite: instructor approval.

Department of History

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PROFESSORS
ADELSON, BATALDEN, BURG, DAVIS DELLHEIM, FUCHS, GIFF N, GRATTON, VERSON, KLE NFELD, LAVRIN, LUCKINGHAM, MacK NNON, PYNE, ROSALES ROTHSCHILD, RUIZ, STOWE, TAMBS TILLMAN, TRENNERT WARNICKE

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ASSISTANT PROFESSORS
GULLETT HENDRICKS LONGLEY, McKEE, THORNTON

SENIOR INSTRUCTIONAL PROFESSIONAL
LUEY

HISTORY—B.A.

The B.A. degree in History consists of 45 semester hours, of which 30 must be in history and 15 in related fields to be approved by the advisor in consultation with the student. Courses in related fields may also be used to satisfy general college requirements. HIS 300 Historical Inquiry is required and is a prerequisite for HIS 498 Pro Seminar. HIS 498 Pro Seminar is required, except for honors students, who may substitute HIS 493 Honors Thesis. At least 18 hours in history courses and nine hours in the related fields must be in upper division courses. Students are required to take at least six hours in each of two different subject areas and at least three hours in a third subject area all within the discipline of history. These subject areas include U.S., European, British, Latin American, and Asian history. A minimum GPA of 2.25 in the 30 hours of history courses is required. See "Major Requirements," page 306.

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 general college requirements. At least 27 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 each of two of the following areas: U.S., Latin American, British, Asian, and European history. A minimum GPA of 2.25 in the 42 hours of history courses is required. Students must earn a minimum grade of "C" in HIS 381, 382, and their prerequisite, MAT 117 or higher. See "Major Requirements," page 306.

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," pages 307-308, 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 308, 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 three 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 2.25 in history courses is required for admission to practice 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.

The minor teaching field consists of 24 semester hours in history courses, of which at least nine must be in upper division courses. The program must include at least three hours in U.S. history.

Social Studies. See page 390.

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 origin and development of Western society, institutions from the ancient world through the Middle Ages. *General Studies SB, H.*

HIS 101 Western Civilization. (3) F S
Traces origin and development of Western society, institutions from the Renaissance and Reformation through Age of Enlightenment. *General Studies SB, H.*

HIS 102 Western Civilization. (3) F S
Traces origin and development of Western society, institutions from the French Revolution to the present. *General Studies SB, G, H.*

HIS 103 The United States. 3 F S
Growth of the Republic from colonial times through the Civil War period. *General Studies SB, H.*

HIS 104 The United States. (3) F S
Growth of the Republic from the Civil War period to the present day. *General Studies. SB, H.*

HIS 107 Introduction to Japan. (3) A
History, culture, politics and economy of Japan, supplemented by audiovisual presentations. Intended for nonmajors. *General Studies SB, G, H.*

HIS 111 Global History Since 1500. (3) F S
Survey of Africa, the Americas and Eurasia, changes in communication, communities, demography, economics, environment, politics, religion, technology, warfare, and women. Lecture, CD ROM, electronic forum discussion. *General Studies. G, H.*

NOTE For the General Studies requirement, codes (such as L1, N3, C, and H), and courses, see pages 84-108. For graduation requirements, see pages 79–83. For omnibus courses offered but not listed in this catalog, see pages 56–57.

HIS 230 American Social History. 3 A
Amer can soc ety from the c on a per od to the present Ethn c ty race age and sex as factors n h'stor ca exper ence Lecture, d s cuss on *Genera Stud es L1 H*

HIS 240 Introduction to Southeast Asia 3) F
An 'nterd sc p nary ntroduct on to the c tures re g ons, pol tca systems geography and h story of Southeast As a Cross sted as ASB 240 GCU 240 POS 240 REL 240 *Gen eral Stud es G*

HIS 270 Judaism in American History. (3 N
A chrono ogical analys s of Jews and Juda sm n Amer can h story and etters *Genera Stud es SB H*

HIS 273 American Military History. 3 N
A study of the role of the m tary n Amer can fe dur ng war and peace from co on a t mes to the present day 3 hours ecture confer ence *Genera Stud es SB H.*

HIS 294 Selected Topics in History. 3 N
A fu descr pt on of top cs for any semester ava' ab e n the Department of H story off ce May be repeated for cred t

HIS 300 Historical Inquiry. 3 F S
H stor ca methods and crit ca nqu ry re ated to particu ar events a d processes Top cs vary Requ red course for majors Prerequ s te for H S 498 D scuss on sem nar ecture Prerequ s te ENG 102 *Genera Stud es L1 SB, H*

HIS 303 American Cultural History. 3 F S
Cu ture in a broad conn tat on, nclud ng deas deals the arts, and soc a and ec nomic standards from the nat on s co on a background and ear y nat ona per od *Genera Studies SB H*

HIS 304 American Cultural History. (3 F S
Culture in a broad connotat on, nc ud ng deas, deals the arts and soc a and eco nom c standards from the age of ndustr a sm and modern Amer ca *Genera Stud es SB H.*

HIS 305 Asian Civilizations. 3 A
The c v zat ons of Ch na Japan and I d a to m d 17th century *Genera Stud es SB G H*

HIS 306 Asian Civilizations. (3) F, S
The c vi zat ons of Ch na Japan and d a from the m d 17th century to present May also nc ude Southeast Asia *General St d 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 ndones a, and Ph pp nes s nce 1750 mper a sm revo u- t on and ndependence. Lecture d scuss on *Genera Stud es SB G H*

HIS 309 History of Chinese Science. (3 A
Explores deve opment of trad t'o a 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 scuss on Cross sted as HPS 325

HIS 312 Interpreting China's Classics. 3 F
Study of se ected Confuc an and/or Tao st c ass cs and ways they have been read n both As an and Western scho arsh p Cross sted as HUM 312 *Genera Stud es L2/HU H*

HIS 315 Japan in the Age of the Samura'. 3) F S
H story of the warr or c ass of Japan 700–1868

HIS 320 Ancient Greece. 3 F
H story and c v zat on of the Greek wor d f om the Bronze Age to the Roman conquest of the He en st c k gdoms *Genera Stud es· SB H*

HIS 321 Rome. 3 S
H story and c v zat on of Rome from the be g nn ng of the Repub to the end of the Em p re. *Genera Stud es· SB, H*

HIS 322 The Middle Ages. 3 A
P t ca soc oeconom c, and cu tura deve op ments of Western Europe dur ng the Ear y M dd e Ages Prerequ s te HIS 100 or nstruc tor approva *Genera Stud es SB H*

HIS 323 The M'ddle Ages. 3 A
Po t ca soc oeconom c, and cu tura deve op ments of Western Europe dur ng the H gh M dd e Ages Prerequ te HIS 100 or nstruc tor approva *Genera Stud es SB H*

HIS 324 Renaissance. 3 F
Antecedents and deve opment of the Rena s sance n ta y and ts spread to the rest of Eu rope *Genera Stud es. L2/SB, H*

HIS 325 Reformation. 3 S
The Protestant and Catho c Refo mat on n the 16th century *Genera Stud es L2/SB H*

HIS 326 Early Modern Europe 3 A
Soc al e on m c cu tura and po t ca changes n 17th century Europe *General Stud es SB H*

HIS 327 Early Modern Europe. 3 N
Soc a , econom c, cu t ra and pol t cal changes n 18th century Europe *Genera Stud es. SB H*

HIS 329 19th-Century Europe. (3 A
Po t ca soc a economic and ntel ectua currents n Eur pe from Napo eon to 1866 *Genera Studies SB H*

HIS 330 19th-Century Europe. 3 A
Po t ca soc a econom c and nte ectua currents n Eur pe fr m 1866–1918 *General Stud es· SB H*

HIS 331 20th-Century Europe. 3) N
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 20th-Century Europe. 3 N
Europe ts wor d sett ng s nce Wor d War emphas z ng ma or po t ca and soc a ssues from 1945 to the present *General Stud es SB G H*

HIS 333 Women and Society in Europe. 3 N
Women s ro e status and ach evements n Europe, 1750–1950 Changes n everyday fe sex ro es fam y patter s work, and cu ture *Genera Stud es 2/HU SB H*

HIS 335 Family, Class, and Society in Modern Europe. 3) N
Fam y fe sex ro es work cr me popu at on changes, and the r re at onsh p to po t ca , econom c and so a changes Prerequ s te upper d v s on stand ng or nstructor approva *Genera Stud es L2/SB H*

HIS 351 England. 3 A
P t ca econom c and soc a deve opment of the Eng sh peop e to the 17th entury *Gen era Stud es SB H*

HIS 352 England. (3 N
Po t ca econom c and soc a development of the Eng sh people from 17th century to the present *Genera Stud es. SB H*

HIS 357 19th-Century West. (3) F
Soc a pol t cal and economic deve opment of trans-M ss ssippi West beg nn ng with Lou s - ana Purchase and end ng n 1900. *Genera Stud es. SB H*

HIS 358 The West in the 20th Century. (3) S
Ro e of the western states n Amer can h story s nce 1890 w th emphasis on po t cs the env ronment ndustry and labor and the chang ng posit on of ethn c minor t es *Genera Studies· SB H*

HIS 360 American Indian History to 1900. 3) F
Cu tura , econom c po t ca , and soc a cont nu ty and change of Amer can Ind an commu n t es to 1900. Lecture d scuss on *General Stud es· SB, C, H*

HIS 361 American Indian History Since 1900 (3) S
Cu tu a econom c po t cal, and soc a cont nu ty and change of American Ind an commu- n t es from 1900 to the present. Lecture d s- cuss on *Genera Stud es· SB C H*

HIS 363 African American History I. (3) A
The Afr can American n Amer can history, thought and cu ture from s avery to 1865. *General Stud es SB C H*

HIS 364 African American History II. 3) A
The Afr can American n Amer can history, thought, and culture from 1865 to the present *General Stud es SB C H*

HIS 365 Islamic Civilization. (3) N
An nterd sc p nary survey of the art h story, and rel g on of Is am c civi zation *General Stud es· HU H*

HIS 366 The Modern Middle East. 3) N
mpact of the Western world upon M dd e Eastern governments re g on, and society n the 19th and 20th centuries prob ems of mod ernizat on and the ro e of the Midd e East in wor d affa rs *General Studies. SB G H.*

HIS 369 Exploration and Empire. (3) S
An nterd sc p inary survey of exp oration by Western Civ zat on over the past 500 years Lecture d scuss on *General Studies L2 H*

HIS 370 Women in U.S. History, 1600–1880. (3 F
Exam nat on of Amer can women of diverse rac a , re g ous, ethn c groups, and c asses, focus 's on chang ng def nit ons of women s ro es. *Genera Studies SB, C H*

HIS 371 Women in U.S. History, 1880–1980. (3 S
Exam nation of Amer can women of diverse rac a re gious ethn c groups and c asses, focus s on chang ng def nit ons of women's ro es *General Stud es: SB, C H*

HIS 380 History of the Mexican American. 3 A
Role of the Mex can Amer can in U S h story. *Genera Studies· SB, H*

HIS 381 Quantification in History. (3) F
Quant tative techn'ques, nclud ng politica ana ys s, new econom c theory demography, and soc a h story Research methods n soc a sc ence nc ud ng des gn, data co ect on, and computer sk s Prerequ s te. MAT 117 or a course for wh ch MAT 117 s a prerequisite.

HIS 382 Historical Statistics. (3) N
H stor cal data ana ysis includ ng samp ing d str but ons tests of hypotheses, t-tests to mu tip e regress on, and nonparametr c tech n ques Prerequ s te H S 381 *General Stud ies N2*

HIS 383 Latin America. 3 A
Anc ent c v zat on exp rers and conquero s and co on a nst tut ons *Genera Stud es SB H*

HIS 384 Lat n America. 3 A
Nat onal st c deve opment of the ndependent repub cs s ce 1825 *Gene a Stud es SB H*

HIS 394 Selected Topics in History. 3 N
A fu descr pt on of top cs f r a y semester s ava ab e n the Department of H story ff ce May be repeated for cred t

HIS 401 American Colonial History. 3 A
Po t ca , ec nom c soc a a d cu tura h st ry of the co on a era Conce trates on Eng h co on es, w th some c s derat on f Span sh French and other co on a reg ons n North Amer ca *Genera St d es SB H*

HIS 403 Revolut'on and Constitution. 3 N
The causes, course and nsequences of the Amer can Revo ut on cu m nat ng n the at f cat on of the Const tut on Prerequ s te H S 103 r nstructor approva

HIS 404 The Early Repub ic, 1789–1850. 3 A
P t ca soc a econom c and c tura deve opment of the n ted States from the Revo u t on to 1850 Prerequ s te H S 103 r nstru tor approva *Genera Stud es L2/SB H*

HIS 406 Civ l War and Reconstruction. 3 A
Exp res the causes conduct a d conse quences f the Ame ca C v War emphas z ng p t cs and po cy Prerequ te H S 103 or nstructor approva *Genera Stud es L2 SB, H.*

HIS 407 The Emergence of Modern Amer ica. 3 A
The tr umph of modern po t ca soc a and econ m c structures and va ues 1870–1918, ro e of reg on re g on ace and et n c ty *Genera Stud es SB H*

HIS 409 Recent American History. 3 A
The Un ted States from 1913 1932 nc ud ng W son an d p omacy ar d the F rst Wor d War the 1920s the or g ns of the Great Depres s on Hoover adm n strat n Prerequ s te H S 104 r equ va ent *Genera Stud es· SB H*

HIS 410 Recent American History. 3 A
The Un ted States fr m 1932 1945 nc ud ng the New Dea soc ety dur ng the Depress n, Second Wor d War Prerequ s te H S 104 o equ va ent. *Ge era Stud es SB H*

HIS 411 Contemporary America. 3 A
The Un ted States from 1945 to the present *Genera Stud es SB H*

HIS 414 The Modern Amer can Economy. 3 A
Or g ns of 19th century s avery and ndustr a zat on 20th century r s s and egu at on po l t ca economy of an advanced cap ta st de mocracy Prerequ s te ECN 111 or 112 or H S 103 or 104 *Genera Stud es SB H*

HIS 415 American D'plomatic H story. 3 A
Amer can re at ons w th fore gn powers 1776 1898 Prerequ s te H 103 or nst uctor ap prova *Genera Stud es SB H*

HIS 416 American Dip omat c History. 3 A
Amer can re at ons w th fore g powe from 1898 to the present Prerequ s te H S 1 4 or nstructor appr va *Genera Stud es SB G H.*

HIS 417 Constitutional History of the United States. 3) N
Or g n and deve opment of the Amer can con st tut ona system from Co on a or g ns through Reconstruct'on Prerequ s te H S 103 or nstructor approva . *General Stud es SB, H*

HIS 418 Constitutional History of the United States. 3) N
Or g n and deve opment of the Amer can con st tut ona system from Reconstruct on to the present Prerequis te HIS 104 or nstructor approva *General Stud es. SB H*

HIS 419 American Urban History. (3) A
The h story of the c ty n Amer can fe from co on a t mes t the ate 19th century. *General Stud es SB H*

HIS 420 American Urban History. 3 A
The h story of the c ty n Amer can fe from the 19th century to the present *Genera Stud es SB H*

HIS 421 History of Amer'can Labor. (3) N
Amer can workers from the co on a per od to the present, nc uding farmers s aves house w ves the sk ed a d unsk ed un on zed and nonun on zed Prerequ s te HiS 103 or 104) or MGT 301. *Genera Stud es SB H*

HIS 422 Rebellious Women. 3) A
Exam nat on of the ro es of rebe ous women n h story through the study of autob ography b ography 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 Mex can per ods to 1848 *Genera Stud es SB, H*

HIS 425 The American Southwest. 3 A
Deve opment f the Southwest from 1848 to the present *Genera Stud es· L2/SB H*

HIS 426 Indian History of the Southwest. 3 S
Comprehens ve review of h stor ca events from preh stor c peop es the Span sh and Mex can per ods and the Amer can per od af- ter 1846 to the present Prerequ 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 times to the present Prerequ s te upper d v s n stand ng or nstructor approva *General Stud es SB H*

HIS 430 20th-Century Chicano History. 3) A
H stor ca deve opment of the Ch cano com munity n the 20th century *Genera Stud es· SB H*

HIS 431 The French Revolution and the Napoleonic Era. 3) N
Cond t ons n France before 1789 the Revo u t onary decade from 1789 to 1799 the organ zat on of France under Napo eon, and the m pact of changes n France on European soc ety Prerequ s te upper d v s on stand ng or nstructor approva . *General Stud es SB, H*

HIS 433 Modern France. (3) A
Soc a , p t ca econom c and cu tura trans format ons of French soc ety 1815–present mpact of ndustr a zat on war and revo ution on peop e s l ves Prerequ s te upper d v sion stand ng or nstructor approva *Genera Stud es SB G, H.*

HIS 434 Hitler: Man and Legend. 3 F
A b graph ca approach to the German Th rd Re'ch emphas z ng nature of Naz reg me, Wor d War I and h tor og aphy *Genera Stud es SB H*

HIS 435 Modern Germany. 3 A
Germany s nce 1840 *Genera Stud es SB G H*

HIS 437 Eastern Europe and the Balkans. (3 N
Peop es and countr es of eastern and south eastern Eur pe n the 19th and 20th centu es fr m 1800 t 1914, emphas z ng the Hapsb rg and Ottoman Emp res *Genera Stud es SB H*

HIS 438 Eastern Europe and the Balkans. 3 N
Peop es and countr es f eastern and s uth eastern Europe n the 19th and 20th cent r es emphas z'ng the successo states from 1914 to the present *Gene a Stud es SB G H*

HIS 441 Imperial Russ a. 3 A
Deve opment of Russ an po t ca econ m c soc a re g ous and nte ectua nst tut ons and trad t ons from the end f the 17th century to the co apse of the tsar st autocracy n 1917 *Genera Stud es SB H*

HIS 442 The Soviet Union. 3 A
An exam nation of Sov et a d post Sov et po t cs econom c deve opment and fore gn re a t ons from the 1917 Revo t on to the prese t *Genera Stud es SB G H*

HIS 443 Russia and the United States. 3 A
Off c a and unoff c a re at on between Rus s a and the Un ted States from the ate 18th century to the present empha z ng per d f low ng the Bo shev k Revo ut on *Genera Stud es SB G H*

HIS 445 Tudor Eng and. 3 A
Po t ca soc a , econom c and cu tura deve opments n 16th century Eng and *Genera Stud es SB, H.*

HIS 446 Stuart England. 3 N
Po t ca , soc a econom c and cu tu a deve opments n 17th century Eng and *Genera Stud es. SB H*

HIS 449 Modern Britain. 3 A
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 p s t on n the 20th cen tury *Genera Stud es SB G H*

HIS 450 British Constitutiona History. 3 N
H stor ca deve opment of the nst tut na system of Great Br ta n from the M dd e Ages to the present emphas z g the growth of de mocracy *Genera Stud es· SB H*

HIS 451 The British Empire. 3 A
Br t sh mper a sm and co on a sm n Afr ca, the Americas As a and the S ut Pac f Prerequ s te upper-d v s on stand ng or n structor approva *Genera St d es SB H*

HIS 455 Intellectual H story of Modern Europe. 3 N
Major deve opments n Eu pean thought from Kar Marx to the present Prerequ s te· upper d v s on stand ng or nstructor appr va *Gen era Stud es HU H*

HIS 456 History of Spain. 3 A
Cu tura , econom c po t ca , and soc a deve opment of Spa n from ear est days t 1700. *Genera Stud es HU SB, H*

NOTE For the Genera Stud es requ rement codes (such as L1, N3 C and H and courses, see pages 84–108 For graduat on requ rements see pages 79–83 Fo omn b s o rses offered but not sted n th s catalog see pages 56–57

HIS 457 History of Spain. (3) A
Cultura economic po t ca , and soc a deve opment of Spa n from 1700 to the present *General Stud es. HU SB G H*

HIS 460 Spanish South America. (3) N
Pol tica economic and soc a deve opment of the Spanish-speak ng nat ons of South Amer- ica since ndependence. 19th-century devel opments. *General Studies. SB H.*

HIS 461 Spanish South America. (3) N
Po tical, econom c, and soc a deve opment of the Span sh-speak ng nat ons of South Amer ca 20th-century deve opments. *General Studies: SB H*

HIS 463 Intellectual and Cultural History of Latin America. (3) N
Ma n currents of thought, the outstand ng th nkers, and the r mpact on 19th and 20th century Lat n Amer ca Cu tura and 'nstitu tiona bas s of Latin American l fe *General Studies: SB, H.*

HIS 464 The United States and Latin America. (3) A
The Latin Amer can struggle for d p omatic recogn tion attempts at pol t cal un on part c - pation n nternat ona organ'zat ons since 1810, and re at ons between the Un'ted States and Lat n Amer ca *General Studies. SB G H*

HIS 466 Mexico. (3) A
Pol tica economic socia and cultural deve - opments from ear est t mes to 1810. *Genera Studies SB H*

HIS 467 Mexico. (3) S
Pol tical, economic soc a and cultural deve opments from 1810 to the present *General Studies. SB H*

HIS 468 Brazil. (3) N
D scovery, conquest, and sett ement by the Portuguese achievement of independence, rise and fal of the empire prob ems and growth of the republ c to the present. *General Stud es SB H*

HIS 469 Chinese Thought and Way. (3) N
Ch na s c assics 'n translat on stud ed both for the r ntr ns c ideas and for the or g ns of Ch - nese thought. *General Studies: SB H*

HIS 470 Chinese Thought and Way. (3) N
Evolut on of Confuc an Tao (Way), ts synthe- s s of Taoism and Buddh sm and 20th-cen- tury react ons to that Tao *General Studies SB G, H.*

HIS 471 The United States and Japan. (3) A
Cu tura pol t cal, and econom c relat ons n the 19th and 20th centur es. Emphas s on post Wor d War II period *General Stud es SB G H.*

HIS 473 China. (3) A
Po tt ca economic social, and cultura h story of the Ch'nese people from early times to the late 17th century. *General Studies. SB H.*

HIS 474 China. (3) A
Pol tica economic socia , and cultura h story of the Ch'nese people from m d-17th century to the present *General Studies: SB, G, H*

HIS 475 The American Experience in Vietnam, 1945–1975. (3) A
ntersection of American and As an histones in Vietnam, v ewed from as many s des as pos- s b e *General Stud es SB, G, H.*

HIS 477 Japan. 3) A
Po t ca economic social and cu tura history of the Japanese people from ear y t mes to the 19th century *General Stud es L2/SB H*

HIS 478 Japan. (3) A
Po t ca economic soc a and cu tura history of the Japanese people from 19th century to the present *Genera Stud es SB, G H*

HIS 481 The People's Republic of China. (3) N
Ana ys s of major po t cal, soc a economic and nte ectua trends n Ch na s nce the found ng of the Peop e s Repub ic n 1949 *General Stud es SB G H*

HIS 488 History of Fire. (3) F
A g oba survey of the natural and cu tura h s tory of fire Lecture d scuss on *Genera Stud ies L2 H*

HIS 495 Methods of Teaching History. (3) F
Methods n nstruct on organ zat on, and pre sentat on of the subject matter of h story and closely a ed f e ds

HIS 498 History Pro-Seminar. (3) F S
Required course for majors on top c se ected by nstructor, writ ng intensive course re ated to the development of research sk i s and wr't ng tools used by histor ans. Prerequ s te: HIS 300

HIS 502 Public History Methodology. 3 F
ntroduct on to h storica research methodo o- g es techn ques, and strateg es used by pub c h stor ans Read ngs short papers and guest speakers Requ red for students n the pub c history concentrat on

HIS 512 Historians of Early Europe. (3) N
A study of the h story of European histor ca wr ting 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 h story of Amer can histor ca wr t'ng from the ear y co on a days to the 20th century

HIS 515 Studies in Historiography. (3) F, S
Methods and theor es of wr ters of h story May be repeated for cred t

HIS 525 Historical Resource Management. 3) F
Ident f cat on documentation and nterpreta t on of h stor c period bui d ngs s tes and d s tricts. Emphas s on nterd sc p nary efforts among h storians, arch tects, and anthropolo g sts

HIS 526 Historians and Preservation. (3 S
Preparation of historians for pub c and private h storic preservat on programs Prerequ s te: HIS 525 or instructor approva

HIS 527 Historical Administration. (3 F
Preparat on of histor ans in adm n strat on of arch ves h storica s tes h stor ca museums, h stor cal soc et es, and histor ca offices in government agenc es

HIS 532 Community History. (3) N
Techn ques and methods of community h s tory emphasizing ocal resources. Requ red for commun ty h story opt on Sem'nar

HIS 551 Comparative Histories of War and Revolution. (3) A
A comparat ve f e d course of the themes of war and revo ut on

HIS 552 Comparative History of Family and Community. (3) N
A comparat ve course with a focus on fam y nc ud ng minority and ethn c groups, n soc ety

HIS 553 Comparative History of State and Institutions. 3 N
A comparative course that exp ores the chang ng nature of central nstitutions and government.

HIS 554 Comparative Historical Population Studies: Ethnicity, Economy, and Migration. (3 N
A comparative course that exp ores the mpact of soc a cu tura or econom c changes n the popula on

HIS 555 Comparative Historical Topics. (3) N
Th s course ana yzes a variety of spec f c so- c a po t ca cu tural, and nte ectua top cs

HIS 591 Seminar. 3) N
Top cs may be se ected from the fo low ng ar- eas.
(a) Br tish History
(b East As an H story
(c Eng sh H story
d) European H story
(e) Lat n American History
(f) 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) 602/965–6747
www.asu.edu/clas/humanities

LANGUAGES AND LITERATURES

Regents' Professor: Foster

HUMANITIES

Professors: Del he m Kugelmass
Assoc ate Professor. Pr'vateer
Assistant Professors: Baker, Ba ew, Lopez Lazaro Lund, Romeyn, Wr ght

HUMANITIES—B.A.

The major in Humanities is interdis ciplinary and may be intercollegiate. In consultation with an advisor, the stu dent takes a minimum of 44 semester hours of interdisciplinary humanities

courses from two components: (1) an interdisciplinary 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 concentration.

Interdisciplinary Core

Issues, Methods and Theory 6 minimum)

HUM 200 Encountering the Humanities *HU* ... 3
HUM 498 PS: Theory and Culture ... 3
Elective ... 3

Cultures in Context (11)

HUM 301, 302 Humanities in the Western World *L1/HU H* ... 8
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)

Minimum total ... 23

Area of Concentration

Required courses from list 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; humanities/liberal arts; justice studies; and planning.

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.

The core courses are to be selected from architecture, art history, dance, English, film studies, history, humanities (HUM), languages and literatures, music, philosophy, religious studies, theatre, 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 Humanities 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 literature art history, history philosophy religion, and other disciplines to common problems affecting modern American life. *General Studies: HU.*

HUM 194 Special Topics in the Humanities. (3) N
Open to all students. Topics include
(a) American Fine Arts
(b) Comparative Fine and Performing Arts
(c) Cultures of Ethnic Minorities
(d) Non Western Cultures
(e) Western Historical or Contemporary Cultures

HUM 200 Encountering the Humanities. (3) S
Introduction to the languages, methods and objectives of the study of the interdisciplinary humanities Intersections of ideas, values, and cultural institutions Lecture, studio, workshop. Prerequisite Humanities major *General Studies· HU*

HUM 294 Special Topics in the Humanities. (3) N
Open to all students Topics include
(a) American Fine Arts
(b) Comparative Fine and Performing Arts
(c) Cultures of Ethnic Minorities
(d) Non Western Cultures
(e) Western Historical or Contemporary Cultures

HUM 301 Humanities in the Western World. (4) F
Interrelation of arts and ideas in Western Civilization, Hellenic through medieval 3 hours lecture, 1 discussion meeting per week *General Studies· L1 HU H*

HUM 302 Humanities in the Western World. (4) S
Interrelation of arts and ideas in Western Civilization, Renaissance to the present 3 hours lecture, 1 discussion meeting per week. *General Studies L1/HU H*

HUM 310 Japanese Cities and Cultures to 1800. (3) S
Relations among ideas and literary, visual and performing arts of the ancient aristocracy medieval samurai and early modern towns people Cross listed as REL 355 *General Studies L1/HU H*

HUM 312 Interpreting China's Classics. (3) F
Study of select Confucian and/or Taoist classics and ways they have been read in both Asian and Western scholarship Cross listed as HIS 312 *General Studies L2/HU H*

HUM 320 Hispanic Cultures: Europe and the Americas. (3) F
Examination of European expansion into the Americas from 15th to 20th centuries with focus on cultural contact, conflict, and compromises *General Studies L1/HU H*

HUM 340 Contemporary American Film and Popular Culture. (3) F
Study of American film, television and popular music of past three decades as cultural documents *General Studies: HU.*

HUM 394 Special Topics in the Humanities. (3) N
Open to all students Topics include
(a) American Fine Arts
(b) Comparative Fine and Performing Arts
(c) Cultures of Ethnic Minorities
(d) Non Western Cultures
(e) Western Historical or Contemporary Cultures

HUM 401 The Culture and Legacy of the European Enlightenment. (3) S
Historical survey of eighteenth century European enlightenment and its status within contemporary intellectual culture Lecture discussion.

HUM 420 Interpreting Latin America. (3) S
Introduction to protocols and methodologies for cultural interpretation of Latin America, with emphasis on four principal cities as cultural space *General Studies HU G H*

HUM 440 Los Angeles and Cultural Theory. (3 S
Analysis of representations of Los Angeles in literary film and musical texts and broader implications for contemporary American society. *General Studies L1/HU C*

HUM 450 Technology and Culture. 3) S
Explores sociocultural, deological, postmodern implications of technology and the role technology plays in social constructions as well as the spaces it creates Seminar discussion. *General Studies L1 HU*

HUM 460 Postmodern Culture and Interpretation. (3) F
Currents and interpretations of postmodern culture international comparative perspective on the culture and traditions of contemporary Europes" and 'Americas " Seminar discussion. *General Studies· L2*

HUM 462 Psychoanalysis and Culture. (3) F
Introduction to intellectual history of psychoanalytic movement of twentieth century and its contributions to humanities disciplines *General Studies L2/HU SB.*

HUM 465 Narrative in the Human Sciences. (3) F
Theor es of narrat ve and narrat v ty 'n the Hu man t es concentratıng on the prob ems of specif c d sc p ines and nterd sc p inary solu t ons *General Stud es. L2/HU.*

HUM 494 Special Topics in the Humanities. (3) N
Open to al students Top cs nc ude
(a) American F ne Arts
(b Comparat ve Fine and Perform ng Arts
c) Cu tures of Ethn c M nort es
d From Courbet to Cézanne: H story of European Art 1860–WW
Cr ss isted as ARS 434.
e) From Dav'd to Daumier: European Art 1780–1860
Cross isted as ARS 432
f ta an C'nema
Cross sted as FLA 494 ITA 420.
g) Non Western Cu tures
(h) Western H stor cal or Contemporary Cu tures

HUM 498 Pro-Seminar in the Humanities. (3) A
Methodo og es and comparat ve theories for the study of relat onsh'ps between various aspects of cu ture, the h story of ıdeas 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 top cs vary *Genera Stud es L2/HU.*

HUM 511 Structures of Knowledge. (3 F
Theories and examples of structures of know edge nc ud ng such top cs as metaphor, sem otics and know edge of the "other."

HUM 512 Writ'ng Cultures. (3) S
Theor es and methods of representing West ern and non Western cultures in ıterature h's tory ethnography and p'ctorial med a

HUM 513 Interpretation of Cultures. (3) A
Methodo og es and comparative theor es for the study of re ationsh ps between var ous as pects 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) F
An advanced survey of major schoo s of 20th-century terary and cr t ca theory Lecture d scuss on Cross-l sted as ENG 502

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 Special Topics in the Humanities. 3 N
Open to a students Top cs nc ude
a) Amer can Fine Arts
(b) Comparative F ne and Perform ng Arts
c) Cu tures of Ethn c M nort es
(d) Non Western Cu tures
e) Western H storica or Contemporary Cu tures

Department of Languages and Literatures

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REGENTS' PROFESSORS
FOSTER KELLER

PROFESSORS
ALARCON, ALEXANDER, BALDINI, BALLON AGU RRE, COUCH, CROFT, CURRAN EKMANIS FLYS GUNTERMANN, HORWATH, LOSSE, VALDIVIESO, VOLEK, WETSEL, WIXTED WONG

ASSOCIATE PROFESSORS
COTA CARDENAS, GAL NDO, GARCIA FERNANDEZ, W. HENDRICKSON, HERNANDEZ G., LAFFORD, OSSIPOV, RE MAN, SANCHEZ, SENNER, WILLIAMS

ASSISTANT PROFESSORS
BOLIVAR, BURTON, CANDELA, COLINA, GROVE, GRUZ NSKA, MARSHALL NISHIMURA-JENSEN, REES, SUWARNO, TIPTON, URIOSTE AZCORRA V TULLO

INSTRUCTORS
HABERMAN, KORET, LE TU

LECTURERS
BERN ER, CRISTO, FEY FOARD S. HENDRICKSON, HUGHES McM LLIAN, PETERSEN, SONANDRES, ST FTEL

BACHELOR OF ARTS DEGREE

The faculty in the department offer majors in Asian Languages (Chinese/Japanese), French, German, Italian, Russian, and Spanish. Each major con sists 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 mini mum of 24 hours must be taken at the 300 or 400 level and must include at least nine hours at the 400 level. Spe cific required courses for each major area are listed below and in a brochure available in the department. See "Ma jor Requirements," page 306.

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 addi tion 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 sci ence, and business courses.

Recommended Courses (6)

CHI	101, 102	Elementary Chinese	10
CHI	201, 202	Intermediate Chinese *G*	10
CHI	205	Chinese Calligraphy	1

Required Courses

CHI	313, 314	Advanced Chinese *G*	6
CHI	321	Chinese Literature *LI/HU*	3
CHI	322	Chinese Literature *LI/HU G*	3
		or FLA 420 Foreign Literature in Translation *HU, G* (6)	
CHI	413, 414	Introduction to Classical Chinese *HU*	6
Total			18

Electives (6)

CHI	309, 310	Chinese Conversation	4
CHI	311, 312	Chinese Conversation	4
CHI	494	Special Topics*	1–4
CHI	499	Independent Study*	1 3

* See the *Schedule of Classes* for course titles.

Japanese. The major requires 45 se mester 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.

Recommended Courses 6)

JPN	101, 102	Elementary Japanese	10
JPN	201, 202	Intermediate Japanese *G*	10
JPN	206	Calligraphy	1

Required Courses

FLA	421	Japanese Literature in Translation *L2/HU, G*[1]	3
JPN	313, 314	Advanced Japanese *G*	6
JPN	321	Japanese Literature *L2/HU G*[1]	3
JPN	414	Introduction to Classical Japanese	3
Total			15

Electives (6)

JPN	309, 310	Intermediate Japanese Conversation	4
JPN	311, 312	Intermediate Japanese Conversation *G*	4
JPN	494	Special Topics[2]	1–4
JPN	499	Independent Study[2]	1 3

[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 6 semester hours of Chinese language or literature courses (CHI), and appropriate courses in art, humani ties, social and behavioral science, and business courses.

French

Required courses follow.

Required Courses

FRE	200-level courses		6
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
Total			18

Select twelve 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	Special Topics	1–4
FRE	499	Independent Study	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 courses follow.

Required Courses

German 200 level courses			6
GER	311	German Conversation *G* or GER 312 Gern an Conversation *G* 3)	3
GER	313	German Composition *G*	3
GER	411, 412	Advanced Grammar and Conversation *G*	6
GER	421	German Literature *HU*	3
GER	422	German Literature *L2/HU*	3
Total			24

Six semester hours are required from the following courses:

GER	415, 416	German Civilization *HU H*	6
GER	445	German Literature Enlightenment to Classic sm	3
GER	451	German Literature Biedermeier to Naturalism	3
GER	494	Special Topics	1–4

Electives (6)

GER	303, 304	Scientific German	6
GER	314	Introduction to German Literature	3
GER	319	Business Correspondence and Communication *G*	3
GER	394	Special Topics	1–4
GER	494	Special Topics	1–4

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 courses follow.

Required Courses

ITA	200 level courses		6
ITA	311, 312	Italian Composition and Conversation *G*	6
ITA	325	Introduction to Italian Literature *HU*	3
Total			5

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	415	Italian Civilization *L2/HU, G*	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 19th Century *HU*	3
ITA	449	20th Century Italian Literature *HU G*	3
ITA	494	Special Topics	1–4
ITA	499	Independent Study	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 so cial and behavioral science, humanities, business courses, and other language courses.

Russian

Required courses follow

Required Courses

RUS	211 212	Basic Russian Conversation *G*	6
RUS	311, 312	Russian Composition and Conversation *G*	6
RUS	411	Advanced Composit on and Conversation I *G* or RUS 412 Advanced Composition and Conversation II *G* (3	3
Total			15

Fifteen semester hours are required from the following list including at least six semester hours from the 400 level:

RUS	303, 304	Scientific Russian	6
RUS	321	Survey of Russian Literature *L2/HU, H*	2
RUS	322	Survey of Russian Literature *L2/HU*	2
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	Special Topics	1–4
RUS	499	Independent Study	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 courses follow.

Required Courses

SPA	313	Spanish Conversation and Composition *G* or SPA 315 Spanish Conversation and Composition for Bilinguals	3
SPA	314	Spanish Conversation and Composition *G* 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
Total			15

Six semester hours are required from the following three courses.

SPA	426	Spanish Literature *HU*	3
SPA	427	Spanish American Literature *L2*	3
SPA	428	Spanish American Literature *L2 G*	3

Select three semester hours from the following three courses:

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

Electives (6)

SPA courses			6

Related Fields

POR	101	Elementary Portuguese	5
POR	201	Intermediate Portuguese *G*	5

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, Russian, and Spanish 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

Chinese 313 and 314 Advanced Chinese are required. Consult with an advisor for other courses.

French

FRE	311	French Conversation *G*	3
FRE	312	French Composition *G*	3
FRE	321, 322	French Literature *L2/HU H*	3

Twelve hours must be at the 300 level or above.

German

GER 311 or 312 German Conversation, GER 313 German Composition, one 400 level German course, and any other upper division course in German are required. Consultation with an advisor in German is recommended.

Italian

ITA 311 or 312 Italian Composition and Conversation, ITA 325 Introduction to Italian Literature, and at least one 400-level ITA course are required. Students are encouraged to meet with a department advisor.

Japanese

Japanese 313 and 314 Advanced Japanese are required. Consult with an advisor for other courses.

Russian

RUS	303, 304	Scientific Russian	6
RUS	311, 312	Russian Composition and Conversation *G*	6
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.

Spanish

One course from each area language, literature, and civilization is required:

Language

SPA	313	Spanish Conversation and Composition *G*	3
SPA	314	Spanish Conversation and Composition *G*	3
SPA	315	Spanish Conversation and Composition for Bilinguals *G*	3
SPA	316	Spanish Conversation and Composition for Bilinguals *G*	3
SPA	412	Advanced Conversation and Composition *G*	3

Literature

SPA	325	Introduction to Hispanic Literature *HU*	3
SPA	425	Spanish Literature *HU*	3
SPA	426	Spanish Literature *HU*	3
SPA	427	Spanish American Literature *L2*	3
SPA	428	Spanish American Literature *L2, G*	3

Civilization

SPA	471	Civilization of the Spanish Southwest *HU*	3
SPA	472	Spanish American Civilization *HU, G, H*	3
SPA	573	Spanish American Essay	3

Students must complete two years of language or equivalent.

CERTIFICATES AND EMPHASES

The following are certificate programs or emphases offered in the Department of Languages and Literatures. For more information on each, see pages 307–309.

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 309

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.

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 admission requirements of the certificate program but who are not enrolled in a degree program. 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 examination, the two entrance requirements to this certificate program 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 Spanish, which at ASU is SPA 412 and (2) either an academic year at a university in a Spanish speaking country, an extensive work experience using Spanish, or demonstrated bilingual facility, both written and oral, in English and Spanish.

Certificate Requirements. The certificate program consists of the following prerequisites:

FLA	400	Linguistics *SB*	3
		or equivalent (SPA 494 ST: Introduction to Hispanic Linguistics [3])	
SPA	413	Advanced Spanish Grammar	3
SPA	494	ST. Lexicography	3

The following is a required course:

FLA	401	Translation Theory and Practice	3

Also required are nine hours of applied translation electives 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

Also required are two hours of in-service practicum (FLA 484).

NOTE: For the General Studies requirement, codes (such as L1, N3, C, and H), and courses, see pages 84–108. For graduation requirements see pages 79–83. For omnibus courses offered but not listed in this catalog see pages 56–57.

FOREIGN LANGUAGE REQUIREMENT

The College of Liberal Arts and Sciences requires knowledge 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 institutions with foreign language credits below the 202 level are placed in a course at the level directly above the work completed.

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 language 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 Admissions.

The foreign language requirement can be met in languages not taught at ASU either by transferring credit from another institution or by passing a proficiency examination. When possible, the Department of Languages and Literatures 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 102 level course in French, German, or Spanish should take the placement exam for that language in the Computer Language Laboratory, LL A33.

Ordinarily, no placement or proficiency examination is administered to students who wish to continue studying languages for which high school credits have been earned. Students 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); students 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 preparation 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 non repeatable 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 Department 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 language coordinator in the department.

If transfer students are uncertain about course equivalencies, 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 audiolingual tape exercises in addition to the regular class periods.

FOREIGN LANGUAGES (FLA)

FLA 150 Introduction to East Asian Cultures. 3 S
An introduction to the cultures of China, Japan, and Korea. *General Studies. HU, G*

FLA 323 Survey of Literature of the Soviet Era in Translation. 3 F S
Survey major literary movements, prominent authors, most significant works of prose, poetry, and drama of the Soviet period, 1917–1991. *General Studies L2/HU G*

FLA 400 Linguistics. 3 S
Introduction to the analysis of language and its use in social contexts. Topics: morphology, phonology, pragmatics, semantics, syntax, and variation. Open to juniors with instructor approval. *General Studies SB*

FLA 401 Translation Theory and Practice. 3 N
Translation theories and professional practices, ethics, bibliography, computer technology, and sample texts for natural and social sciences and humanities. Prerequisite: 4th year composition or instructor approval in respective language area.

FLA 415 Bilingualism and Languages in Contact. 3 F
Analysis of linguistic aspects of bilingualism, e.g., pidgins and creoles, code switching, and other contact phenomena, simultaneous sequential bilingual language acquisition. Prerequisite: FLA 400 or equivalent or instructor approval.

FLA 420 Foreign Literature in Translation. 3) F S
Topics may be chosen from the following:
a Brazilian
b Chinese
c French
d German
e Greek
f Italian
g Latin
h Portuguese
Russian
Soviet
k Spanish
Spanish American
Not for language majors except in Asian languages and Russian. Open to language majors as a related area course. Graduate students by permission. *General Studies. HU G*

FLA 421 Japanese Literature in Translation. 3 F S
Readings selected by theme or genre or period from various works of Japanese literature. English translation. May be repeated as topic changes. Graduate students by permission. Prerequisite: a course that satisfies the L1 general studies requirement. *General Studies. L2/HU G*

FLA 480 Methods of Teaching Foreign Languages. 3 F
Teaching foreign languages and literatures at secondary and college levels. This course does not meet the Liberal Arts and Sciences general studies requirement for humanities and fine arts. Required for admission to SED 478. Prerequisite: 12 hours of upper-division courses in 1 foreign language

FLA 481 Technical and Scientific Translation. (3) N
Resources pract ces strateg es and ex con for trans at'on of professiona texts n sub ects such as eng neering, arch tecture agr cu ture computer techno ogy e ectron cs and phys cal 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 lex con for trans ation of profess onal texts n subjects such as econom cs finance, nsurance man agement market ng, account ng, advertis ng and rea estate. Prerequis te FLA 401

FLA 483 Medical and Legal Translation. (3) N
Resources and strateg es for trans at on of profess'onal texts n sub ects such as med cine nursing pub c hea th cr m na just ce and nternat onal aw May be repeated for a total of 6 semester hours. Prerequ s te FLA 401

FLA 485 Problems of Literary Translation (3) N
Theory and pract ce w th emphasis on app cation through nd v dual translat on projects May be repeated for a tota of 6 semester hours Prerequ s te FLA 401 or nstructor ap prova in the respect ve anguage area

FLA 494 Special Topics. (3 F
Major trends of Ita an c nema from the post war per od to the present. Cross sted as HUM 494/ TA 420

FLA 515 Second Language Acquisition. 3 S
D scuss on and app cat on of theor es of sec ond anguage acquisition Prerequ s te FLA 400 or equ va ent

FLA 525 Trends and Issues in Foreign Language Teaching. (3) N
Advanced methods sem nar designed for experienced teachers.

ARABIC (ARB)

ARB 101 Elementary Arabic. (4) F
Reading wnt ng speaking and understand ng basic Arab c. 4 hours lecture, 1 hour ab.

ARB 102 Elementary Arabic. (4) S
Read ng, wr t ng, speaking and understanding bas c Arab c. 4 hours lecture 1 hour ab Pre requ s te: ARB 101 or equ va ent

ARB 201 Intermediate Arabic. 4) F
Rev ew of Arab c grammar w th emphas s on the deve opment of the sk s of sten ng com prehension read ng, speak ng, and wr t ng 4 hours ecture 1 hour ab Prerequ s te ARB 102 or equiva ent

ARB 202 Intermediate Arabic. (4) S
Rev ew of Arab c grammar w th emphas s on the deve opment of the sk l s of sten ng com prehension read ng speak ng, and wr t ng 4 hours lecture, 1 hour ab Prerequ s te ARB 201 or equiva ent

CHINESE (CHI)

CHI 101 Elementary Chinese. 5 F
Pronunc ation grammar e ementary c nver sation and deve opment of bas c read ng and wr t ng sk s Standard d ect 5 c ass hours

CHI 102 Elementary Ch nese. 5) S
See CH 101. Prerequ s te CH 101 or equ va lent.

CHI 107 Chinese for International Professions I. 10 F
Acce erated program a ternat ve to CH 101 102 sequence Funct ona approach to needs of nternat ona profess ons 10 c ass hours

CHI 201 Intermediate Chinese. 5) F
Systemat c rev ew of grammar. Development of vocabu ary through read ng and wr ting Dr l in aura ora sk s 5 c ass ours. Prereq uisite CHI 102 r equ va ent *Genera Stud es G.*

CHI 202 Intermed ate Chinese. 5 S
See CH 201 Prerequ s te CH 201 or equ va ent *Genera Stud es G*

CHI 205 Chinese Calligraphy. (1 F S
An ntroduct on to sty es and techn ques of Chinese wnt ng Know edge of Chinese or Japanese s not requ red

CHI 207 Ch nese for International Professions II. 10) S
Cont nuat on of CHI 107 a ternat ve to CHI 201, 202 sequence. Expans on of commun ca t ve prof c ency n spec f c areas of nte na t ona profess ons 10 class hours Prereq u site CHI 107 or nstructor approva *Genera Stud es. G.*

CHI 309 Ch nese Conversat on. 2) F
Aura oral dr s us ng contemporary stor es, art cles and essays For students w th ower eve prof c ency Prerequ s te CH 202

CHI 310 Chinese Conversation. 2) S
See CHI 309. Prerequ s te CH 202

CHI 311 Ch nese Conversation. 2 F
Intens ve aura ora pract ce n Modern Chi nese For students who have ved n Ch na or a Ch nese speak ng env ronment D scuss on dr l. Prerequ s te CH 202

CHI 312 Chinese Conversat on. 2 S
See CHI 311 D scuss on, dr Prerequ s te CHI 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 n terests 3 hours ecture arranged ab. Prereq u s te CH 202 or equ va ent *Gene a Studies G*

CHI 314 Advanced Chinese. (3) S
Cont nuat on of CH 313 Prerequisite CHI 313 *General Stud es G*

CHI 321 Chinese Literature. (3) F
Masterworks of the trad t on from the 6th cen tury B C E through the 13th century Read ngs, lectures and exam nat ons are n En g sh *General Stud es L1 HU*

CHI 322 Chinese Literature. (3 S
Masterp eces from the ater trad t o and ts trans t on to modern t mes Read ngs, lec tures and exam nat ons are n Engl sh *Gen eral Stud es L1 HU, G*

CHI 413 Introduction to Classical Chinese. 3) F
Read ng n var ous genres of pre-20th century terature (wen yen with ana ys s of the struc ture f the ass ca wr t gs. Prerequ s te CHI 314 or n truct r approva *Genera Stud es HU*

CHI 414 Introduction to Classical Chinese. (3 S
Cont nuat on of CH 413 Prerequis'te: CH 413 *General Stud es. HU*

CHI 500 Bibliography and Research Methods. 3 N
Introduct on to research mater a s on China n Ch nese Japanese and Western anguages Overv ew of research methods Lecture, d s cuss on

CHI 514 Advanced Classical Ch nese. (3 N
C ose read ngs n se ected premodern texts w th focus on spec a grammatica features, and ncreased vocabu ary Lecture, d scus s on

CHI 520 Teaching of Chinese as a Second Language. 3 N
Theory and pract ce of teach ng Ch nese, in c ud ng presentat on, nteraction and eva ua t on w th cons derat on g ven to cu tura fac tors Lecture, d scuss on

CHI 535 Advanced Readings. (3) N
Read ngs n 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
Analys s and d scussion w th n the framework of ngu st c theory of selected problems n Ch nese phonet cs, morpho ogy, and syntax. Lecture d scuss on

CHI 585 Problems of Trans ation. (3) N
Theo es and pract ce of trans at on strateg es for hand ng a var ety of Ch nese texts. Lec ture d scuss on.

CHI 591 Seminar. 3 N
Topics n 'terary ngu st c, or cu tural stud es

FRENCH (FRE)

FRE 101 Elementary French. (4) F S, SS
ntens ve aural/ora dr in c ass and abora tory bas c grammar supplemented by s mple 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 valent.

FRE 107 French for International Professions I. 8) F
Acce erated a ternat ve to FRE 101 102 Funct nal approach Emphas s on speaking understand ng wr ting and read ng for com mun cative competence for nternat ona pro fess ons

FRE 111 Fundamentals of French. 4 F, S
Pr mari y for students w th two years of h gh schoo French who need rev ew to enter sec ond year study Not open to students w th cred t n FRE 101 or 102 4 hours ecture 1 hour ab

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NOTE For the General Stud es requ rement, codes (such as L1, N3 C and H) and courses see pages 84 108 For graduat on requ rements see pages 79–83 For omn bus courses offered but not sted n th s cata og, see pages 56–57

FRE 201 Intermediate French I. (4) F, S SS
Grammar rev ew, w th emphas s on deve op ment of sk s of speaking read ng writ ng and stening comprehens on Four hours ec ture· 1 hour ab Prerequ site FRE 102 or 111 or equ valent. *General Stud es G*

FRE 202 Intermediate French II. 4) F S, SS
Cont nuat on of grammar rev ew w th empha s s on deve opment of sk ls n speak ng, read ng writ ng, and sten ng comprehens on 4 hours ecture 1 hour ab Prerequ s te FRE 201 or equ va ent *General Studies G*

FRE 205 Readings in French Literature. (3) F S SS
Des gned to teach read ng with fac ty and comprehens on. Vocabu ary bu d ng and tex tual analys s of terary genres are major e e- ments Prerequ s te· FRE 202 or equ va ent *General Studies G*

FRE 207 French for International Profes- sions II. (8) S
Cont nuat on of FRE 107 a ternat ve to FRE 201 202 sequence. Expansion of commun ca- t ve prof c ency n spec f c areas of nterna tiona professions Prerequ s te FRE 107 or 'nstructor approva *General Stud es G*

FRE 311 French Conversation. (3) F, S
Further pract ce in speak ng French empha s z ng current usage and promot ng fac ty n the expression of ideas. Prerequ site. 8 hours of 200 eve French or equ va ent. *General Stud es· G*

FRE 312 French Composition. (3) F, S
Further practice n wr ting French emphas z ng current usage and promot ng fac t y in the expression of deas Prerequ site 8 hours of 200-leve French or equiva ent *Genera Stud- es G*

FRE 315 French Phonetics. (3) F
Pract ce and theory of French pronunc at on Emphas s s on standard French although an overv ew of reg ona variet es s offered Lec- ture and ab Prerequ s te FRE 311 or equiva- ent

FRE 319 Business Correspondence and Communication. (3) S
Organ zat on and presentat on of c ear, effec t ve bus ness commun cat ons, vocabu ary ap p cable to modern bus ness usage Prerequ - site FRE 312 or nstructor approva *Genera Stud es G*

FRE 321 French Literature. (3 F S
Representat ve masterp eces and s gn f cant movements of French iterature of the m dd e ages through the 18th century Prerequ s te FRE 205 or equ va ent *General Stud es L2/ HU H.*

FRE 322 French Literature. (3) F, S
L terature of the 19th and 20th centuries Pre requ s te FRE 205 or equiva ent *General Studies L2/HU*

FRE 411 Advanced Spoken French. (3) F S
mprovement of spoken French Prerequ s tes: 9 hours of 300 evel French nc ud ng FRE 311 *or* equ va ents. *Genera Stud es· G.*

FRE 412 Advanced Written French. (3 F S
mprovement of compos tion sk l s Prerequ - s tes 9 hours of 300- eve French nc ud ng FRE 312 *or* equ valents *General Stud es· G*

FRE 415 French Civilization I. (3) F
Po t ca nte ectua soc a econom c and ar t st c deve opment of France from ts org ns to the end of the 17th century Prerequ site· 6 hours of upper d v s on French *Genera Stud es. HU.*

FRE 416 French Civilization II. 3) S
Po t cal, inte ectua soc al, econom c and ar t st c development 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, morphology, syntax, semantics, and var et es of French Prerequis tes FRE 311 and 312 *or* nstructor approva .

FRE 422 Applied French Linguistics. 3) S
App cat on of ngu st c theory and second an guage acqu s tion theory 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 syntactic structure by contemporary theoret ca mode s Prerequ s te ASB 480 or ENG 213 or FLA 400.

FRE 424 French Phonology. (3) S
Introduct on to phono og ca theory and ts ap p cat on to French Prerequ s tes FRE 311 and 312 *or* nstructor approva

FRE 441 French Literature of the 17th Cen- tury. (3) N
From 1600 to 1660 Prerequ s te 9 hours of 300 evel French, nc ud ng FRE 321 *or* n structor approval *Genera Stud es. HU*

FRE 442 French Literature of the 17th Cen- tury. 3 N
From 1660 to 1700 Prerequ s te 9 hours of 300- evel French, inc ud g FRE 321 *or* n structor approva *General Studies HU, H*

FRE 445 French Literature of the 18th Cen- tury. 3 N
Contr but ons of the ph osophers and the de- ve opment of the novel and drama Prerequ s te 9 hours of 300 eve French inc ud ng FRE 321 *or* nstructor approval *General Stud es L2/HU*

FRE 451 French Poetry of the 19th Cen- tury. 3 N
From Romant c sm to Parnass an poetry to Symbo sm Prerequ s te 9 hours of 300 eve French, nc ud ng FRE 322 *or* nstructor ap prova

FRE 452 French Novel of the 19th Century. 3) N
From Constant Hugo Ba zac Stendhal, and Sand to F aubert and Zo a w th emphas s on major terary movements. Prerequ s te 9 hours of 300 leve French, nclud'ng FRE 322 *or* nstructor approva . *General Stud es· HU.*

FRE 453 Theater of the 19th Century. (3) N
From Roma tic drama to the Symbo st The ater Representat ve p ays of Hugo, Musset V gny Dumas, Becque Rostand, Feydeau and M rbeau. 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 Malraux to Sartre from 1900 to 1945 Pre requ site: 9 hours of 300- eve French, nclud ng FRE 322 *or* nstructor approva *Genera Stud es· HU*

FRE 462 Postatomic Literature. (3) S
Representat've authors ncluding Camus Duras and Robbe-Gr et from 1945 to pres ent. Prerequ s te 9 hours of 300 eve French nc ud ng FRE 322 *or* nstructor approva . *General Studies HU*

FRE 471 The Literature of Francophone Af rica and the Caribbean. (3 N
Se ected prose poetry and drama of black authors from Afr ca and the Car bbean. Pre requ s te 9 hours of 300 eve French nc ud- ng FRE 322 *or* nstructor approva *Genera Stud es· L2/HU.*

FRE 472 Franco-Canadian Civilization. (3 S
A study of the c v ızat on of Quebec n part cu ar through ts h story anguage terature mus c, and customs Prerequ's te 9 hours of 300 evel French or nstructor approval Cross sted as FRE 598

FRE 500 Bibliography and Research Meth- ods. 3 F
Requ red of a graduate students

FRE 510 Explication de Textes. 3 N
Detai ed analys s of iterary texts

FRE 515 Intellectual Currents in France, from the Middle Ages to the 18th Century. (3) N
S gnif cant soc a aesthet c, ph osoph c and sc ent f c deas as presented by major writers of f ct on 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 phono og ca morpho og ca and se mant c deve opme ts of French from Lat n to present, w th emphas s on o d and m dd e French Some fam iar ty w th Lat n s recom mended

FRE 531 Medieval French Literature. (3) F
Read ngs n the ep cs, ear y drama roman courto s, and ther representat ve terary genres of the M'dd e Ages

FRE 535 French Literature of the 16th Cen- tury. (3 S
Read ngs n French Rena ssance terature with spec al attent on to the human st move ment and to Rabe a s, Monta gne and the Ple ade

FRE 591 Seminar. (3) N
Top cs may be se ected from the fo ow ng.
a) Advanced Prob ems n French Literature
b) Ba zac
c Corne e, Mo ere and Rac ne
d D derot, Vo ta re and Rousseau
(e F aubert
(f French Ex stent a st L terature
(j French L terary Cr t c sm
h Proust
i Rea sm and Natura sm
(j Romant c sm
(k Stendha and Zo a

NOTE. For the General Stud es requ rement codes (such as L1 N3 C and H and courses see pages 84 108. For graduat on requ reme ts see pages 79–83. For omn bus courses offered but not sted in th s cata og, see pages 56–57.

GERMAN (GER)

GER 101 Elementary German. 4 F S SS
Read ng wr t ng, speak ng and understand ng of basic German w th emphas s on pronun c at on and grammar 4 hours ecture 1 hour lab Not open to students with cred t in 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
Primar ly for students w th two years of h gh schoo German who need rev ew to enter second year study 4 hours ecture 1 hour lab 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 l s of speak ng sten ng comprehens on read ng and wr t ng 4 hours lecture, 1 hour ab Prerequis 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'ste: GER 201 r equ va ent *Genera Stud es. G*

GER 303 Scientific German. (3 N
Acqu s t'on of a spec a zed vocabu ary through the read ng of German scient fic pub cations Prerequ s te GER 202 or equ va ent

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 id om through ora pract ce dea ng w th contemporary art'cles essays and stor es 3 semester hours mit for majors Pre requis te· GER 202 or equ va ent *General Stud'es G.*

GER 312 German Conversat'on. 3) S
See GER 311. Prerequ s te GER 202 or equiva ent *Genera Stud es: G*

GER 313 German Composition. 3 S
Intens ve pract ce n wr t ng emphas z ng style, and grammar Prerequ's te GER 202 or equ va ent *Genera Stud es· G*

GER 314 Introduction to German Literature. (3 F
Beg nn ng study of German poetry drama the nove and the *Novel e* Prerequ s te GER 202 or equ va ent

GER 319 Business Correspondence and Communication. (3) N
Organ zat on and presentat on of c ear effec tive bus ness commun cat ons, vocabulary ap p ıcab e to modern bus ness usage Prerequ · s te GER 313 or nstructor approval *Genera Stud es G*

GER 411 Advanced Grammar and Conversation. (3) F
mprovement of d ct on and d om through n tens ve ora rev ew Prerequ s te GER 311 or 312 or equivalent. *Genera Stud es G*

GER 412 Advanced Grammar and Composition. (3) S
mprovement 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 cal, soc a and cu tura fe of the German-speak ng wor d from the beg nning through 1600 Prerequ s te any 300 eve course in German or nstructor approva *Gen eral Stud es HU H*

GER 416 German Civilization. (3 F
From 1600 through 1945 Prerequ s te any 300- eve course 'n German or instructor ap prova *General Stud es. HU, H.*

GER 421 German Literature. 3 F
From the beg nn ng to c ass'c sm Prerequ s te 6 hours of 300 leve German *Genera Studies. HU*

GER 422 German Literature. 3 S
From Romant c sm to the present Prerequi site 6 hours of 300 evel German *Genera Stud es L2/HU*

GER 445 German Literature: Enlightenment to Class cism. 3) N
Major works of the 'terary epochs n the century Prerequ s te GER 321 r nstructor approva .

GER 451 German Literature: Biedermeier to Naturalism. 3 N
Representat ve works of prose and poetry from 1820 to 1890 Prerequ s te GER 322 or nstructor approva

GER 453 German L'terary Masterpieces on Film. (3) F, S, SS
F lm and l terature in the r correlat on to each other and to cu tura pol t ca , and soc a trends n German speak ng countr es Spec a arrangements for graduate students and those w thout a know edge of German. Lecture, dis cussion *General Stud es HU, G H.*

GER 461 Contemporary German Literature. (3 S, SS
German wr ters s nce 1945 Prerequ s te GER 322 or nstructor approva .

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 sty st cs

GER 521 History of German Language. (3) N
L ngu'st c deve opment of German from the ear 'est records to the present

GER 523 German Drama. (3) N
Drama of the 19th and 20th centuries

GER 525 German Novel. 3 N
Specia stud es n the German nove

GER 527 The *Novelle.* 3 N
Spec a stud es in the German short story

GER 531 Middle High German Language and Literature. (3) N
Read ng and d scuss on of spec mens of the M dd e H gh German ep cs romances, and other iterary genres

GER 551 Romanticism. (3) N
Treatment of early and ate Romant c sm

GER 555 Modern German Literature. (3 N
Ma or works from the per od of Expressionism to 1945

GER 591 Seminar. (3 N
Spec a top cs are concerned w th a f gure theme, or work n German iterature or Ger man c stud es Top cs may be se ected from the fol ow ng

a Faust
b) German c Stud es
c) Goethe
d Grass and Bo
e) Hesse
f) Kafka
(g) K e st
(h) Sch er

ANCIENT GREEK (GRK)

To sat sfy the fore gn language requirement students must take GRK 301 and 302

GRK 101 Elementary Ancient Greek. (4) F
Anc ent Greek grammar and vocabulary w th an emphas s on develop ng reading sk l s For beg nn ng students n y

GRK 201 Intermediate Ancient Greek. 4) S
Cont nuat on of GRK 101 ncreased empha s s on read ng texts adapted from Ar stophanes, Demosthenes, a d Plato Pre requ s te: GRK 101 or nstructor approval.

GRK 301 Ancient Greek Literature. 3 F
Read ngs n the masterpieces of anc ent Greek terature· advanced grammar. Authors read are changed each year n accordance w th needs of the c ass May be repeated for cred t Prerequ s te GRK 201 or nstructor ap prova *Genera Stud es HU*

GRK 302 Ancient Greek Literature. (3) S
Cont nuat on of GRK 301. Prerequ s te GRK 201 or nstructor approva *General Stud es HU*

HEBREW (HEB)

HEB 101 Elementary Modern Hebrew. (4) F
Read ng wr t ng speaking and understand ng of bas c modern Hebrew, w th emphas s on pronunc at on and grammar 4 hours ecture 1 hour ab

HEB 102 Elementary Modern Hebrew. (4) S
Read ng, wr t ng, speak ng and understand ng of bas c modern Hebrew w th emphas s on pronunc at on and grammar 4 hours lecture 1 hour ab. Prerequ s te HEB 101 or equ va ent

HEB 201 Intermediate Modern Hebrew. 4 F
ntens ve rev ew of grammar, w th emphas s on the development of the sk s of speak ng, sten ng comprehens on read ng and wrnt ng 4 hours ecture 1 hour ab Prerequ s te HEB 102 or equ va ent

HEB 202 Intermediate Modern Hebrew. 4 S
Intens ve rev ew of grammar w th emphas s on the deve opment of the sk s of speak ng sten ng comprehens on, reading and wr t ng. 4 hours ecture, 1 hour ab Prerequ s te HEB 201 or equ va ent

HEB 313 Advanced Modern Hebrew. 4 F
Cont nued development of abi ty to commun cate oral y and n wnt ng Read ng of se ected terary works Prerequ s te HEB 202 or equ va ent

HEB 314 Advanced Modern Hebrew. 4 S
Cont nued deve opment of ab ty to commun cate ora y and n wr t ng Read ng of se ected terary works Prerequ site HEB 313 or equ va ent

INDONESIAN (IDN)

IDN 101 Elementary Indonesian I. (5) F
Bas c commun cat on, read ng and wr t'ng ski s Intens ve ora aura c assroom dr supp emented by prose read ng. 4 hours ec ture 1 hour ab

IDN 102 Elementary Indonesian II. (5 S
Bas c commun cat on, read ng and wr t ng sk s ntens ve ora a ra c assroom dr supplemented by prose read ng 4 hours ec ture, 1 hour ab. Prerequ s te· DN 101 or equ va ent

IDN 201 Intermediate Indonesian I. (5) F
Systemat c rev ew of grammar Cont nued de ve opment of commun cat on sk ls w th n creased emphas s on read ng and wr t ng 4 ectures 1 hour ab Prerequ s te DN 102 or equ va ent *General Stud es· G*

IDN 202 Intermediate Indonesian II. 5 S
Systemat c rev ew of grammar Continued de ve opment of commun cat on sk s w th in creased emphas s on read ng and writing 4 ectures, 1 hour ab Prerequ s te DN 201 or equiva ent *General Stud es G*

ITALIAN (ITA)

ITA 101 Elementary Italian. (4) F S
Aura ora dr l in c ass and laboratory, and ba s c grammar supp emented by s mp e pr se read ngs 4 hours ecture, 1 hour lab.

ITA 102 Elementary Italian. 4) F, S
See TA 101. Prerequ s te TA 101 or equ va ent

ITA 201 Intermediate Italian. (4) F S
ntens ve rev ew of the fundamenta s of ta an grammatica structure to ncrease the stu dent's ab ty n compos t on, trans ation and d omat'c express on 4 hours ecture 1 hour lab Prerequ s te TA 102 or equ valent *Gen era Stud es G*

ITA 202 Intermediate Italian. 4) F S
See ITA 201 Prerequ s te TA 201 or equ va ent *Genera Stud es· G*

ITA 311 Italian Composition and Conversation. (3) F S
Deve opment of writ ng ab ty and ora expres s'on Prerequ s te TA 202 or equivalent. *Gen era Studies· G.*

ITA 312 Italian Composition and Conversation. (3) F S
See ITA 311 Prerequ s te ITA 202 or equ va ent *General Stud es G*

ITA 314 Advanced Italian. (3) N
An advanced grammar and compos t on course w th read ngs of se ected iterary works Prerequ site: ITA 202 or nstructor ap prova *General Stud es G*

ITA 325 Introduction to Italian Literature. (3) F
Ital an terature through the nterpretat on of representat ve works n drama, poetry and novel Prerequ s te ITA 202 or nstructor ap prova . *General Stud es HU*

ITA 415 Italian Civilization. 3) N
A genera survey of the h story terature, art and mus c emphas z ng ta y s cu tura contr but on to Western c v zat on Prerequ s tes. ITA 311, 312 (or 314) *General Stud es· 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 Cross sted as FLA/HUM 494

ITA 430 Italian Literature of the Middle Ages. (3) N
Emphas s on St l Novo ' Dante s minor works Petrarch and Boccaccio Prerequ s te: TA 325 or nstructor approva *General Stud es HU*

ITA 441 Dante: *Divina Commedia.* 3 N
Cr t ca read ng of the three *Cant che (Inferno Purgatorio, and Parad so)* Prerequisite: ITA 325 *General Stud es L2/HU*

ITA 443 Italian Literature of the Renaissance. (3 N
Emphas s on Lorenzo de'Med c Po z ano Cast g one Mach ave Ar osto, and Tasso Prerequ s te· ITA 325 or nstructor approva *General Stud es HU, H*

ITA 446 Italian Literature of the 18th and 19th Centuries. (3) N
Go don Par n Alf er , the poetry of Fosco o and Leopard and the soc oh'stor ca nove s of Fosco o Manzon , and Verga Prerequ s te TA 325 or nstructor approval *Genera Stud es HU*

ITA 449 20th-Century Italian Literature. 3) N
Ma or works f gures and m vements of con temporary ta an terature. Prerequ s te TA 325 *General Stud es HU G*

JAPANESE (JPN)

JPN 101 Elementary Japanese. 5 F
Commun cat on sk l s and bas c sk s in gram mar, reading and wr t ng nc ud ng h ragana katakana and about 75 kanj 5 hours week.

JPN 102 Elementary Japanese. 5 S
Cont nuat on of JPN 101 Add t onal 99 kanj Cont nued deve opment of commun'cat on sk l s n speak ng sten ng reading wr t ng and cu ture Prerequ s te JPN 101 or equ va lent

JPN 107 Japanese for International Professions I. (10) F
Acce erated program a ternat ve to JPN 101 102 sequence Funct onal approach to needs of nternationa profess ons 10 c ass hours a week

JPN 201 Intermediate Japanese. (5) F
Cont nued deve opment of commu ication on sk s ncreased emphas s on read ng and wr t ng Rev ew of fundamenta s of structure to ncrease student s ab t es n compos t on and trans at on. 5 c ass hours a week Prereq u s te JPN 102 or equiva ent *Genera Stud es G*

JPN 202 Intermediate Japanese. (5 S
Cont nuat on of JPN 201 Prerequ s te. JPN 201 or equ va ent *General Stud es: G.*

JPN 206 Calligraphy. (1) N
ntroduct on to the pract ce of ca graphy n Japan w th emphas s on the der vat on of Japanese kana sy abar es from Ch nese char acters Prerequ s te CH 205 or JPN 101

JPN 207 Japanese for International Professions II. 10 S
Continuat on of JPN 107 a ternat ve to JPN 201, 202 sequence Expansion of c mmun ca t've prof c ency n spec f c areas f nterna tiona profess ons 10 c ass hours a week Prerequ s te JPN 107 or nstructor approva *General Stud es G*

JPN 309 Intermediate Japanese Conversation. (2) F
Pract ce n current usage n express on of deas Recommended espec a y for those who have not had the opportun ty to pract ce Japanese n Japan Prerequ s te JPN 202

JPN 310 Intermediate Japanese Conversation. 2 S
Cont nuat on of JPN 309 Prerequ s te JPN 309

JPN 311 Japanese Conversation and Composition. (3 F
Intens ve aura ora practice eading toward conversat ona f uency Pract ce n wr t ng Japanese, emphas z ng current usage. Pre-requisite: JPN 202 *General Studies G*

JPN 312 Japanese Conversation and Composition. 3) S
See JPN 311 Prerequ site JPN 202. *General Stud es. G*

JPN 313 Advanced Japanese. 3) F
Cont nued deve opment of ab' ty to commun - cate ora y and in writ ng. Exposure to the var - ety of Japanese wr tten styles Prerequ s te JPN 202 or equ va ent *General Stud es G*

JPN 314 Advanced Japanese. (3) S
See JPN 313. Prerequ s te: JPN 313 or 'n- structor approva *Genera Studies: G.*

JPN 321 Japanese Literature. (3 N
Read ngs in representat ve masterpieces of modern Japanese terature Authors read change each year n accordance w th the needs of the c ass May be repeated for cred t Prerequ s te JPN 313 or nstructor approva . *General Stud es. 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 struc ture of the class ca language Prerequ s te· JPN 313 or nstructor approva

JPN 435 Advanced Readings. (3) N
Read ngs n h story, art re g ous stud es, eco- nom cs, or other fie ds Lecture, d scuss on Prerequ s te. JPN 314 or equ va ent.

JPN 485 Prob ems of Translation. (3) N
Theor es and pract ce of trans at on strateg es for hand ng a var ety of Japanese texts. Lec- ture d cuss on Prerequ s te JPN 314 or equ va ent

JPN 500 Bibliography and Research Methods. 3 N
ntroduct on to research mater a s on Japan both in Japanese and n Western anguages. Overv ew of research methods Lecture d s cuss on

JPN 514 Advanced Premodern Japanese. 3 N
C ose read ngs of se ected premodern texts w th focus on grammat ca and sty st c fea tures Lecture d scuss on Prerequ s te JPN 414 or equ va ent

JPN 520 Teaching of Japanese as a Second Language. 3 N
Theory and pract ce of teach ng Japanese, n c ud ng presentat on, nteraction and evalua t on w th cons derat on g ven to cu tura fac tors Lecture d scussion

JPN 535 Advanced Readings. 3 N
Read ngs n pr mary and secondary sources n h story, art re g ous stud es terature, or other fie ds Lecture d scuss on Prerequ s te· JPN 414 or equ va ent

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NOTE For the Genera Stud es requ rement, codes such as L1 N3 C and H and courses see pages 84 108 For graduation requ rements see pages 79–83 For omnibus courses offered but n t sted n th s cata og, see pages 56–57

JPN 543 Japanese Language and Linguistics. 3 N
Ana ys s and d scuss on of ngu st c theor es app ed to Japanese phono ogy m rpho ogy and syntax nc ud ng psycho og ca soc o og ca and h stor a aspects

JPN 585 Advanced Problems of Translation. 3 N
Theor es and pract ce of trans at on strateg es for hand ng a var ety of Japanese texts Lec ture d scuss on Prerequ s te JPN 435 or equ va ent

JPN 591 Seminar. 3 N
Top cs n terary ngu st c or cu tura stud es.

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 bera Arts and Sc ences anguage re qu rements

LAT 101 Elementary Latin. 4 F S
Bas c Lat n grammar with an emphas s on de ve op ng read ng sk s For beg nn g students on y.

LAT 102 E ementary Lat n. 4 F S
Cont nuat on of LAT 101 Prerequ s te LAT 101 or equ va ent

LAT 201 Intermediate Latin. 4 F
Se ected Lat n te ature both c ass ca and postc ass ca V rg s *Aene d* advanced gram mar Prerequ s te. LAT 102 o nstructo ap prova *Genera Stud s HU*

LAT 202 Intermediate Lat n. 4 S
See LAT 201 Prerequ s te LAT 102 r n structor approva *Genera Stud es HU*

LAT 421 Roman Literature. 3 F
Read ngs n the Lat n masterp eces Auth rs read change each year n acco dance w th needs of the c ass May be repeated for cred t Prerequ s te LAT 202 or n tructor approva .

LAT 422 Roman Literature. 3 S
See LAT 421 Prereq s te LAT 202 or struct r approva

NORWEGIAN (NOR)

NOR 101 E ementary Norwegian. 4 F
Read ng wr t ng speak ng and understand ng of bas c Norweg an 4 hours ecture 1 hou ab.

NOR 102 Elementary Norwegian 4 S
Read ng wr t ng, peak ng and understand ng of bas c Norweg an 4 h urs ecture 1 h u ab Prerequ s te NOR 101 or eq va ent

NOR 201 Intermediate Norwegian. 4 F
Rev ew of Norweg a gramma w th emphas s on the deve pment of the sk of speak ng sten ng comprehens on read ng and wr t ng 4 hours ecture 1 ho r ab Prerequ s te NOR 102 or equ va ent

NOR 202 Intermediate Norwegian. 4 S
Rev ew of Norweg an grammar w th emphas s on the deve opment of the sk s f speak ng sten ng comprehen on read ng and wr t ng 4 hours ecture 1 h ur ab Prerequ s te NOR 201 or equ va ent

PORTUGUESE (POR)

To sat sfy the foreign anguage requirement students must take POR 314 or a h gher num bered POR course

POR 101 Elementary Portuguese. (5) F
Bas c grammar w th ntens ve dr ls n c ass and aboratory d rected toward conversat onal f uency 5 hours lecture, 1 hour ab Prerequ s te 1 year of Spanish or French or ta ian or nstructor approval.

POR 201 Intermediate Portuguese. 5 S
Cont nuat on of POR 101 ntens ve dr l of fundamentals n c ass and aboratory d rected toward conversat ona f uency 5 hours lec ture 1 hour ab. Prerequ s te POR 101 or n structor approval *Genera Stud es G*

POR 313 Portuguese Composition and Conversation. 3) F
Des gned to develop sk l n wr tten Portu guese 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 . *General Stud es. G*

POR 321 Luso-Brazilian Literature. 3) N
Representat ve masterp eces of Portuguese and Braz l an terature from the beg nn ng to the present Prerequ s te POR 313 or nstruc tor approva *General Stud es. HU.*

POR 472 Luso-Brazilian Civilization. (3) N
Lectures, read ngs and d scuss on of mpor tant aspects of Luso Braz l an c v l zat on. Top cs from mus c, art fo klore, terature. h story and po t cs Prerequ s te POR 313 or nstruc tor approva *Genera Stud es HU, G*

RUSSIAN (RUS)

RUS 101 Elementary Russian. (4) F S SS
Structura grammar and bas c vocabu ary n troduct on and re nforcement of aural oral read ng and wr t ng sk l s 4 hours ecture 1 hour ab

RUS 102 Elementary Russian. (4) S SS
See RUS 101 Prerequ s te RUS 101 or equ va ent

RUS 201 Intermediate Russian. (4) F, SS
Systemat c review of grammar. Deve opment of vocabu ary through read ng and wr t ng. Dr n aura ora ski s 4 hours lecture, 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 valent. *Genera Stud es G*

RUS 211 Basic Russian Conversation. 3) F
Intens ve aural oral dr to supp ement read ng and grammat ca sk s acqu red n RUS 101 102 201, and 202 Required of Russian ma jors Prerequ s te RUS 102 *General Stud es G*

RUS 212 Basic Russian Conversation. 3 S
See RUS 211 Prerequ site. RUS 102 *Gen era Stud es G*

RUS 303 Scientific Russian. (3) F
Acqu s tion of sc entif c vocabulary through read ng from current Russ an scient fic publ cat ons Does not sat sfy the L bera Arts and Sc ences anguage requ rement for B A de gree Prerequ s 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
Development of wr t ng ab ty and ora expres s on Prerequ s te RUS 2 2 *General Stud es G*

RUS 312 Russian Composition and Conversation. (3) S
See RUS 311. Prerequisite: RUS 202. *Gen eral 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 cen tury Russ an thought, fe, and cu ture by read ng trans ations of works of major wr ters Pre requ site RUS 202 or equ va ent *Genera Stud es L2/HU*

RUS 323 Survey of Literature of the Soviet Era. (3) A
Main terary movements prom nent authors and the most s gn f cant works of prose, po etry, and drama of the sov et per od from 1917–1991 Prerequ s te RUS 202 or equ va lent *General Studies L2/HU G*

RUS 411 Advanced Composition and Conversation I. 3 F
Des gned to mprove aural d scr m nat on and se f express on n ora and wr tten sk s em phas z ng vocabu ary bu d ng Subject mater ais drawn from current post Sov et Russ an pub icat ons Prerequ s te RUS 312. *Genera Stud es. G.*

RUS 412 Advanced Composition and Conversation II. (3) S
See RUS 411. Prerequ s te. RUS 312 *Gen eral Stud es G*

RUS 417 Applied Russian Phonetics . 2 N
Genera improvement in the student s an guage sk ls through aura ora tra n ng n Rus s an phono ogy and an ana ys s of Russ an or thography Prerequ s te· RUS 102.

RUS 420 Russian Poetry. 3) N
Development of Russ an poetry from ts beg n n ngs to the present, nc ud ng both nat ve and ém gre poets Top cs n cr t c sm and the study of poet cs Prerequ s te RUS 312 or nstructor approval. *Genera Stud es L2/HU*

RUS 421 Pushkin. (3) N
Pushk n's poetry p ays and prose f ct n n c ud ng *Eugene Oneg n, The L tt e Traged es, Tales of Be k n Queen of Spades* and *The Capta n s Daughter* Taught n Eng ish Does not sat sfy the L bera Arts and Sc ences an guage requ rement for B A degree *Genera Stud es L2/HU*

RUS 423 Dostoyevsky. (3) N
Dostoyevsky s major works of f ct o c ud ng *Cr me and Pun shment* and *Brothers Kara mazov* Taught n Eng sh D es not sat sfy the L bera Arts and Sc ences anguage requ re ment for B A. degree *Genera Stud es L2/ HU*

RUS 424 Tolstoy. (3) N
To stoy's major works, nclud ng *War and Peace* and *Anna Karenina* Taught n Eng ish Does not sat sfy the L bera Arts and Sciences anguage requ rement for B A. degree *Gen eral Stud es L2/HU*

RUS 425 Chekhov. (3) N
Chekhov's major works, representat ve short stones and major p ays, including *The Cherry Orchard* and *Three Sisters* Taught n Eng sh. Does not sat sfy the L bera Arts and Sciences anguage requ rement for B A. degree *General Studies: L2/HU*

RUS 426 Literatures of the Nationalities of the Former Soviet Union. (3) N
Inc uding such authors as Belsev ca, Kross Venc ova Kupa a, Khvy ovy Sevak Nasri, Aitmatov Charents, Cholpan Prerequisite RUS 312 or instructor approval. *General Stud ies L2/HU G*

RUS 430 Russian Short Story. (3) N
Detai ed study of representative works of the Russ an short story genre. Authors ncluded are from both mper a and Soviet Russ a. Prerequisite: RUS 312 or nstructor approvai. *General Stud es. L2/HU*

RUS 440 History of the Russian Language. (3) N
Pr nciples of histor ca l ngu st cs presented through the evo ut on of the Russ an anguage from Proto ndo-European to the present Readings of h stor cal documents n Old Rus s an and O d Church Slavic Prerequis te: RUS 312 or nstructor approval.

RUS 441 Survey of Russian Culture. (3) N
Interplay of art stic, soc a and pol tical forces n the deve opment of Russian cu ture from the K evan per od to the present Exc us ve use of Russian language source mater a s. Prerequ s te RUS 312 or nstructor approva *General Studies· L2/HU, G, H.*

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) L terature Literary Zhdanov sm
(d) 19th-Century Russ an
(e) Post Soviet Literature
(f) Pre 19th Century Russ an L terature
(g) Russ an Literary Crit c sm
(h) Russ an Poetry to 1890
(i) Russ an Poetry 1890 to Present

SCANDINAVIAN (SCA)

SCA 314 Medieval Scandinavia. (3) F, S
Study n Eng ish trans at on of the Sagas, Edda and Ska d c poetry h story and mytho · ogy of the Vikings

SCA 315 Old Norse. 3) F, S
Read ngs and study of grammatica structures of Med eva Scandinavian w th emphas s on the Sagas and Edda poetry and histor ca wr't ings

SCA 316 Scandinavian Cinema. 3) F, S
Presentation of Dan sh, Norweg an, Ice and c and Swed sh fi m, w th Eng sh subt t es, as representatives of contemporary histor ca culture

SPANISH (SPA)

Students who have completed their secondary education in a school where Span sh was the off cia anguage of instruct on should begin their studies at the 325 level or above For the courses SPA 313 and 314 certa n restr ct ons apply no student who has completed more than two years of h gh schoo n a Spanish speak ng country, where Spanish is the me d um of instruction n the school is allowed to reg ster n a Span sh class below the 400 evel.

SPA 101 Elementary Spanish. (4 F, S SS
Fundamenta s of the language Emphasis on l sten ng, speaking read ng and writ'ng 4 hours lecture, 1 hour ab Not open to students with 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 Funct ona appr ach to needs of nternat ona profess ons

SPA 111 Fundamentals of Spanish. (4 F, S
Primarily for students w th two years of h gh schoo Span sh who need rev ew to enter sec ond year study 4 hours ecture, 1 hour lab Not open to students w th cred t n SPA 101 or 102.

SPA 201 Intermediate Spanish. 4 F S SS
Cont nuat on of fundamentals Emphas s on the deve opment of the sk' s of read ng, sten ing comprehens on speaking wr ting and cu ture 4 hours ecture 1 hour ab Prerequ s te· SPA 102 or 111 *Genera Studies G*

SPA 202 Intermediate Spanish. (4) F S, SS
See SPA 201 Prerequ s te SPA 201 or equ va ent. *General Stud es· G*

SPA 203 Intermediate Spanish for Bilinguals. (4 F
For Span sh speaking st dents n eu of SPA 201 Compos tion iterature, conversat on, grammar fundamenta s. 4 hours lecture 1 hour lab. Prerequ s te· SPA 102 or 111 or p acement *General Studies G*

SPA 204 Intermediate Spanish for Bilinguals. 4) S
For Span sh speak ng students n eu of SPA 202. Composit on terature 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 ternative to SPA 201, 202 sequence Expans'on of commun ca t ve prof ciency in spec f c areas of nterna tional profess ons Prerequ s te SPA 107 or nstructor approva *General Stud es G*

SPA 311 Spanish Conversation. 3 F S
Des gned pr mar y for nonmajors to promote vocabu ary bu d ng and commun cat ve ex press'on n Span sh through discuss ons based on cu tura read ngs Prerequis te SPA 202 or equ va ent

SPA 312 Spanish Conversation. (3) F, S
See SPA 311 Prerequ s te SPA 311 or equ va ent

SPA 313 Spanish Conversation and Composition. 3 F, S SS
Des gned to develop sk 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 equ va ent. *Genera Stud es G*

SPA 314 Span'sh Conversation and Composit on. (3) F S SS
See SPA 313 Prerequisite: SPA 313 or equ va ent *Genera Stud es G*

SPA 315 Spanish Conversation and Composition for Bilinguals. 3 F
Emphas s on comparing standard Span sh w th reg ona Southwest Span sh May be taken 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 s te SPA 315 or equ valent.

SPA 319 Business Correspondence and Communication. (3 N
Organ zat'on a d presentat on of clear effec t ve bus ness communicat ons vocabu ary ap p cab e to modern bus ness usage Prerequ s te. SPA 314 or 316 or 'nstructor approval *General Stud es G*

SPA 325 Introduction to Hispanic Literature. 3 F S
A cr t ca approach to and ana ys s of terary types nc ud ng poetry drama short story, and novel Requ red of al majors. Prerequ s te SPA 313 *Genera Stud es. HU*

SPA 412 Advanced Conversation and Composition. 3 F S
Oral and wr tten Span sh commun cation sk s w th part cu ar attent on g'ven to deve op ng f uency and fac ty Requ red of majors Prerequ s te SPA 314 or 316 or nstructor approva . *Genera Stud es G*

SPA 413 Advanced Spanish Grammar. 3 F
Intens ve ana ys s of the Spanish anguage Requ red of teach ng majors Prerequ s'te: SPA 314 or 316 or nstructor approva *Gen e al Stud es G*

SPA 417 Spanish Phonetics and Phonology. (3 F
ntr duct on to the theory and practice of Span sh phonet cs and phono ogy Prerequ s te SPA 412

SPA 420 Applied Spanish Linguistics. 3) S
App cat on of ngu st c pr nc p es to the teach ng of Span sh Prerequ s tes FLA 400 or equ va ent SPA 412 *General Stud es L2*

SPA 421 Spanish in the Southwest. (3 F
D scuss on a d ngu st c ana ys s of South west Span sh Prerequ s te SPA 412 *General Stud es L2/SB C.*

SPA 425 Spanish Literature. (3 F S
Survey f Span sh terature from ts beg nn ng to 1700 Prerequ s te SPA 325 *General Stud es HU*

SPA 426 Spanish Literature. 3 F S
Survey of Span sh terature from 1700 to the present Prerequ s te SPA 325. *General Stud ies HU*

SPA 427 Spanish American Literature. 3) F S
Survey of major works f gures and move ments from Co on al per od to 1880. Prerequ s te· SPA 325 *Genera Stud es· L2*

SPA 428 Spanish American Literature. (3) F S
Survey of major works f gures, and move ments from 1880 to the present Prerequ s te: SPA 325 *General Stud es L2 G*

SPA 429 Mexican Literature. 3 N
Se ected read ngs from pre-Columb an wr t- ers/poets e.g , Macui xoch t through the nove of the Revo ut on to the present Prereq u s te SPA 325

SPA 434 Drama of the Golden Age. 3) S
Dramat c works of Lope de Vega Ca deron de a Barca and the r contemporar es Prerequ site· SPA 325

SPA 435 Cervantes—*Don Quijote.* 3) F
Don Qu ote and the deve opment of the nove Prerequ s te SPA 325.

SPA 454 19th-Century Spanish American Narrative. 3 F
Pr ncipal works n the nove short story narra t've f ct on, and narrative Gauchesque) po etry. 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 ıterature ın Span sh and En- g sh by Mex can Amer cans emphas zıng so- c ocu tura as we as terary values Prerequı s te SPA 325. *Genera Stud es HU.*

SPA 471 Civilization of the Spanish Southwest. (3) S
The po t ca ntel ectua soc al, 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. *Genera Stud es HU*

SPA 472 Spanish American Civilization. 3 F
Growth of the nstitut ons and cu tures of Span sh Amer can peop e Prerequ s te SPA 314 or 316 or nstructor approva *Genera Stud es. HU, G H*

SPA 473 Spanish Civilization. (3) S
Po t ca , nte ectua s c al, econom c and ar- t st c deve opment of the Spanish nat on from ts or g n to the present Prerequ s te SPA 314 or 316 or nstructor approva *General Stud es HU SB, G*

SPA 485 Mexican American Short Story. (3) N
Cnt ca study of contemporary short stories by Mex can Amer can authors with emphas s on the r Span sh- anguage wr t ngs Prerequ s te SPA 325 or nstructor approva

SPA 486 Mexican American Novel. (3) N
Soc a and terary contexts of representat ve nove sts, emphas z ng the r Span sh an guage wr t ngs Prerequ s te SPA 325 or ın- structor approva

SPA 487 Mexican American Drama. 3) N
Representat ve dramat c works, w th empha s s on the h story and development of th s genre from ts reg ona or g ns to the present. Prerequ s te SPA 325 or ınstructor approva

SPA 500 Bibliography and Research Methods. (3) F
Requ red of a graduate students

SPA 536 Generation of 1898. (3) N
Works of Unamuno Baroja Azor´n, and the r contemporar es, studied against the deo og ca background of the turn of century ın Spa n. Prerequ s te SPA 325

SPA 540 History of the Spanish Language. (3) S
Ana ysis and d scuss on of the deve opment of Span sh from Vu gar Lat n to the present day Prerequisite: FLA 400 or equ va ent.

SPA 541 Spanish Language in America. (3) F
D scussıon and ana ys s of varıous reg onal and socıa varıet es of Spanish n the Amerı cas. Prerequ s te FLA 400 or equ va ent

SPA 542 Studies in the Spanish of the Southwest. (3) S
Examınat on of b ´ngua sm and the soc a and reg ona d alects 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 n Span sh morphology semant cs, and syntax Prerequisite: FLA 400 or equ va ent

SPA 545 Concepts of Literary Criticism. (3 S
A ms and methods of modern ıterary scho ar sh p D scuss on of major theor es of terary ana ys s

SPA 555 Spanish American Modernism. 3) N
Prınc pa works and f gures of l terary Modern ısm, 1880–1920 w th emphasıs on nterna- t ona terary context of the movement Pre requ s te SPA 325.

SPA 557 Contemporary Spanish American Poetry. (3) N
Major works and prob ems n contemporary poetry and poetıcs w th emphasis on Paz Parra, Cardena and new poetry s nce 1960 Prerequ 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 figures and works of the 16th and 17th centur es, w th emphas s on the p caresque nove

SPA 562 Golden Age Spanish Poetry. 3) N
Major figures and works of the 16th and 17th centuries, w th emphas s on yric poetry

SPA 563 Spanish Romantic´sm. (3) N
Prınc pal f gures and works of the Span sh Ro mantic sm, w th emphas s on ´nternat onal ıt- erary context of the movement

SPA 564 19th-Century Spanish Prose Fiction. 3) N
Pr nc pa f gures and works of Rea ısm n the 19th-century novel, w th emphas s on Ga dós

SPA 565 20th-Century Spanish Drama. 3) N
Prınc pa figures and works of Span sh dramatic terature from the Generation of 1898 to the present

SPA 566 Generation of 1927. (3 N
Major poets of the Generat on of 1927 w th emphas s on works of Lorca Gu en Sa nas, and Aleixandre

SPA 567 Contemporary Spanish Novel. (3) N
Major works of post-Civ War Spanish f ction

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 Span sh Go den Age Lecture sem nar.

SPA 570 Indigenous Literatures of Spanish America. (3) N
The ndıgenous ıterary trad tıons, w th empha- s s on Nahuatl, Mayan and Quechua l tera tures through read ngs n Span sh transla t ons.

SPA 571 Colonial Spanish American Literature. (3) N
The major figures and works from Conquest to Independence

SPA 572 Spanish American Drama. (3) N
Major contribut ons of Span sh Amer can drama w th emphasis on contemporary dra matists.

SPA 573 Spanish American Essay. (3) N
Major works of the essay, with n the frame work of inte ectual h story and l terary move- ments

SPA 574 Spanish American Vanguard Poetry. (3) N
Exam nat on of poet c developments 1920– 1940, with emphas s on Huidobro Va lejo Neruda and the nternat onal context of the r works

SPA 575 Contemporary Spanish American Novel. (3) N
Prınc pa novels of the *Nueva Narrativa H s- panoamericana* w th n the context of contem- porary theor es of the narrative.

SPA 576 Contemporary Spanish American Short Story. (3) N
Pr nc pal short stories of the *Nueva Narrativa Hispanoamer cana* w th n the context of con temporary theor es of the narrat ve

SPA 577 Regional Spanish American Literature. (3) N
The f gures and works of major nat ona (Peru Argent na, Ch e and Mex co) and regıona (Caribbean) teratures Top cs offered on a ro tating bas´s May be repeated for different top cs

SPA 578 Novel of the Mexican Revolution. (3) N
Representat ve works and authors of th s genre (Guzman Azue a, Urqu zo, Munoz, and Romero) nc ud ng related or per phera off- shoots n ınd genous novels

SPA 581 Latin American Popular Culture. (3) N
Stud es n se ected topıcs of Latın Amer can popu ar cu ture with emphasıs on appropr ate academ c mode s for the crıt ca analys s of these materıa s.

SPA 582 Studies in Latin American Film. (3) N
Exam nat on of the ro e of fi m n contempo- rary Lat n Amer can cu ture; f lms v ewed and analyzed as casebook examples Sem nar.

SPA 591 Seminar. (3 N
Span sh and Spanish Amer can ´terary cu tura and ´ngu st c top cs

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NOTE For the General Stud es requ rement codes (such as L1, N3 C, and H) and courses see pages 84 108 For graduat on requ rements see pages 79–83 For omn bus courses offered but not ısted n th s cata og see pages 56–57.

SPA 691 Figures and Works Seminar. (3) N
Topics may be selected from Spanish and Spanish American literatures.

SWEDISH (SWE)

SWE 101 Elementary Swedish. (4) F
Reading, writing, speaking and understanding of basic Swedish. 4 hours lecture, 1 hour lab.

SWE 102 Elementary Swedish. (4) S
Reading, writing, speaking and understanding of basic Swedish. 4 hours lecture, 1 hour lab. Prerequisite: SWE 101 or equivalent.

SWE 201 Intermediate Swedish. (4) F
Review of Swedish grammar with emphasis on the development of the skills of speaking, listening comprehension, reading and writing. 4 hours lecture, 1 hour lab. Prerequisite: SWE 102 or equivalent.

SWE 202 Intermediate Swedish. (4) S
Review of Swedish grammar with emphasis on the development of the skills of speaking, listening comprehension, reading and writing. 4 hours lecture, 1 hour lab. Prerequisite: SWE 201 or equivalent.

THAI (THA)

THA 101 Elementary Thai I. (5) F
Basic communication, reading, and writing skills. Intensive oral/aural classroom drill supplemented by prose readings in Thai script. 4 hours lecture, 1 hour lab.

THA 102 Elementary Thai II. (5) S
Basic communication, reading, and writing skills. Intensive oral/aural classroom drill supplemented by prose reading. 4 hours lecture, 1 hour lab. Prerequisite: THA 101 or equivalent.

THA 201 Intermediate Thai I. (5) F
Systematic review of grammar. Continued development of communication skills with increased emphasis on reading and writing. 4 hours lecture, 1 hour lab. Prerequisite: THA 102 or equivalent. *General Studies: G.*

THA 202 Intermediate Thai II. (5) S
Systematic review of grammar. Continued development of communication skills with increased emphasis on reading and writing. 4 hours lecture, 1 hour lab. Prerequisite: THA 201 or equivalent. *General Studies: G.*

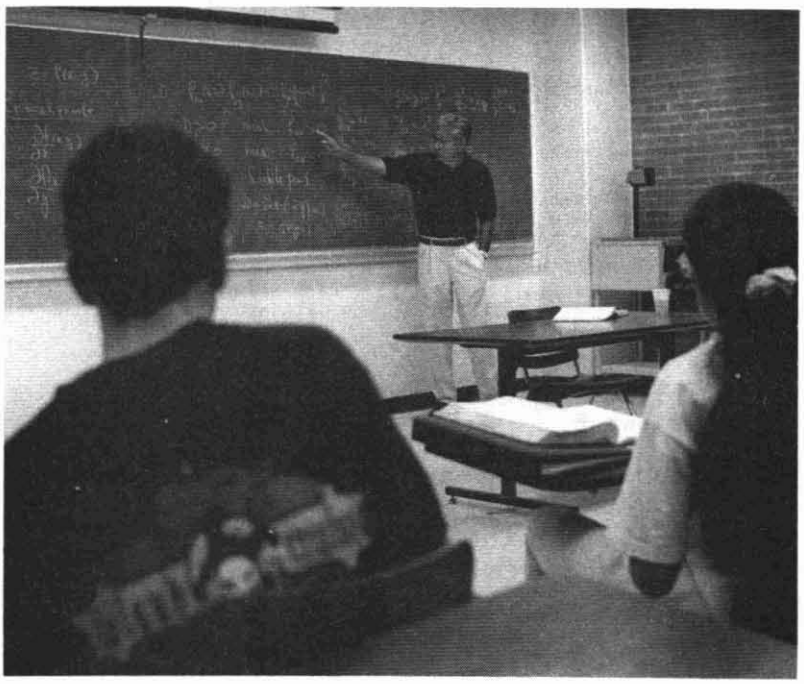
VIETNAMESE (VTN)

VTN 101 Elementary Vietnamese I. (5) F
Basic skills in modern conversational Vietnamese and development of basic reading and writing skills, with special emphasis on tones. 4 hours lecture, 1 hour lab.

VTN 102 Elementary Vietnamese II. (5) S
Basic skills in modern conversational Vietnamese and development of basic reading and writing skills, with special emphasis on tones. 4 hours lecture, 1 hour lab. Prerequisite: VTN 101 or equivalent.

VTN 201 Intermediate Vietnamese I. (5) F
Improve students' speaking, listening, reading, and writing competence through dialogues, reading passages, pattern drill, and grammar and communicative exercises. 4 hours lecture, 1 hour lab. Prerequisite: VTN 102 or equivalent. *General Studies: G.*

VTN 202 Intermediate Vietnamese II. (5) S
Improve students' speaking, listening, reading, and writing competence through dialogues, reading passages, pattern drill, and grammar and communicative exercises. 4 hours lecture, 1 hour lab. Prerequisite: VTN 201 or equivalent. *General Studies: G.*



Joaquin Bustoz, professor of Mathematics, is one of 10 teachers nationwide to be honored with a Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring. Jeff Havir photo

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ASSOCIATE PROFESSORS
BAER, BARCELO, BLOUNT, CHILDRESS, DRISCOLL, FAN, FARMER, HASSETT, HURLBERT, J. JONES, KOSTELICH, KURTZ, LOHR, MAHALOV, McCARTER, MOORE, QUIGG, SPIELBERG, SWIMMER, TAYLOR, TURNER, WELFERT

ASSISTANT PROFESSORS
CARLSON, HOLST, D. JONES, NIKITIN, PREWITT, ZANDIEH

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	4
MAT	272	Calculus with Analytic Geometry III	4
MAT	274	Elementary Differential Equations	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

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 (3)	
MAT	270	Calculus with Analytic Geometry I *N1*	4
MAT	271	Calculus with Analytic Geometry II	4
MAT	272	Calculus with Analytic Geometry III	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	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 Combinatorial Mathematics I (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 (3)	
MAT	274	Elementary Differential Equations	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	Combinatorial Mathematics I	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 *N3*[1]	3
CSE	210	Data Structures and Algorithms I *N3*[1]	3
MAT	274	Elementary Differential Equations	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	Combinatorial Mathematics I	3
MAT	416	Combinatorial Mathematics II	3
MAT	419	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	243	Discrete Mathematical Structures	3
		or MAT 300 Mathematical Structures *L2* (3)	
MAT	274	Elementary Differential Equations	3
MAT	371	Advanced Calculus I	3

NOTE: For the General Studies requirement codes (such as L1 N3, C, and H) and courses, see pages 84–108 For graduation requirements, see pages 79–83 For omnibus courses offered but not listed in this catalog, see pages 56–57.

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* or STP 420 Introductory Applied Statistics *N2* 3)	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 or MAT 472 Intermediate Real Analysis 3)	3
MAT	372	Advanced Calculus II	3
STP	420	Introductory Applied Statistics *N2*	3
STP	421	Probability	3
STP	425	Stochastic Processes or STP 427 Mathematical Statistics (3)	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	Combinatorial Mathematics I	3
MAT	419	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	4
MAT	272	Calculus with Analytic Geometry III	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* or CSE 183 Applied Problem Solving with FORTRAN *N3* 3) or CSE 100 Principles of Programming 3	3
MAT	270	Calculus with Analytic Geometry I	4
MAT	271	Calculus with Analytic Geometry II	4
MAT	272	Calculus with Analytic Geometry III	4
MAT	300	Mathematical Structures *L2* or MAT 243 Discrete Mathematical Structures 3)	3
MAT	310	Introduction to Geometry	3
MAT	342	Linear Algebra	3
MAT	370	Intermediate Calculus or MAT 371 Advanced Calculus I (3)	3
MAT	443	Introduction to Abstract Algebra or MAT 445 Theory of Numbers (3)	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 321) or physics (page 374). 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	4
MAT	272	Calculus with Analytic Geometry III	4
MAT	274	Elementary Differential Equations or MAT 371 Advanced Calculus I 3 or MAT 460 Applied Real Analysis 3	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

A computer science course CSE 100 Introduction to Computer Science I or CSE 183 Applied Problem Solving with FORTRAN or CSE 200 Concepts of Computer Science is recommended

Mathematics. 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	4
MAT	272	Calculus with Analytic Geometry III	4
MAT	274	Elementary Differential Equations or MAT 371 Advanced Calculus I 3 or MAT 460 Applied Real Analysis 3)	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
Top cs from bas c algebra such as near equat ons, po ynomials factor ng exponents roots and radicals Prerequ s te 1 year of h gh schoo a gebra

MAT 114 College Mathemat cs. 3 F S SS
App cat ons of bas c co ege eve mathemat- cs to rea - fe prob ems Appropriate for students whose major does not requ re MAT 117 or 170. Prerequ s te MAT 106 or 2 years of h'gh schoo a gebra *General Studies N1*

MAT 117 College Algebra. (3 F S, SS
L near and quadrat c funct ons systems f n ear equat ons, ogar thm c and exponent a funct ons, sequences ser es, and comb nato r cs. Prerequ s te MAT 106 or 2 years of h gh school a gebra *Genera Stud es· N1*

MAT 119 Finite Mathematics. (3) F, S SS
Top cs from near a gebra, near programming comb nator cs probab ty and math emat cs of f nance Prerequis te. MAT 117 o equivalent. *Genera Studies N1*

MAT 170 Precalculus. (3 F, S SS
ntens ve preparat on for ca cu us MAT 260 270 and 290) Top cs nc ude funct ons n c ud ng trigonometr c , matrices po ar coord nates, vectors comp ex numbers and math emat ca nduct on Prerequ site w th a grade of "B" or h gher: MAT 106 Prerequ s te w th a grade of "C" or h gher MAT 117 *or* two years of h gh schoo algebra *General Stud es N1*

MAT 210 Brief Calculus. (3) F S SS
Different al and ntegra ca cu us of e ementary functions w th app cat ons. Not open to stu dents with cred t in MAT 260 270 or 290 Prerequ'site: MAT 117 or equ va ent *Genera Stud es: N1.*

MAT 242 Elementary Linear Algebra. (2 F S SS
ntroduction to matr ces systems of near equat ons, determ nants vector spaces near transformat ons, and e genva ues Empha s zes deve opment of computat ona sk s Prerequisite· 1 semester of ca cu us or nstruc tor approval.

MAT 243 Discrete Mathematical Structures. (3) F S SS
ntroduction to att ces graphs, Boo ean alge bra, and groups, w th emphas s on top cs re evant to computer science Prerequ s te. 1 se mester of calcu us

MAT 260 Technical Calculus I. (3) F S SS
Ana yt c geometry, d fferent al and ntegra calcu us of e ementary funct ons emphas z ng phys ca nterpretation and prob em so v'ng Not open to students w th cred t in MAT 210, 270 or 290 Prerequis'te. MAT 170 or equ va lent *General Stud es. N1*

MAT 261 Technical Calculus II. 3 F S SS
Cont nuation of MAT 260 Prerequ s te. MAT 260 or instructor approva .

MAT 262 Technical Calculus III. 3 F, S
nfin'te series an introduction to d fferent al equat ons and elementary near algebra Pre requ site MAT 261 or equ va ent

MAT 270 Calculus with Analytic Geometry I. 4) F, S, SS
Rea numbers, m ts and cont nuity and d ffer ent a and ntegra ca cu us of funct ons of 1 var able Not open to students w th cred t n MAT 290 The sequence MAT 270 and 271 may be subst tuted for MAT 290 t sat sfy re quirements of any curr cu um Pre equ s te w th a grade of C or h gher MAT 170 or equ va ent *Genera Stud es· N1*

MAT 271 Calculus with Analytic Geometry II. 4) F S, SS
Methods of ntegrat on app cat ons of ca cu us, e ements of ana yt c geometry, mproper nteg a s sequences and ser es Not open to students w th cred t n MAT 291 The se quence MAT 270 271 272 may be subst tuted to sat sfy requ rements for MAT 290 and 291 Prerequ s te w th a grade of C or h gher MAT 270 or equ va ent

MAT 272 Calculus with Analyt'c Geometry III. (4) F S SS
Vector va ued funct ons of several var ab es, mu tip e ntegrat on and ntroduct on to vector ana ys s The sequence MAT 27 , 271 272 may be substituted to sat sfy requ rements for MAT 290 and 291 Prerequ s te w th a grade of C or h gher MAT 271 or equ va ent

MAT 274 Elementary Differential Equations. 3) F S SS
Introduct on to ord nary different al equat ns adapted to the needs of students n eng neer ng and the sc ences MAT 272 or equ va ent is recommended Prerequ s te MAT 271 or equ va ent

MAT 290 Calculus I. 5 N
D fferent a and ntegra ca cu us of e ementary funct ons top cs from ana yt c geometry es sent a to the study of ca cu us Prerequ s te: MAT 170 or equ va e t *Genera Stud es. N1*

MAT 291 Calculus II. 5 N
Further app cat ons of ca cu us part a d ffe entiat on, mu t p e integra s and nf n te ser es. Prerequ s te MAT 290 or equ va ent

MAT 300 Mathematical Structures. 3) F S
Introduct on to rigor and proof n mathemat cs Basic log c, set theory mathemat ca nduc t on combinatorics funct'o s re at ons, and probabi ty Prerequ s te 1 semester of calcu l s or nstructor approva *Genera Stud es L2*

MAT 310 Introduction to Geometry. 3 S
Congruence area para el sm s m ar ty and vo ume, and Euc dean and on Euc dean ge ometry Prerequ s te MAT 272 or equ va ent

MAT 342 Linear Algebra. 3 F, S, SS
Linear equat ons matr ces determ nants, vec tor spaces bases inear transformat ons and s m ar ty nner product spaces, e genvectors rthonorma bases d agona zat on, and pr n- c pa axes. Pre or corequ site MAT 272 or equ va ent

MAT 362 Advanced Mathematics for Engineers and Scientists I. (3) F S SS
Vector ana ys s, F ur er analys s and part a d fferent a equat ons Prerequ s tes· MAT 272 and 274 *or* equ valents

MAT 370 Intermediate Calculus. 3 F S
Theory beh nd bas c 1 variab e ca cu us: cont nu ty derivative Riemann ntegra , se quences and ser es Not open to students w th cred t n MAT 371. Prerequ s tes MAT 272 300

MAT 371 Advanced Calculus I. 3 F S
Rea numbers comp eteness, sequences se r es cont nuity, unifo m theorems der vat ve R emann integral po ntw se un form c nve gence, Taylor s theorem Not open to students w th cred t n MAT 370. Prerequ s te MAT 272 or 300 or nstructor approva

MAT 372 Advanced Calculus II. 3 F S
Open, c osed compact sets n R^n cont nu ty d fferent ation part a d fferent at n, ntegra t n n R^n nverse mp c t funct on theorems Not open to students w th cred t n MAT 460 Prerequ s te: MAT 371 Pre or corequ s te· MAT 342

MAT 410 Introduction to Genera Topology. (3 A
Topo og ca spaces metr c spaces compact ness connectedness and p oduct space Prerequ site MAT 300 or 371 or nstructor ap prova .

MAT 415 Combinatorial Mathematics I. 3 F
Permutat ons and comb nat ons, recurren e re at ons generat ng funct ons graph theory, and comb nator a proof techn ques. Prerequ s tes MAT 300 and 342 *or* instru tor approva

MAT 416 Combinatoria Mathematics II. (3 S
Cont nuat on of MAT 415 co s der ng some advanced aspects of the theory as we as ap p cat ons Top cs chosen fr m tran port et works match ng theory b ock des gns cod ng theory Po ya s count ng theory a d app ca t ons to the phys cal and fe sc ences MAT 443 s recommended Prerequ s te MAT 415 or instructor approva

MAT 419 Linear Programming. 3) S
L near programm ng and the s mp ex a go r thm network problems quadrat c and non near programm'ng Prerequ s tes: MAT 242 or 342 1 semester of co ege ca cu us *Gen era Stud es N2*

MAT 421 Applied Computational Methods. 3 F, S
Numer ca methods for quadrature d ffere t a equations roots of non near equat ons nter po at on, approx mat on near equat ons f oat ng po nt ar thmet c and roundoff error Prerequ s tes MAT 271 or equ va e t and f uency n computer programm ng p eferab y FORTRAN) *or* nstruct r approva *Genera Stud es N3.*

MAT 423 Numerical Analysis I. 3 F S
Analys s and a gor thms f r numer ca so u t ons near non near equat ons d rect so vers terat ve proced res, opt m zat on Determ na- t on of e genva ues E ementary computer ar thmet c Prerequ s tes MAT 342 and 371 and f uency in computer programm ng *o* n structor approva *Genera Stud es N3*

MAT 425 Numerical Analysis II. 3 F, S
Ana ysis of and algor thms for numer ca nter po at on, ntegrat on and d fferent at on Nu mer ca so ut on of ord nary d fferent a equa t ons and method of nes. Those seek ng a methods survey course shou d take MAT 421 Prerequ s tes. MAT 342 and 371 and f uency n computer programm ng *or* 'nstructor ap prova *Genera Stud es· N3*

NOTE For the Gene a Stud es requ rement codes such as L1 N3 C and H and courses, see pages 84–108 For graduat on requ rements see pages 79–83 For omn bus courses offered but n t sted n th s cata og see pages 56–57.

MAT 427 Computer Arithmetic. 3 S
Number systems, hardware software ar th met c overf w s gn f cance round ng mu - t p e prec s on and automat c error contro m- pact on anguages arch tectures robust pro gramm ng and software deve opment Pre requ s te CSE 100 or 200 *or* MAT 421 and 423 r MAT 425) *o* 'nstructor approva *Gen era Stud es N3*

MAT 442 Advanced Linear Algebra. (3) F
Fundamenta s of near a gebra, dua spaces, nvar ant subspaces canonica forms, b' near and quadrat c forms and mu t near a gebra Prerequ s tes MAT 300 and 342 *or* nstructor approva

MAT 443 Introduction to Abstract Algebra. 3 F
ntroduct on t co cepts of abstract a gebra Not open to students with cred t 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, n c ud ng an ntroduct on to Ga o s theory Ap propr ate as preparat on for MAT 543 Prereq- u s tes MAT 300, 342

MAT 445 Theory of Numbers. 3) S
Pr me numbers un que factor zat on theorem c ngruences D ophant ne equat ons, pr m t ve roots and quadrat c rec proc ty theorem. Pre requ s tes MAT 300 and 342 *or* nstructor ap- prova

MAT 451 Mathematical Modeling. (3) S
A deta ed study f 1 or more mathematica mode s that occur 'n the phys cal or b o og ca sc ences May be repeated for credit w th n- structor approva Prerequ'sites: MAT 242 (or 342 and 274 *or* nstructor approva . *General Stud es N2.*

MAT 452 Introduction to Chaos and Nonlin- ear Dynamics. 3 F
Propert es of non near dynam ca systems; dependence on n t a cond tions; strange attractors per od doub ng, b'furcat ons sym bo c dynam cs Sma e B rkhoff theorem; and app cat ons MAT 371 s recommended. Pre requ s tes: MAT 242 (or 342) 274

MAT 455 Introduct'on to Fracta s and Ap- plications. 3 S
Fracta s se f s m ar structures fracta s w th t erated funct on systems of maps comput ng fracta s fra ta d mens ons, chaotic dynamics n fracta s appl cat ons MAT 371 s recom mende Prereq s tes MAT 242 or 342) 274

MAT 460 App ied Real Analysis. (3) S
Vectors curv near c ord nates, Jacob ans mp c t fun t on theorem ne and surface n teg a s Green s Stokes and d vergence theorems Not open to students w th cred t n MAT 372 Prerequ s tes MAT 242 or 342), 272 274

MAT 461 Applied Complex Analysis. (3) F, SS
Ana yt c fu ct ons comp ex ntegrat on, Tay or and La rent er es res due theorem confor mal mapp ng, and ha mon c functions Prereq- u s te MAT 272 or equ va ent

MAT 462 Applied Partial Differential Equa- tions. (3) S
Second order part a d fferent a equat ons emphas z'ng Lap ace, wave and d ffus on equat ons So ut ons by the methods of char acter st cs separat on of var ab es and nte- gra transforms Prerequ s tes MAT 242 (or 342) 274

MAT 472 Intermediate Real Analysis. (3) F
ntroduct on to ana ys s n metnc spaces with emphas s on the rea ne Appropr ate as preparat on for MAT 570 Prerequ s tes: MAT 300 342

MAT 475 Differential Equations. (3) F
Asympt ot c behav or of solut ons of near and non near ord nary different a equat'ons sta b ty Sturm Liouv l e prob ems boundary va ue problems and s ngu ar po nt behavior of autonomous systems Prerequisites MAT 242 (or 342) 274

MAT 476 Partial Differential Equations. (3) S
F rst order quasi near second order near (wave, Lap ace, heat Characterist cs, har- mon c funct ons max mum pr'nc ples Four er ser es, separat on of var ab es. Prerequ s tes: MAT 274 (or 475) 372 (or 472)

MAT 485 History of Mathematics. (3) N
Top cs from the h story of the orig n and devel- opment of mathemat cal deas Prerequis te MAT 272 or equ va ent

MAT 510 Point Set Topology. (3 F
Topo og ca spaces metr c spaces, compact- ness connectedness loca properties prod uct and decompos t'on spaces mapp ngs, cover ng propert'es, and separat on proper t es Prerequ s te· MAT 371 or 410 or nstruc tor approva

MAT 511 Point Set Topology. (3) S
Continuat on of MAT 510 Prerequ s te MAT 510 or nstructor approva

MAT 520 Numerical Linear Algebra. (3) F
D rect so ution of near systems, terat ve methods, e genva ues and e genvectors, s n- gu ar va ue decomposit on the QR a gor'thm, error propagat on arithmetic and stab i ty. Prerequ s tes MAT 342 and 423 (or 421 *or* nstructor approva

MAT 521 Iterative Methods. (3) S
Numer ca methods for so v ng near nonl near systems of equat ons (symmetr c, non symmetr c) terat ve methods for near sys tems conjugate gradients mult gr d methods, precond t on ng Kry ov methods Prerequ - s tes MAT 371 and 423 (or 421 *or* nstructor approva .

MAT 523 Numerical Optimization. (3) N
L near programm ng unconstra ned nonl near m n m zation ne search a gonthms conju gate gradients quas Newton methods con strained non near optim zat on, grad ent pro- jection and penalty methods Prerequ s te MAT 342 or 371 or 460 or 520 (or equ va ent) or instructor approval.

MAT 524 Parallel Numerical Algorithms. (3) N
A gor thms for mass ve y para le , hypercube arch tectures paral e " FORTRAN· solut on of l near non near systems; partial d fferentia equat ons· terat ve methods mu t grid do ma n decompos t on Prerequ s tes MAT 371 and 423 (or 421) or nstructor approval

MAT 526 Numerical Solution of Bifurcation Problems. (3) N
Non near parameter dependent d fferent al, a gebra c equat ons numerical solut ons, bi furcation turn ng po nts· cont'nuat on meth ods, branch switch ng, steady state t me de pendent cases Hopf Bifurcation Prerequi sites· MAT 371 and 423 (or 421) *or* nstructor approva .

MAT 530 Numerical Solution of Ordinary Differential Equations. (3) F
One step 'near mu t step methods, cons s- tency, order, stab ity, convergence; d scret za t on roundoff errors, error estimat on, adaptive strategy mp ementation software for nonst ff equat ons Prerequ s tes MAT 371 and 423 (or 421) *or* nstructor approva

MAT 531 Numerical Solution of Stiff Differ- ential Systems. (3) S
Runge Kutta methods order cond t ons con struct on of h gh y stab e methods, order stars error estimat on stepsize select on con- tract vity properties near mu t step methods Prerequ s tes MAT 371 and 423 (or 421) *or* nstructor approva

MAT 533 Computational Elliptic and Para- bolic Partial Differential Equations. (3) F
Parabol c and e l pt c equat'ons, f n te d ffer ence, f n te e ement methods stab ity, cons s- tency convergence pract ca aspects, app i cations software Prerequ s'tes: MAT 371 and 423 (or 421) *or* nstructor approva

MAT 534 Computational Hyperbolic Partial Differential Equations. 3) S
Numer ca so ut'ons of hyperbo c PDEs, f n te d fference methods, we posedness, stab i ty cons'stency, convergence adapt ve gr ds; Maxwe 's equat ons e astic wave propaga- tion Nav er-Stokes Prerequ s tes MAT 371 and 423 (or 421) *or* nstructor approva .

MAT 535 Spectral Methods for Partial Dif- ferential Equations. (3) N
Spectra pseudo-spectral theory Ga erk n col ocat on methods, Tau methods g oba ap- prox mation propert es stab i ty convergence; solut ons for near, non inear systems Pre- requ's tes: MAT 371 and 423 (or 421) *or* in structor approval

MAT 543 Abstract Algebra. (3) F
Groups modu es, r ngs and f e ds Galois theory homo og ca a gebra, and the repre sentation theory Prerequ s te· MAT 444 or in- structor approva

MAT 544 Abstract Algebra. (3) S
Continuat on of MAT 543 Prerequ s'te MAT 543 or nstructor approval

MAT 550 Variational Methods. (3) F
Ca cu us of variations and its app cat ons to extrema prob ems, c ass'ca mechan cs, and part'a d fferent a equations. Prerequ s tes. MAT 274 and 462 *or* equ va ents

MAT 551 Linear Operators and Integral Equations. 3) S
Bounded near and compact operators on H bert spaces L near ntegra equations Fredho m and H lbert Schm dt theory and ap- proximate methods. D str butions. Prerequ - s tes MAT 242 and 462 *or* equ va ents.

MAT 555 Fractal Geometry. (3) N
Geometry and ana ys s of fractal sets; def n t ons of dimens'ons ca culat ng dimens ons; project ons products of fracta s· random fractals· mu t fracta measures; and appl ca- t ons Prerequ s tes: MAT 371, 455. MAT 472 is recommended

MAT 570 Real Analysis. (3) S
Lebesgue ntegrat on se ected funct on spaces d fferent at on, abstract measure theory and e ements of functiona analys s Prerequ s te MAT 372 or instructor approva

MAT 571 Real Analysis. (3) F
Cont'nuat on of MAT 570. Prerequ s te MAT 570 or instructor approva

MAT 572 Complex Analysis. 3) F
Analyt c functions series and product representat ons entire and meromorph c functions normal fam l es, Riemann mapping theorem harmon c functions and R emann surfaces. Prerequisite: MAT 371 or nstructor approval.

MAT 573 Complex Analysis. (3) S
Continuation of MAT 572 Prerequisite. MAT 572 or nstructor approval.

MAT 574 Theory of Ordinary Differential Equations. (3) N
Systems, existence proofs s ngu ar t es as ymptot c behavior of so ut'ons, boundedness of so ut'ons, e genva ues and e genfunct ons and perturbation theory. Prerequ s te MAT 372 or nstructor approval

MAT 575 Theory of Ordinary Differential Equations and Dynamical Systems. (3 N
Geometric approach to ODEs and dynam ca systems; (un)stable center man fo ds, struc tural stab ty; norma forms averag ng; chaos pers stence May be repeated for cred t w th nstructor approva . Prerequ s tes MAT 452 and 475 *or* MAT 574 *or* instructor approva

MAT 576 Theory of Partial Differential Equations. (3) N
Ex stence and uniqueness theorems bound ary va ue and n tia va ue prob ems character stics Green s funct ons max mum prin c p e d str butions, and weak so ut ons Pre requ'site· know edge of Lebesgue ntegrat on or nstructor approva

MAT 577 Theory of Partial Differential Equations. (3) N
Continuat on of MAT 576 Prerequ s te MAT 576 or instructor approva

MAT 578 Functional Analysis. (3 N
Loca ly convex normed and H bert spaces Linear operators spectra theory, and app ca tion to c ass cal ana ysis Prerequ s te MAT 472 or 571 or nstructor approva

MAT 579 Functional Analysis. (3) N
Cont nuation of MAT 578 Prerequisite MAT 578 or nstructor approval

MAT 591 Seminar. (1 3) N
Top cs may be se ected from the fol ow ng
(a) A gebra
(b) Analysis
(c) App ed Mathemat cs
(d) Comb nator a Mathemat cs
(e) Mathemat ca Log c
(f) Numencal Ana ysis
(g) Topology

MATHEMATICS EDUCATION (MTE)

MTE 180 Theory of Elementary Mathematics. (3) F, S, SS
Number systems, ntu t ve geometry e ementary algebra, and measurement ntended for prospective e ementary schoo teachers. Pre requ s te MAT 117 or equ va ent

MTE 181 Theory of Elementary Mathematics. (3) A
Continuat on of MTE 180 Prerequ s te MTE 180 or nstructor approval

MTE 380 Arithmetic in the Elementary School. (3) A
H'storical numerat on systems, overview of e ementary number theory nc ud ng primes, factorization d v s b ty bases modu ar sys tems, near congruence, and cont nued frac t ons Prerequ s te· MTE 181 or nstructor approval

MTE 381 Geometry in the Elementary School. (3) N
Informa geometry, including concepts of engh area, vo ume s m ar ty and congru ence C ass fication of f gures straightedge and compass construct ons, and mot on ge ometry Prerequ's te· MTE 380 or nstructor approva

MTE 480 Mathematics in the Upper-Elementary Grades I. (3) N
An ntroduct on to probab ity and stat st cs, in cluding open ended data gathering and pro cess ng, count ng techn ques samp ng strateg'es est mat on, and dec s on 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 appl cat ons. A thorough nvest gat on of some of the a go rithms of basic ar thmet c. Prerequ s te MTE 480 or nstructor approva

MTE 482 Methods of Teaching Mathematics in Secondary School. (3 F SS
Exam nat on of secondary school curr cu ar mater a and ana ys s of nstruct ona dev ces Teaching strateg es, evaluat ve techn ques d agnosis and remed at on and prob em solv ing Prerequisite: nstructor approva

MTE 483 Mathematics in the Secondary School. (3) S SS
Top cs in geometry, number theory a gebra, and ana ys s Emphas s on unify ng princ ples Prerequ s te MAT 310 or instructor approval

MTE 582 Modern Mathematics for Teachers. (3) N
Theory of sets real number system, transf n te numbers, and other se ected top cs Prerequi s te nstructor approva

MTE 583 Abstract Algebra for Teachers. (3 N
Postu at onal approach to algebra and el ementary mathematical systems, including groups and f e ds Prerequ s te instructor ap proval

MTE 585 Modern Geometry for Teachers. (3 A
Euc dean projective, and non Euc dean ge ometries Prerequisite nstructor approva

MTE 587 Analysis for Teachers. 3 N
Subject matter n mathemat cs appropriate for acce erated programs in secondary schools, nc ud ng ana yt c geometry and ca cu us. Pre requ s te nstructor approval.

MTE 588 Analysis for Teachers. (3) N
Cont nuat 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
Basic concepts and methods of stat st cs n c ud ng descript ve stat st cs s gn f cance tests, est mat on samp ng, and corre at on Not open to maj rs n mathematics or the phys ca sc ences Prerequ s te MAT 114 or 117 or equ va ent *General Stud es N2*

STP 326 Intermed ate Probability. (3 F, S
Probab ty mode s and computat ons jo nt and cond t ona d str butions moments and fam ies of d str butions Top cs n stochast c processes s mu at'on and stat stics Prereq uisite MAT 210 or equ va ent *Genera Stud ies N2*

STP 420 Introductory Applied Statistics. (3 F S SS
Introductory probabi ty descr pt ve stat st cs sampl ng d str but ons, parameter est mat on tests of hypotheses ch -square tests, regres s on analys s ana ys s of var ance and nonparametric tests Prerequ s te: MAT 117 or equ valent *General Studies: N2*

STP 421 Probability. 3 F
Laws of probab ty combinator a ana ys s, random var ab es, probab ty d str but ons ex pectations moment generat ng functions transformat ons of random var ab es and cen tra m t theorem Prerequ s tes MAT 300 and STP 420 *or* equ va ents

STP 425 Stochastic Processes. (3) S
Markov chains stationary distr butions pure jump processes 2D order processes and other top cs n stochast c processes. Prerequ s tes: MAT 342, STP 421.

STP 427 Mathematical Stat stics. 3 S
L mit ng d str but ons nterva est mat on po nt est mat on, suff c ent stat st cs and tests of hy potheses Prerequ's te STP 421

STP 429 Experimental Statistics. (3) S
Stat stical nference for contro ed experimen tat on Mu t p e regress on corre at on ana y s s of variance mu t p e compar sons and nonparametr c procedures. Prerequ s te STP 420 or equ va ent *Genera Stud es· N3*

STP 525 Advanced Probability. 3 N
Measure theoret c foundat ons of probab ty, d str but on funct ons and character st c func tions, aws of arge numbers and centra m t theorems condit ona probab ties mart n ga es, and top cs n stochast c processes Prerequ sites MAT 571 and STP 421 *or* nstructor approva

STP 526 Theory of Statistical Linear Models. (3) F
Mu tinorma distribut on d str but on of qua drat c forms fu and nonfu rank mode s, gen era zed inverses unbalanced data var ance components and the large sample theory Prerequ sites STP 427 knowledge of matrix a gebra

STP 530 Applied Regression Analysis. (3) F
Method of ea t squares s mp e and mu t p e l near regress on, po ynom a regression ana ys s of residua s, dummy var ab es, and model bu ld ng Prerequ s te STP 420 or equ valent.

NOTE· For the General Stud es requirement codes (such as L1, N3 C and H), and courses, see pages 84–108 For graduation requ rements, see pages 79–83 For omn bus courses offered but not isted n th s cata og, see pages 56–57

STP 531 Applied Analysis of Variance. 3) S
Factorial designs, ba anced and unba anced data fixed and random effects random zed blocks Lat n squares, ana ys s of covariance, and mu t p e compar sons Prerequ s te STP 420 or equ va ent

STP 532 Applied Nonparametric Statistics. 3) F
One samp e test tests of 2 or more re ated or ndependent samp es, measures of correla t on, and tests of trend and dependence. Pre requisite: STP 420 or equ va ent.

STP 533 Applied Multivariate Analysis. (3) S
Discrim nant analys s pr nc pa components factor analys s, c uster analys s and canon cal correlat on Prerequis te STP 420 or equiva lent

STP 534 Applied Discrete Data Analysis. (3) N
Mode s for d screte and count data measures of assoc at on and og- near and regress on models for contingency tab es Prerequ s te: STP 420 or equ valent.

STP 535 Applied Sampling Methodology. (3 S
S mp e random, stratified, c uster samp ng· variance est mat on n comp ex surveys nonparametr c superpopulat on approaches nonresponse mode s, computat ona methods Prerequ s te STP 420 or equ valent

STP 591 Seminar. (1 3 N
Top cs may be selected from the fol ow ng
(a) Probab ty
(b) Statist cs

Department of Microbiology

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Chair
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PROFESSORS
BURKE, JACOBS
MOSSMAN, SCHMIDT

ASSOCIATE PROFESSORS
BIRGE HOFFMAN M SRA

ASSISTANT PROFESSORS
BLOOM, CHANG, STOUT

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
Choose between the two combinations of courses below			8
CHM	231	Elementary Organic Chemistry *S1/S2* (3 [1]	
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, 332	General Organic Chemistry (6	
CHM	335, 336	General Organic Chemistry Laboratory (2	
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	470	Bacterial Diversity and Systematics	4
MIC	494	Clinical Bacterial Laboratory	3
MIC	495	Undergraduate Research	2
MIC	498	Techniques in Molecular Biology Laboratory	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, 112	General Physics *S1/S2**	6
PHY	113, 114	General Physics Laboratory *S1/S2**	2
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 con

sists of 40 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 602 965 0743 for more information

CLINICAL LABORATORY SCIENCES/ MEDICAL TECHNOLOGY (CLS)

CLS 100 Introduction to Clinical Laboratory Sciences. (1) F
Introduction to the field of clinical laboratory sciences Required for Clinical Laboratory Sciences majors

Enrollment for the following CLS classes is restricted to students admitted to the Clinical Laboratory Sciences Professional Study Program.

CLS 310 Principles of Clinical Chemistry I. (6) S
Theory and application of principles of clinical chemistry with emphasis on laboratory technique, pathophysiology, methods of analysis, and assessment of procedure 3 hours lecture 9 hours lab

CLS 320 Principles of Clinical Microbiology I. (6) S
Emphasizes disease mechanisms isolation and identification of medically significant fungi and bacteria Includes principles of laboratory *safety and quality control*. 3 hours lecture, 9 hours lab.

CLS 330 Principles of Clinical Hematology I/Body Fluids. (3) F
Theory and application of principles in hematology with emphasis on techniques to evaluate blood dyscrasias and analyze body fluids 2 hours lecture, 3 hours lab

CLS 410 Principles of Clinical Chemistry II. 2) SS
Continuation of 310 with emphasis on principles of automation laboratory computers, and method evaluation 1 hour lecture 3 hours lab

CLS 411 Advanced Applications of Clinical Chemistry. (4 F
Clinical application of theory techniques from Principles of Clinical Chemistry and Emphasis on operation of common laboratory instrumentation, clinical correlation and radioimmunoassay Minimum 180 hours practicum

CLS 420 Principles of Microbiology II. (2) SS
Disease mechanisms and identification of medically significant parasites. Mycobacteria Actinomycetes, Chlamydia Ricketts a, Mycoplasma and viruses 1 hour lecture 3 hours lab

CLS 421 Advanced Applications of Clinical Microbiology. (4 S
Practical laboratory application of the principles of specimen collection processing detection identification, and antimicrobial testing of medically significant bacteria fungi and parasites. Minimum 180 hours practicum

CLS 430 Principles of Clinical Hematology II/Hemostasis. 3) F
Theory and applications of principles in hematology with emphasis on etiology pathophysiology, clinical manifestations, and treatment of blood dyscrasias/hemostatic defects 2 hours lecture, 3 hours lab

CLS 431 Advanced Applications of Clinical Hematology. 4 S
Practical laboratory application of methods/techniques used to evaluate and diagnose blood dyscrasias/hemostatic defects. Applied techniques in body fluid analysis. Minimum 180 hours practicum

CLS 440 Principles of Clinical Immunology/ Immunohematology. (4) F
Theoretical and practical application of clinical immunology and immunohematology Emphasizes serological techniques that aid disease diagnosis and blood donor selection 3 hours lecture 3 hours lab

CLS 441 Advanced Applications of Clinical Immunology/Immunohematology. (3) S
Practical laboratory application of the principles of serological methods used in diagnosing disease and selecting blood components for transfusion therapy. Minimum 135 hours practicum.

CLS 450 Principles of Clinical Laboratory Administration. (2 F, S
Principles of management with emphasis on the clinical laboratory Basic management process personnel supervision identification and a location of resources. *General Studies· L2 (if credit also earned in CLS 460)*

CLS 460 Principles of Clinical Laboratory Education. (1) S
Principles of learning with application to the development of instructional objectives, strategies and evaluation for teaching-learning situations in the laboratory *General Studies: L2 (if credit also earned in CLS 450)*

MICROBIOLOGY (MIC)

MIC 205 Microbiology. (3) F, S, SS
Basic course for persons without credit in BIO 181, emphasizing general principles role of microorganisms in health ecology and applied fields May not be used for Microbiology major credit unless additional prerequisites passed Prerequisites BIO 100 (or PLB 108) and CHM 101 *or* instructor approval *General Studies S2 (if credit also earned in MIC 206)*

MIC 206 Microbiology Laboratory. (1) F S, SS
Principles and laboratory techniques used in identifying and handling microorganisms. 3 hours lab Pre- or corequisite MIC 205 or 220. *General Studies S2 (if credit also earned in MIC 205)*

MIC 220 Biology of Microorganisms. (3) F S
Basic course for persons with credit in BIO 181 Detailed study of microbial cells their structure, genetics physiology, and taxonomy Corequisites BIO 182; CHM 115

MIC 302 Advanced Bacteriology Laboratory. (2) F, S
Advanced laboratory techniques in bacterial growth, physiology, genetics, microscopy, and basic virology Required of Microbiology majors 4 hours lab. Prerequisites completion of L1 requirement and either A or B. A) MIC 206 and 220 *or* (B) MIC 205 and 206 and instructor approval. *General Studies L2 (if credit also earned in MIC 401).*

MIC 360 Bacterial Physiology. (3) F, S
Mechanisms and control of cellular metabolism, structures and functions Prerequisite MIC 220 Pre or corequisite· CHM 361 or instructor approval.

MIC 380 Medical Parasitology. (3) F
Parasitic diseases of humans including life cycle events and clinical manifestations Prerequisite. MIC 205 or 220.

MIC 381 Pathogenic Microbes. (3) S
Host-microbial interactions in infectious disease, with emphasis on pathogenesis, host defenses and molecular mechanisms of microbial virulence Prerequisite MIC 360 or 6 hours of microbiology with instructor approval

MIC 401 Research Paper. (1) F S SS
A paper of 15 or more pages based on brary or aboratory research in col aborat on with a facu ty member Requ red of a l M crobio ogy majors Prerequ sites M C 302, comp et on of L1 requirement. *Genera Stud es· L2 (if cred t also earned n MIC 302*

MIC 420 Immunology: Molecular and Cellular Foundations. (3) F
Mo ecular and cel u ar foundat ons of immuno ogy Ant body ant gen nteract ons ce u ar response, cytok nes, mmunogenet cs, mmu noregu at on, auto mmun ty psychoneuro mmuno ogy research medical perspectives Pre requ s tes CHM 231 or 331) and MIC 205 (or 220) *or* nstructor approval

MIC 421 Experimental Immunology. (2) F, S
An ntroduct on to the bas c techn ques meth ods, and assays used n mmuno ogy 6 hours ab. Prerequisites CHM 231 and 331 and M C 302 *or* nstructor approva .

MIC 425 Advanced Immunology. (3) F S 2001
A survey of recent advances in mmuno ogy, 'nc ud ng lymphocyte membranes ymphok ines/b ochem stry mo ecu ar genet cs, theoret ca mmuno ogy mmunoregu at on neuro immuno ogy and mmuno og c d seases. Pre requ site: MIC 420 or nstructor approva .

MIC 441 Bacterial Genetics. (3) S
Survey of genet c exchange and regulatory processes n bacter a and their viruses Bacte r a and v ruses as too s n genet c eng neer ng Prerequ s tes BIO 340 and M C 205 (or 220) *or* nstructor approva

MIC 442 Bacterial Genetics Laboratory. (1) N
Techn ques of mutagenes s, mapp ng, and stra n construct on. 4 hours ab Prerequ s tes: M C 206, 302 Pre or corequ s te M C 441

MIC 470 Bacterial Diversity and Systematics. (4) F
Bio ogy c assif cat on and enr chment cu ture of the nonpathogen c bacteria 2 hours lec ture 6 hours ab. Prerequ s te M C 302

MIC 485 General Virology. 3 F
Fundamenta nature of viruses the r repl ca t'on pathogenes s and eco ogy Prerequ s tes· BIO 340 and CHM 331 *or* nstructor approva .

MIC 486 General Virology Laboratory. (2) N
An ntroduct on to the growth, assay and detect on of viruses 6 hours ab Prerequ s te MIC 302 Pre- or corequ s te M C 485

MIC 495 Undergraduate Research. (1-6) F, S, SS
Supervised research n m crob o ogy May be repeated for cred t Lab. Prerequ s tes MIC 206 220, 302, nstructor approva

MIC 527 Neuroimmunology. (3) S 2000
Study ng m nd s nf uence on mmun ty and the mmune system's nf uence on the m nd, neuro mmuno og c d seases, and the neuro mmuno og ca c rcuitry nvolved. Sem nar. Pre requ s te MIC 420 or nstructor approval

MIC 545 Recombinant DNA Methodology. 3) N
Pr nc p es of genetic eng neering using in v tro DNA recomb nation character stics of p asm d and phage vectors, recomb nant selection and phys ca characterizat on Prerequisites BIO 443 M C 441 nstructor approva

MIC 546 Recombinant DNA Laboratory. (2) N
Bas c techn ques in so ation of chromosoma p asm d and bacteriophage DNA· transforma t on, gene sp c ng methods. Corequis te. M C 545.

MIC 581 Molecular Mechanism of Pathogenesis. (3 S 2000
Pathogen c mechan sms and host responses n v ra and/or bacter a d seases Prerequi s tes: MIC 381 and 420 *or* nstructor approval.

MIC 585 Molecular Virology. (3) N
Se ected top cs concern ng mo ecular aspects of eukaryot c virus repl cat on and pathogen es s. Prerequ s te nstructor approval.

MIC 591 Seminar. 1 3) F S
Top cs may be se ected from the fo owing
a) Bacterial Ecology
(b) Current Research n M crob o ogy
(c Enzymo ogy
(d Genetic Engineer ng
(e) Genetics
(f) Immuno ogy
(g) Mo ecular Viro ogy
(h) Neuro mmuno ogy
( ) Pathogen c Bacter o ogy

Department of Military Science

Army ROTC

Lt. Col. Wylie K. Bearup
Chair
(MAIN 240) 602/965–3318

PROFESSORS
BEARUP, COX, DALGLE SH

ASSISTANT PROFESSORS
BLEDSOE, DENT, MASSEY, POOLE, ROBERTS

INSTRUCTORS
ANDREWS, GR FFIN, KNOLL, LANE, MAATTA, RINGENOLDUS STEVENS

PURPOSE

The Department of Military Science curriculum consists of the basic course (MIS 101, 102, 201, and 202) and the advanced course (MIS 301, 302, 401, and 402). The goal of this professional education curriculum is to prepare students with leadership potential to be commissioned as U S Army officers. Objectives include developing the following characteristics in the students: leadership and managerial skills, the ability to think creatively; the ability to speak and write effectively, apprecia tion of the requirements for national se curity, and an understanding of the na ture and functions of the U.S. Army Upon successful completion of the advanced course and graduation, qualified students receive commissions in the Active Army (on a competitive basis), U.S. Army Reserve, or Army National Guard.

In addition to the military science curriculum, core courses in the field of national defense studies are both an integral and parallel source of the department's program. Integrally, they provide MIS courses at all levels with topical intensity and highlight such professionally related areas as military technology; weapons procurement; national intelligence, secrecy, and counterintelligence, civil military relations; security coalitions and regional defense communities; national, regional, and global levels of strategy; generalship skill in action; deterrence dynamics and structure; military doctrine; service branch livelihood, appropriations rivalry, and interservice cooperation; personnel recruitment, morale, training, advancement, and bureaucratic organization; military reform; threat and threat perception; military-historical experience and analogy, media and biographical insights; the rationale and matrices of security analysis and research; and independently selectable topics

The department also fields an independent but parallel set of 400 level courses in the areas of geostrategic, politico strategic, and national defense policy and analysis available to students irrespective of Reserve Officers' Training Corps (ROTC) status, department major, or college affiliation for assigned credit toward General Studies, social science, and global awareness requirements for graduation. (See catalog qualifications for course 499 Independent Study, page 56.)

GENERAL QUALIFICATIONS

Basic Course. Any student who is enrolled in ASU (or approved by the professor of military science) can enter into military science basic classes. It is strongly recommended that the student be in good physical shape because some of the curriculum requires physical exertion

Advanced Course. Any student who is enrolled in ASU (or approved by the professor of military science) may participate in military science advanced classes. However, to be fully enrolled

in the advanced course and compete for and obtain a commission in the U.S. Army, students must meet the follow ing requirements:

1. be a citizen of the United States (noncitizens may enroll but must obtain citizenship before commissioning);
2. be of sound physical condition and pass the U.S. Army physical fitness test;
3 meet the required professional mili tary educational requirements; and
4. be at least 17 years of age for en trance into the advanced course and be able to complete all commis sioning requirements before age 27.

Only those students in the basic and advanced courses who meet the re quired standards according to military regulations are eligible to receive finan cial assistance through the U.S. Army. Faculty of the Department of Military Science are available during normal of fice hours to answer questions or pro vide counseling.

The following are various options open to students who wish to obtain a commission in the U.S. Army. Contact the Department of Military Science personnel for more information

Four-Year Program. Students may enroll in Army ROTC during their freshman year They take the basic course during the first two years, re ceiving a total of 12 semester hours of credit for four semesters of study. Upon satisfying the requirements, they enter the advanced course, where they earn 12 additional semester hours for four semesters of study Students are also required to attend a five week advanced summer camp at Fort Lewis, Washington, between their junior and senior years. All commissioned offic ers must meet certain Professional Military Education requirements by completing courses in English, math, and computer literacy. Selected majors such as nursing, engineering, and archi tecture, among others, may require an additional semester or two, or summer school, to complete all requirements for a degree and commission without ex cessive course overloads. Upon suc cessful completion of the advanced course and requirements for a degree, students are commissioned as second lieutenants in the Active Duty Army, U.S. Army Reserve, or Army National Guard

Two-Year Program. Students must have at least two academic years of col lege work remaining, either at the un dergraduate or graduate level. The stu dent must also have reached academic junior status. This program is open to all students with the exception of three and four-year Army ROTC scholarship winners (see "Scholarship Programs" on this page). Students seeking enroll ment in the two year program should make application during the spring se mester of the calendar year in which they desire to enter the program. They must provide SAT ACT scores and pass the Army physical fitness test After successfully completing a paid five week basic camp, students may enroll in the advanced course. (The camp is conducted during June and July at Fort Knox, Kentucky. Students who have previous military experience or who are currently members of the National Guard or Reserves may be admitted di rectly into the two year program, provided they are academic juniors. They then follow the same program and meet the same requirements as stated for ad vanced course students in the four year program.

Qualifications for Admittance to the Advanced Course. The following qualifications are required for admit tance to the advanced course:

1. successful completion of the basic course for the students in the four year ROTC program; for the stu dents in the two year program, se lection for and completion of the six week basic summer camp or prior military service;
2 score at least 850 on SAT or 19 on ACT;
3. passing the Army physical exami nation;
4. achieving and maintaining the min imum cumulative GPA required for graduation in the student's selected major, but no less than 2.00,
5. attainment of at least junior class standing, and
6. maintenance of full time student status.

Pay and Allowances. Each advanced course student receives one half the pay of a second lieutenant during atten dance at the six week advanced camp Uniforms, housing, and meals are pro vided at camp without cost to the students, and they are reimbursed at the current mileage rate for travel to and from the camp. Students who attend basic camp receive the pay of an army recruit during attendance at basic camp as well as the current mileage rate for travel to and from the camp. All stu dents in the advanced course, regard less of scholarship status, are paid about $1,500.00 tax free for each of these two years.

Simultaneous Membership Program. Under this program, ROTC students may simultaneously be members of the Army Reserves or the National Guard The combination of advance course al lowance and pay for Army Reserve or National Guard participation provides more than $1.250.(0 for each semes ter's involven ent

Scholarship Programs. The Army ROTC offers scholarship programs for outstanding young men and women who are motivated toward a career as professional officers in the U.S. Army These scholarships are awarded in varying amounts for tuition. In addi tion, the scholarship pays $15) 00 per month subsistence allowance and $225 00 each semester for textbooks and supplies. A scholarship for four years is available to freshmen who en ter the four year program Applications must be submitted in accordance with a schedule furnished by high school counselors Selection is made on a na tionwide basis. Scholarships are also available for three and two year peri ods, commencing with the sophomore and junior years of ROTC respectively. Applications are open to all students in good standing with the university, pre vious ROTC or military experience is not required for application for three and two year scholarships Se ection is made by a review board at the national level. Acceptance of any of the three scholarship programs requires a service commitment to serve in the Active

NOTE For the Genera Stud es requ rement codes (such as L1 N3 C, and H and courses see pages 84 108 For graduat o requ rements, see pages 79–83 For omnibus courses offered but not sted n th s cata og see pages 56–57

Army for a period of up to four years after commissioning and graduation.

Active Duty Requirements. Graduates of Army ROTC may serve as officers in the Active Army, Army National Guard, or Army Reserves. Active duty commitments may vary from four years to as little as three months. Scholarship students have up to a four year active duty commitment.

Graduate and Professional Studies Programs. A delay from call to active duty for up to four years is available to outstanding students who desire to earn graduate or professional degrees. Special programs for graduate and professional studies are available to both Regular Army appointees and U.S. Army Reserve appointees in the following areas: medicine, osteopathy, and clinical psychology.

MILITARY SCIENCE (MIS)

MIS 101 Introduction to the Military. (3) F
Overview of mission, organization, and structure of the Army and its role in national defense; discussion of current military issues. 3 hours lecture, conference, 2 hours lab.

MIS 102 Land Navigation, First Aid, and Survival. 3 S
Introduction to military maps and land navigation; first aid, and lifesaving techniques; basic outdoor survival skills. 3 hours lecture, conference, 2 hours lab.

MIS 201 American Military History. (3) F
A study of the role of the military in American life during war and peace from colonial times to the present day. 3 hours lecture, conference, 2 hours lab.

MIS 202 Introduction to Leadership Dynamics. 3) S
Introduction to interpersonal dynamics involved in military team operations; theory and application of military leadership principles. 3 hours lecture, conference, 2 hours lab.

MIS 205 ROTC Basic Camp. (4) SS
Six week training program emphasizing practical hands on skills and leadership development. Taken in lieu of MIS 101, 102, 201, 202. Conducted at Fort Knox, Kentucky.

MIS 301 Advanced Military Science I. (3 F
Theory and dynamics of the individual soldier and military units in offensive combat operations. 2 hours lecture, conferences, 1.5 hours of Leadership Practica; Application 1.2 day field exercise. 3 1 day field exercises. Prereq: uisites MIS 101 and 102 and 201 and 202 *or* equivalents. Corequisite EPE 105 Physical Education Activity (Army Master Fitness).

MIS 302 Advanced Military Science II. (3 S
Theory and dynamics of military units in defensive combat operations. 2 hours lecture, conferences, 1.5 hours Leadership Practical Application 1.3 day field exercise, 2.1 day field exercises. Prerequisites MIS 101 and 102 and 201 and 202 *or* equivalents. Corequisite EPE 105 Physical Education Activity (Army Master Fitness)

MIS 303 ROTC Advanced Camp. (4) SS
Six week training program emphasizing leadership development and advanced military skills, including tactics, and navigation and physical training. Conducted at Fort Lewis, Washington. Prerequisites MIS 301, 302.

MIS 401 Advanced Military Science III. 3) F
The military legal system, preparation and conduct of military training, leadership development, ethics and professionalism of the military officer. 3 hours lecture-conferences, 2 hours Leadership Practica; Application, 1.2 day field exercise. 3 1 day field exercises. Prerequisites MIS 301, 302. Corequisite EPE 105 Physical Education Activity (Army Master Fitness).

MIS 402 Advanced Military Science IV. (3) S
Military correspondence, career planning and personal affairs in service, conduct of training; leadership development; ethics and professionalism of the military officer. 3 hours lecture, 2 hours Leadership Practica; Application, 1.3 day field exercise, 2.1 day field exercises. Prerequisites MIS 301, 302. Corequisite EPE 105 Physical Education Activity. Army Master Fitness)

MIS 410 American Defense Policy I. (3) F
Evolution, organization and execution of U.S. national security policy. *General Studies: SB.*

MIS 412 American Defense Policy II. (3) S
Contemporary problems and analytical issues in the formation and implementation of U.S. national security. Prerequisite: MIS 410. *General Studies. SB*

MIS 414 Comparative Defense Policy Analysis. 3) F
Historical problems and analytical issues in the evolution, organization, application, and control of effective military establishments in various political systems. *General Studies' SB*

MIS 416 Soviet/C.I.S. Foreign and Defense Policies. 3) S
Analysis of foreign and security policies of the Soviet Union/C.I.S. and of the successor states to the Warsaw Pact. *General Studies. SB*

MIS 499 Independent Study: National Defense Analysis. (1 3)

Molecular and Cellular Biology

Bertram L. Jacobs
Director, Executive Committee
602/965–0743
lsvl.la.asu.edu/mcb

GRADUATE PROGRAMS

The interdisciplinary M.S. and Ph.D. degrees with a major in Molecular and Cellular Biology are administered by the Interdisciplinary Committee on Molecular and Cellular Biology. The participating faculty are drawn primarily from four core departments (the Departments of Biology, Chemistry and Biochemistry, Microbiology, and Plant Biology), with additional faculty from the Departments of Anthropology and Physics and Astronomy.

For more information, contact the director or refer to the *Graduate Catalog.*

MOLECULAR AND CELLULAR BIOLOGY (MCB)

See the *Graduate Catalog* for the MCB courses.

Department of Philosophy

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REGENTS' PROFESSOR
MURPHY

PROFESSORS
CREATH, FITCH, HUMPHREY
MAIENSCHEIN, WHITE

ASSOCIATE PROFESSORS
ARMENDT, BLACKSON, COHEN,
de MARNEFFE, GULESER AN,
KOBES, McGREGOR, REYNOLDS

ASSISTANT PROFESSORS
COWLES, DELANEY

PHILOSOPHY—B.A.

The major in Philosophy consists of 45 semester hours, 33 of which must be upper division hours. In addition to the 45 semester hours, the mathematics proficiency requirement must be met by completing MAT 117 or higher. In exceptional cases, up to nine units may be in related fields as approved by the undergraduate advisor. Required courses are as follows:

PHI	301	History of Ancient Philosophy *HU H*	3
PHI	302	History of Modern Philosophy *HU H*	3
PHI	305	Ethical Theory *HU*	3
PHI	312	Theory of Knowledge *HU* or PHI 314 Philosophy of Science *HU* (3)	3
PHI	316	Metaphysics *HU*	3
		or PHI 317 Philosophy of Mind *HU* (3	
PHI	333	Introduction to Symbolic Logic	3

PHI	350	Philosophical Argument and Exposition *L2*	3
Total			21

Also required are at least two of the following courses:

PHI	401	Rationalism	3
PHI	402	Empiricism *HU*	3
PHI	403	Contemporary Analytic Philosophy *HU*	3
PHI	413	Advanced Symbolic Logic	3
PHI	420	Topics in Philosophy	3
PHI	494	Special Topics	3

Exceptions by special permission of the chair only. PHI 420 may be taken more than once.

Students planning to do graduate work in philosophy should consult an advisor to develop an appropriate selection of courses at the 300 and 400 levels. A minimum grade of "C" is necessary for each course used to fulfill the major requirements. See "Major Requirements," page 306.

History and Philosophy of Science. The faculty in the Department of Philosophy offer courses bearing the HPS prefix. With the consent of the director of undergraduate studies, these courses may be taken to satisfy the requirements of the Philosophy major.

MINOR IN PHILOSOPHY

A minor in Philosophy consists of 18 semester hours, of which at least 12 must be in the upper division and approved by an advisor in the department. All courses must be passed with a minimum grade of "C."

GRADUATE PROGRAM

The faculty in the Department of Philosophy offer a graduate program leading to the M.A. degree that prepares one for either teaching in a community college or pursuing a Ph.D. degree in Philosophy. Consult the *Graduate Catalog* for requirements.

HISTORY AND PHILOSOPHY OF SCIENCE (HPS)

HPS 322 History of Science. (3) F
Development and application of scientific thinking from ancient times through the 17th century. *General Studies: HU, H.*

HPS 323 History of Science. (3) S
Development and application of scientific thinking from the 18th century to the present. *General Studies HU H*

HPS 325 History of Chinese Science. (3) S
Explores development of traditional Chinese science in the context of Chinese thought and society and in comparison with developments elsewhere. Lecture, discussion. Cross listed as HIS 309.

HPS 330 History of Biology: Conflicts and Controversies. (3) A
Focuses on the 19th and 20th centuries, considering biology as a discipline, evolution and problems of heredity, development, and cell theory. Cross listed as BIO 316 *General Studies: H.*

HPS 331 History of Medicine. (3) A
Scientific study of the human body, changing theories of disease, evolution of practical opinions on treatment and the emerging institutionalization of medical practice. Students may receive credit for this course and BIO 218. Cross-listed as BIO 318 *General Studies: H.*

HPS 402 Technology, Society, and Human Values. (3) A
Values that motivate humankind to create technology. Areas of conflict and resolution of conflict between values and technology. Readings and discussions with visiting lecturers. Prerequisite: junior standing.

HPS 410 Professional Values in Science. (2 3) A
Considers issues related to values in science such as collaboration, finances, legal issues, mentoring, ownership of ideas, scientific integrity. Discussion, student projects. Cross listed as BIO 416. *General Studies. L2.*

PHILOSOPHY (PHI)

PHI 101 Introduction to Philosophy. (3) F S SS
Exploration of issues that philosophers have traditionally considered including morality, reality and knowledge. *General Studies: HU.*

PHI 103 Principles of Sound Reasoning. (3) F S, SS
Fallacies, validity, and soundness of arguments. May include syllogistic, elementary symbolic, inductive logic, and scientific method. Prerequisite: ENG 101 *General Studies: L1/HU.*

PHI 301 History of Ancient Philosophy. (3) F
History of western philosophy from its beginnings through the Hellenistic period *General Studies: HU, H*

PHI 302 History of Modern Philosophy. (3) S
History of western philosophy from the Renaissance through Kant. *General Studies HU H.*

PHI 304 Existentialism. (3) N
Covers such topics as absurdity, authenticity, the meaning of life and death, responsibility, and subjectivity. May include readings in phenomenology. *General Studies HU*

PHI 305 Ethical Theory. (3) A
Current theories about the nature of morality (metaethics) and about what is right and wrong (normative ethics). Prerequisite: PHI 306 or 307 or instructor approval. *General Studies HU*

PHI 306 Applied Ethics. (3) F, S, SS
Philosophical discussion of contemporary moral and political issues, such as abortion, euthanasia, animal rights, affirmative action and sexual rights. *General Studies: HU.*

PHI 307 Philosophy of Law. (3) A
Nature and source of law and its relation to morality. Legal rights, legal enforcement of morals, civil disobedience, liability and responsibility, punishment, judicial reasoning, justice, property and differences between theories of natural and positive law. *General Studies HU.*

PHI 308 Philosophy of Art. (3) A
Central problems in philosophy of art, e.g. the nature of a work of art, modern and traditional theories of art, aesthetic perception and experience, and objectivity and relativity in artistic. *General Studies: HU.*

PHI 309 Social and Political Philosophy. (3) A
Alternative principles and methods relevant to problems of human association and conflict; justice and power, freedom and equality and autonomy and order are discussed. Prerequisite: PH 305 or instructor approval. *General Studies: HU*

PHI 310 Environmental Ethics. (3) A
Examination of a full range of philosophical positions pertaining to our moral relationship to the natural world; anthropocentrism, individualism, biocentrism. *General Studies HU*

PHI 311 Philosophy in Literature. (3) A
Selected works of literature introduce philosophical problems such as the nature of moral goodness and people's relation to the world and other people. *General Studies HU*

PHI 312 Theory of Knowledge. (3) A
Nature, sources and limits of human knowledge. Topics may include truth, a priori knowledge, empirical knowledge, perception, induction, and skepticism. Prerequisite: 1 course from among PHI 101, 103, 301, 302, 333, 350. *General Studies. HU*

PHI 314 Philosophy of Science. (3) A
The structure and justification of scientific theories, explanation, and theory change. The roles of observation and laws, theoretical concepts and entities, reduction, probability, confirmation, space and time, and causation. *General Studies: HU*

PHI 315 Philosophy of Language. (3) A
Problems pertaining to the nature of language, including meaning, reference, truth, definition, analyticity, translatability, synonymy, and contributions of contemporary linguistics. Prerequisite: PHI 103 or 333 or 350. *General Studies. HU.*

PHI 316 Metaphysics. (3) A
Problems pertaining to the nature of reality. Topics may include nature of persons, minds, substance, universals, space, time, causation and modality. Prerequisite: 1 course from among PHI 101, 103, 301, 333, 350. *General Studies HU*

PHI 317 Philosophy of Mind. (3) A
Nature of consciousness. The common sense view of mind, behaviorism, materialism, dualism, functionalism, self knowledge and knowledge of other minds. Prerequisite: 1 course from among PHI 101, 103, 301, 302, 333, 350. *General Studies: HU.*

NOTE: For the General Studies requirement, codes (such as L1, N3, C and H), and courses, see pages 84–108. For graduation requirements see pages 79–83. For omnibus courses offered but not listed in this catalog, see pages 56–57.

PHI 318 Philosophy of Religion. (3) A
Class ca arguments for the ex stence of God The argument from ev l against the ex stence of God Justif cation of re gious be ef *Gen eral Studies HU*

PHI 319 Philosophy of Computing. (3) N
Ph losophica prob ems surround ng the theory of computat'on Eth cs and epistemology of comput ng, m nd and A neura network com puting tur ng mach nes Lecture ab, discus sion *General Stud es. N3/HU.*

PHI 325 Philosophy of Social Science. (3) N
Ph osophica prob ems surround ng the a'ms, structure and methods of the soc al sc ences. *General Studies HU SB.*

PHI 332 19th-Century Philosophy. (3 N
The h story of 19th century phi osoph ca thought emphas z ng either the German or the Brit sh trad tions Prerequ s te. PHI 302. *General Stud es· HU*

PHI 333 Introduction to Symbolic Logic. (3) A
Symbol c techn ques emphasizing deduct ons and proofs in the propos tional and f rst order pred cate ca cu r

PHI 335 History of Ethics. (3) A
Major works of moral ph osophy, both anc ent and modern such as those by Plato, Anstot e, Hobbes Hume Kant, and M Prerequ s te PH 101 or 306 or 307 or nstructor approva . *General Studies HU*

PHI 350 Philosophical Argument and Exposition. (3) S
The deve opment of techn ques of ph losoph ca argument and expos tion Frequent wr tten exerc ses Course content may vary w th n structor Prerequ s tes major; nstructor ap proval *General Stud es: L2*

PHI 401 Rationalism. (3) N
Examinat on of class ca ph losoph ca rat'o na sm, as n Descartes, Sp noza, Ma e branche or Leibn z Contemporary rationa st thought may a so be exam ned Prerequ s tes PH 302 1 course from among PH 305 309, 312 316, 317.

PHI 402 Empiricism. (3) N
Exam nat on of representat ves of e ther c ass s ca or contemporary ph osoph ca emp r c sm e.g Bacon, Hobbes Locke But er, Ber ke ey, Reid, Hume Mi Carnap and Ayer. Prerequ s tes PH 302 and 305 (or 309 or 312 or 316 or 317) *General Studies· HU*

PHI 403 Contemporary Analytic Philosophy. (3) A
A ms and methods of such 20th-century ph losophers as Frege Moore Russel Witt genste'n, Carnap Ayer W sdom Ry e, Aust n, Strawson Qu ne, and Sel ars w th appl cat on to metaphysics and ep stemology Prerequ sites PH 302 1 course from among PHI 312, 314 315 316 317, 401, 402 *Genera Studies. HU.*

PHI 413 Advanced Symbolic Logic. (3) N
Propert es of forma systems axiomat z ng proposit ona and 1st order pred cate og c May a so nc ude moda og c, number theory, and m ts of og c sm Prerequis te· PHI 333

PHI 420 Topics in Philosophy. (3) A
Course descnptions on f e n department. Top cs may be se ected from the fo lowing
(a) H story of Phi osophy
(b) Metaphysics/Ep stemo ogy
(c) Ph losophy of Language Log c
d) Ph osophy of Sc ence
(e Va ue Theory
Courses may be repeated for cred t. Prerequ s te one re evant upper-d v s on PHI course or nstructor approva

PHI 591 Seminar. (1 3) A
Top cs may be se ected from the fo low ng
a) Aesthet cs
(b) Ep stemo ogy
(c) Ethics
d) History of Ph osophy
(e) Log c
f) Metaphys cs
(g) Ph osophy of Language
(h) Ph osophy of Law
( ) Ph osophy of Sc ence
(j Soc a and Po it ca Ph osophy

Department of Physics and Astronomy

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REGENTS' PROFESSOR
SPENCE

PROFESSORS
BAUER, BENNETT, BURSTE N, COMFORT, COWLEY, DOAK, DOW, HANSON HESTENES, JACOB, KAUFMANN LINDSAY, NIGAM, PAGE, REZ, RITCHIE, SANKEY, SCHEINFEIN, SM TH STARRFIELD, TILLERY TSEN, TSONG, VENABLES VOSS WINDHORST, WYCKOFF

ASSOCIATE PROFESSORS
AANNESTAD ACHARYA, ALARCON, BENIN, CHAMBERLIN CULBERTSON, HERBOTS HESTER, MARZKE, MENENDEZ SCHMIDT

PHYSICS—B.S.

Students majoring in Physics may pursue one of two options.

Option I. Designed for students who wish to pursue physics at the bachelor or graduate degree levels, option I consists of the following required courses·

PHY	150	Physics I 4	
		or PHY 121 University Physics I Mechanics *S1/S2* 3)[1] and PHY 122 University Physics Laboratory I *S1/S2* (1)[1]	
PHY	151	Physics II *S1/S2* 4	
		or PHY 131 University Physics II. Electricity and Magnetism *S1/S2* (3)[2] and PHY 132 University Physics Laboratory II *S1/S2* (1)[2]	
PHY	201	Mathematical Methods in Physics I 3	
PHY	252	Physics III *S1/S2*..... 4	
PHY	302	Mathematical Methods in Physics II 2	
PHY	310	Classical Particles, Fields, and Matter I 3	
PHY	311	Classical Particles, Fields, and Matter II 3	
PHY	314	Quantum Physics I 3	
PHY	315	Quantum Physics II 3	
PHY	333	Electronic Circuits and Measurements 3	
PHY	334	Advanced Laboratory I.... 2	
PHY	412	Classical Particles, Fields, and Matter III.... 3	
PHY	416	Quantum Physics III 3	
PHY	441	Statistical and Thermal Physics I 3	
PHY	465	Advanced Laboratory II 2	
Total 45			

[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.

Supporting mathematics courses are as follows:

Choose between the two combinations of MAT courses below . . . . 12 or 10			
MAT	270	Calculus with Analytic Geometry I *N1* 4	
MAT	271	Calculus with Analytic Geometry II 4	
MAT	272	Calculus with Analytic Geometry III 4	
		or ——	
MAT	290	Calculus I *N1* 5	
MAT	291	Calculus II 5	

Additional courses in physics and related fields are selected with the approval of the advisor French, German, or Russian is strongly recommended to fulfill the foreign language requirement.

NOTE For the Genera Studies requ rement, codes (such as L1 N3 C and H and courses see pages 84 108. For graduation requ rements see pages 79–83 For omnibus courses offered but not 'sted n th s cata og see pages 56–57.

Option II. The interdisciplinary option II is designed for students who wish to obtain an undergraduate physics preparation for entry into other professions or graduate programs. A total of 53 hours are required, including the following courses:

Choose between the two combinations of MAT courses below.			12 or 10
MAT	270	Calculus with Analytic Geometry I *N1* (4)	
MAT	271	Calculus with Analytic Geometry II (4)	
MAT	272	Calculus with Analytic Geometry III 4)	
		or	
MAT	290	Calculus I *N1* (5)	
MAT	291	Calculus II (5)	
PHY	150	Physics I or PHY 121 University Physics I: Mechanics *S1/S2* (3)[1] and PHY 122 University Phys cs Laboratory I *S1/S2* (1)[1]	4
PHY	151	Physics II *S1/S2* or PHY 131 University Physics II Electricity and Magnetism Physics *S1/S2* 3)[2] and PHY 132 University Physics Laboratory II Physics *S1/S2* 1)[2]	4
PHY	201	Mathematical Methods in Physics I	3
PHY	252	Physics III *S1/S2*	4
PHY	302	Mathematical Methods in Physics II	2
PHY	310	Classical Particles, Fields, and Matter I	3
PHY	311	Classical Particles, Fields, and Matter II	3
PHY	314	Quantum Physics I	3
PHY	315	Quantum Physics II	3
PHY	333	Electronic Circuits and Measurements	3
PHY	334	Advanced Laboratory I	2
PHY	412	Classical Particles, Fields, and Matter III	3
PHY	441	Statistical and Thermal Physics I	3
Total			52 or 50

[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 are selected from physics and an area of concentration as approved by the student's advisor. Examples of possible areas of concentration are astronomy, astrophysics, materials science, physical chemistry, applied mathematics, geophysics, biological physics, philosophy of science, scientific journalism, and premedical and prelaw programs. French, German, or Russian is strongly recommended to fulfill the foreign language requirement.

Emphasis in Astronomy

The astronomy faculty offer courses in astronomy both for nonscience majors and for science and physics majors. For an emphasis in astronomy, the following courses (or their equivalents) should be taken:

AST	321	Introduction to Planetary and Stellar Astrophysics *S1/S2*[1]	3
AST	322	Introduction to Galactic and Extragalactic Astrophysics *S1/S2*[2]	3
AST	421	Astrophysics I	3
AST	422	Astrophysics II	3
AST	499	Independent Study	3
Total			15

[1] Both AST 113 and 321 must be taken to secure S1 or S2 credit

[2] Both AST 114 and 322 must be taken to secure S1 or S2 credit

MINOR IN ASTRONOMY

The minor in Astronomy consists of a minimum of 24 semester hours. Required courses are as follows.

AST	113	Astronomy Laboratory I *S1/S2*[1]	1
AST	114	Astronomy Laboratory II *S1/S2*[2]	1
AST	321	Introduction to Planetary and Stellar Astrophys cs *S1/S2*[2]	3
AST	322	Introduction to Galactic and Extragalactic Astrophysics *S1/S2*[2]	3
PHY	150	Physics I or PHY 121 University Physics I Mechanics *S1/S2* (3 [3] and PHY 122 University Physics Laboratory I *S1/S2* 1)[3]	4
PHY	151	Physics II *S1/S2* or PHY 131 University Physics II: Electricity and Magnetism *S1/S2* 3)[4] and PHY 132 University Physics Laboratory II *S1/S2* 1)[4]	4
PHY	252	Physics III *S1/S2*	4
Approved electives			4
Total			24

[1] Both AST 113 and 321 must be taken to secure S1 or S2 credit

[2] Both AST 114 and 322 must be taken to secure S1 or S2 credit.

[3] Both PHY 12 and 122 must be taken to secure S1 or S2 credit

[4] Both PHY 13 and 132 must be taken to secure S1 or S2 credit.

Electives are chosen with the approval of an astronomy advisor from upper division courses in physics and astronomy.

MINOR IN PHYSICS

The minor in Physics consists of a minimum of 29 semester hours. Required courses are as follows:

PHY	150	Physics I or PHY 121 University Physics I Mechanics *S1/S2* 3 [1] and PHY 122 University Physics Laboratory I *S1/S2* (1)[1]	4
PHY	151	Phys cs II *S1/S2* or PHY 131 University Phys cs II Electricity and Magnetism *S1/S2* 3)[2] and PHY 132 University Physics Laboratory II *S1/S2* (1)[2]	4
PHY	201	Mathematical Methods in Physics I	3
PHY	252	Phys cs III *S1/S2*	4
PHY	302	Mathematical Methods in Physics II	2
PHY	310	Classical Particles, Fields, and Matter I	3
PHY	311	Classical Particles, Fields, and Matter II	3
PHY	314	Quantum Physics I	3
Approved electives			4
Total			30

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

[2] Both PHY 13 and 132 must be taken to secure S1 or S2 credit

Electives are chosen with the approval of the physics advisor from upper division courses in physics and astronomy

SECONDARY EDUCATION—B.A.E.

Physics. Two options are available for physics as the major teaching field.

Option One. The major teaching field consists of 42 semester hours. Required courses are as follows:

PHY	150	Physics I[1]	4
		or PHY 121 University Physics I: Mechanics *S1/S2* (3)[2] and PHY 122 University Physics Laboratory I *S1/S2* 1)[2]	
PHY	151	Physics II *S1/S2*[1]	4
		or PHY 131 University Physics II· Electricity and Magnetism *S1/S2* (3[3] and PHY 132 University Physics Laboratory II *S1/S2* (1)[3]	
PHY	201	Mathematical Methods in Physics I	3
PHY	252	Physics III *S1/S2*[1]	4
PHY	302	Mathematical Methods in Physics II	2
PHY	310	Classical Particles, Fields, and Matter I	3
PHY	311	Classical Particles, Fields, and Matter II	3
PHY	333	Electronic Circuits and Measurements	3
PHY	361	Introductory Modern Physics	3
		or PHY 314 Quantum Physics I (3)	
PHY	480	Methods of Teaching Physics	3
		or PHY 484 Internship: Physics Teaching (3)	
Approved electives			10
Total			42

[1] PHY 111, 112, 113, and 114 or equivalents may be substituted for PHY 150, 151, and 252 on approval of the advisor.

[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.

Electives are chosen in physics or other closely related fields, subject to the approval of the advisor.

Option Two. The interdisciplinary 60 hour option two consists of 30 semester hours in physics and an additional 30 semester hours in either chemistry (see page 321) or mathematics (see page 362). The physics portion of this program requires the following courses:

PHY	150	Physics I[1]	4
		or PHY 121 University Physics I: Mechanics *S1/S2* (3)[2] and PHY 122 University Physics Laboratory I *S1/S2* (1)[2]	
PHY	151	Physics II *S1/S2*[1]	4
		or PHY 131 University Physics II: Electricity and Magnetism *S1/S2* 3)[3] and PHY 132 University Physics Laboratory II *S1/S2* (1)[3]	
PHY	201	Mathematical Methods in Physics I[4]	3
PHY	252	Physics III *S1/S2*[1]	4
PHY	302	Mathematical Methods in Physics II	2
PHY	310	Classical Particles, Fields, and Matter I	3
PHY	311	Classical Particles, Fields, and Matter II	3
PHY	333	Electronic Circuits and Measurements	3
PHY	361	Introductory Modern Physics	3
		or PHY 314 Quantum Physics I (3)	
PHY	480	Methods of Teaching Physics[5]	3
		or PHY 484 Internship: Physics Teaching (3	
Total			32

[1] PHY 111, 112, 113, and 114 or equivalents may be substituted for PHY 150, 151, and 252 on approval of the advisor

[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

[4] Physics/Math option: MAT 274 plus MAT 342 may be substituted for PHY 201

[5] Physics/Chemistry CHM 480 may be substituted for PHY 480

Minor Teaching Field. The minor teaching field consists of 24 semester hours Required courses are as follows:

PHY	150	Physics I	4
		or PHY 121 University Physics I. Mechanics *S1/S2* (3)[2] and PHY 122 University Physics Laboratory I *S1/S2* (1)[2]	
PHY	151	Physics II *S1/S2*[1]	4
		or PHY 131 University Physics II Electricity and Magnetism *S1/S2* (3[3] and PHY 132 University Physics Laboratory II *S1/S2* (1[3]	
PHY	201	Mathematical Methods in Physics I	3
PHY	252	Physics III *S1/S2*[1]	4
PHY	314	Quantum Physics I	3
		or PHY 361 Introductory Modern Physics (3)	
PHY	480	Methods of Teaching Physics	3
		or PHY 484 Internship Physics Teaching (3)	
Approved Elective			3
Total			24

[1] PHY 111, 112, 113, and 114 may be substituted for PHY 150, 151, and 252, or equivalents, on approval of the advisor

[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

The remaining hours are selected from upper division courses in physics or astronomy (including AST 113 and 114), subject to approval of the advisor.

GRADUATE PROGRAMS

The faculty in the Department of Physics and Astronomy offer programs leading to the degrees of Master of Natural Science, M.S , and Ph.D. Con sult the *Graduate Catalog* for require ments.

ASTRONOMY (AST)

AST 111 Introduction to Solar Systems Astronomy. (3) F
H story; propert es of ght, instruments; study of so ar system and nearby stars For non-sc ence majors. Opt onal lab (AST 113) *Gen era Stud es: S1/S2 (f credit a so earned in AST 113)*

AST 112 Introduction to Stars, Galaxies, and Cosmology. (3) S
Structure and evo ut on of stars star c usters, ga ax es cosmo ogy For nonscience majors Optional ab (AST 114) *General Studies· S1/S2 (f cred t also earned in AST 114)*

AST 113 Astronomy Laboratory I. (1) F
Astronom ca observations and experiments designed to he p the student become fam iar w th the sky, te escopes and astronom ca measurements 2 5 hours ab. Pre- or corequ s tes· AST 111 (or 321)· a work ng knowledge of h gh schoo algebra and geometry *General Studies· S1/S2 (if cred t also earned in AST 111 or 321).*

AST 114 Astronomy Laboratory II. (1) S
S m ar to AST 113 but mater al chosen to supplement AST 112 and 322 2.5 hours lab Pre- or corequ sites AST 112 (or 322) a work ng know edge of high school a gebra and geometry. *General Stud es S1 S2 (if cred t also earned n AST 112 or 322).*

AST 321 Introduction to Planetary and Stellar Astrophysics. (3) F
Physica aws; ce estial mechanics properties of p anets the sun, and other stars formation and evolut on of stars and planetary systems. Prerequ s tes· MAT 270 (or 290) PHY 150 *General Stud es· S1/S2 (if credit a so earned in AST 113)*

NOTE For the General Stud es requirement codes (such as L1, N3 C and H) and courses see pages 84–108 For graduation requ rements see pages 79–83 For omn bus courses offered but not sted in th s catalog see pages 56–57.

AST 322 Introduction to Galactic and Extragalactic Astrophysics. (3) S
Evo ved stars ntroduct on to re at v ty; ga ax ies and nterste ar matter structure and dynam'cs of ga ax es cosmo ogy Prerequ site AST 321 or nstructor approva . *General Studies: S1 S2 (if credit also earned n AST 114)*

AST 421 Astrophysics I. 3) F
Aspects of observat ona astronomy, atom c propert es of matter; ste ar atmospheres ste ar structure, evolut on, nuc eosynthesis com pact objects· c ose b nary systems. Prerequ s tes AST 321; PHY 311, 314

AST 422 Astrophysics II. (3) S
nterstel ar med um gaseous nebu ae shock waves; ste ar dynam cs star c usters and ste ar popu at ons ga ax es and their evo u t on cosmo ogy. Prerequ s tes AST 321 PHY 412.

PHYSICAL SCIENCES (PHS)

PHS 110 Fundamentals of Physical Sci ence. (4) F S
One semester survey of the princ p es of phys cs and chem stry Understand ng of e ementary algebra s presumed 3 hours ec ture, 2 hours ab. *General Stud es. S1/S2.*

PHS 208 Patterns in Nature. (4) F S
Project or ented sc ence course w th computer tra n ng to deve op cr t ca th nk ng, and techn ca sk l s for student or ented sc ence essons K–12. Lecture, lab. Cross sted as STE 208 Prerequ s te co ege evel science course or nstructor approva . *Genera Stud es S1 S2*

PHYSICS (PHY)

PHY 101 Introduction to Physics. 4 F, S
Emphasizes app cat ons of phys cs to l fe n the modern world Understand ng of e ementary a gebra s presumed 3 hours ecture 1 rec tat on, 2 hours lab *General Stud es. S1 S2.*

PHY 105 Basic Physics. 3) F
One semester survey of the princ ples of phys'cs. Primari y for students who ntend to take PHY 121 131 but have not taken h gh schoo physics 3 hours lecture, 1 rec tat on Prerequ s tes a gebra and tr gonometry

PHY 111 General Physics. 3) F, S SS
Nonca cu us treatment of the princ ples of phys cs for nonphys cs majors Students whose curr cu a require a aboratory course must a so reg ster for PHY 113 3 hours ecture, 1 recitat on Prerequis'te. trigonometry *General Stud es S1 S2 (f cred't a so earned in PHY 113)*

PHY 112 General Physics. 3 F S, SS
Cont nuat on of PHY 111 Students whose curricula requ re a laboratory course must a so reg ster for PHY 114 Prerequ s te PHY 111 *General Stud es S1 S2 (if cred t also earned in PHY 114)*

PHY 113 General Physics Laboratory. (1 F S SS
Elementary exper ments n phys cs 2 hours lab Outside preparation for experiments and report writ ng are requ red May be taken concurrent y w th or subsequent to PHY 111 *Genera Stud es· S1 S2 (if credit also earned in PHY 111).*

PHY 114 General Physics Laboratory. (1) F, S SS
See PHY 113 May be taken concurrent y w'th, or subsequent to, PHY 112 *General Stud es· S1 S2 (if cred t also earned n PHY 112).*

PHY 121 University Physics I: Mechanics. 3 F, S SS
Kinemat cs, Newton s aws work energy, momentum, conservat on aws, dynam cs of part c es sol ds, and f u ds. 3 hours ecture, 1 hour recitat on Prerequisite: MAT 270 or 290 or nstructor approva . *General Stud es: S1 S2 (if credit also earned in PHY 122)*

PHY 122 University Physics Laboratory I. (1) F S, SS
Lab accompany ng PHY 121. Pre or corequ' s te PHY 121 *General Studies· S1/S2 (if cred t also earned n PHY 121)*

PHY 131 University Physics II: Electricity and Magnetism. (3) F, S SS
Electr c charge and current e ectr c and magnetic fields n vacuum and n materials, and nduct on AC circu ts d sp acement current, and electromagnet c waves 3 hours ecture 1 hour rec tat on. Prerequis tes MAT 271 (or 291 or instructor approval); PHY 121 Coreq u s te MAT 272 or nstructor approva *Gen era Studies. S1 S2 (if credit a so earned n PHY 132)*

PHY 132 University Physics Laboratory II. (1) S, SS
Lab accompanying PHY 131. Pre or coreq u s te PHY 131 *General Stud es· S1/S2 (if cred t also earned n PHY 131).*

PHY 150 Physics I. 4) S
ntroductory phys cs for majors Kinemat cs, Newton s Laws basic forces energy, momentum, spec a re at v ty 3 hours lecture, 3 hours ab Prerequis te: MAT 270 or 290 or equiva lent

PHY 151 Physics II. 4) F
Cont nuat on of PHY 150. E ectromagnetic f e ds; Ampere s and Faraday s Laws; Maxwe s equat ons, basic c rcu t e ements. 3 hours ecture 3 hours lab Prerequ s tes MAT 271 (or 291 or equ va ent); PHY 121, 122 (or PHY 150) *General Studies: S1 S2*

PHY 190 Seminar: Physics as a Curriculum and a Profession. (1) F, S
Sem nar for new Phys'cs majors nstruct on and nformat on on curr culum, departmenta functions, and profess ona preparat on. Week y meet ngs and excurs ons Pass/fa grad ng

PHY 201 Mathematical Methods in Physics I. (3 S
Different a equat ons near equat'ons, vec tors, matr ces Fourier series and numerical methods. 2 hours lecture 2 hours lab Prerequisite: MAT 272 or equ va ent Corequ s te PHY 252.

PHY 241 University Physics III. (3) F, S
Thermodynam'cs, k net c theory, phys ca and wave opt cs re at v ty, photons matter waves, atom c phys cs 3 hours ecture 1 hour rec ta t on Prerequ sites PHY 131; nonmajor.

PHY 252 Physics III. (4) S
Cont nuation of PHY 151 Wave phys cs, osc lat ons, harmon c systems, phys cal opt cs thermodynam cs, k net c theory. 3 hours ec ture, 3 hours ab Prerequ sites MAT 272 (or equ va ent PHY 131 and 132 (or PHY 151 or equ va ent . Corequ s te· PHY 201 *General Stud es· S1 S2*

PHY 302 Mathematical Methods in Physics II. (2) F
Cont nuation of PHY 201 Vector ca cu us comp ex var ab es, partial d fferent a equa t'ons, spec al functions numer ca methods 1 hour lecture, 3 hours ab. Prerequ s te. PHY 201 or equ va ent.

PHY 310 Classical Particles, Fie ds, and Matter I. (3) F
Part c e kinemat cs mechan cs conservat on aws particle mot on n force f e ds dynam cs of two-body systems, reference frames r g d body motion re at v ty Corequisites PHY 302 and 314 *or* nstructor approva

PHY 311 Classical Particles, Fields, and Matter II. (3) S 1999
Electrostat c and grav tat ona f e ds Po sson and Lap ace equat ons dielectr c mater a s magnet c fie ds and mater a s, magnet c nduct on, Faraday's Law Prerequ s tes: PHY 302 310 Corequ s te· PHY 315 or nstructor ap proval

PHY 314 Quantum Physics I. (3) F 1998
Photons mode s of the atom, wave propert es of matter, ntroduction to wave mechan cs 1 d mens ona systems n quantum mechan cs Prerequisites: PHY 201 and 252 *or* equ va ents Corequ s tes PHY 302 and 310 *or* n structor approva

PHY 315 Quantum Physics II. (3) S
Genera princ ples of quantum mechan cs 3 d mens ona prob ems, approx mat on meth ods, sp n ntroduct on to many part c e sys tems Prerequ s tes PHY 302, 310 314 Co requis te PHY 311 or nstructor approva .

PHY 333 Electronic Circuits and Measurements. 3 F, S
Bas c pr nc p es of e ectron c c rcu t ana ys s and measurement techn ques us ng modern nstrumentat on and computer a ded ana ys s of data 1 hour ecture 3 hours lab Equ va ent effort outs de of the ab s requ red Coreq u s te PHY 201 or instructor approva

PHY 334 Advanced Laboratory I. (2) S
Se ected exper ments from contemporary phys'cs. Emphasis on modern instrumenta tion computer assisted acqu s t on and analy- s s of data and report form wr t ng Lecture lab Prerequisites PHY 310 314, 333.

PHY 361 Introductory Modern Physics. 3 F S
Spec a re at v ty and ntroductory quantum theory w th app cat ons drawn from atom c nuc ear and so d state phys cs 3 hours ec ture 1 rec tation Prerequis te: PHY 131.

PHY 412 Classical Particles, Fields, and Matter III. 3) F
E ectromagnet c f e ds of mov ng charges, Maxwe s equat ons harmon c phenomena osc'lations waves e ectromagnet c rad at on covar ant electromagnet sm ntroduct on to genera re ativ ty. Prerequ s tes PHY 311, 333 Corequis te: PHY 416 or nstructor approva .

PHY 416 Quantum Physics III. 3 F
ntroduct on to the quantum theory of at ms, molecu es so ds and nuc e , D rac s equation Prerequ s tes PHY 311, 315 Corequ s te PHY 412 or nstructor approva

PHY 420 Research Paper. (1 F S
Scient f c report wr t ng. Culm nates n a paper based on brary or laboratory research or both Taken n conjunct on w th other courses as approved Conference Prerequ s te n structor approva . *General Stud es L2*

PHY 441 Statistical and Thermal Physics I. 3 F
Stat st ca and exper menta bas s of heat temperatu e, and entropy Mechan ca and stat st a bas s of the aws of thermodynam cs App cat ons of acrosc p c therm dy nam cs Phase equ rum Pre equ s tes PHY 311 315

PHY 442 Statistical and Thermal Physics II. 3 S
Pr nc p es and app cat n of tat st ca me chan cs Quantum stat st cs of dea gases and s mp e so ds Equ br um f phases and chem ca spec es T a sp rt theory rrevers b e processes and f uctuat on P erequ s te PHY 441

PHY 452 Physical Opt cs. 3 F
Pr nc p es of ref ect on ref act on d ff act on Add t ona top cs from contemporary opt cs may nc ude Four er transform spectrosc py, near systems theory ho graphy 2 hours ecture 2 hour ab Prerequ s tes PHY 302 311 315 Corequ s te PHY 412

PHY 462 Nuc ear and Part'cle Physics. 3 S
Stat c propert es of nuc e natura and nduced rad oact v ty nuc ear react ons nuc ea m d e s and energy eve s mesons a d hyperons and nteract on of photon and e ectrons w th matte Prerequ s tes PHY 311 315

PHY 465 Advanced Laboratory I 2 F, S
Cont nuat n of PHY 334 Students are en couraged to subst tute aboratory research pro ect n consu tat on w th facu ty ponsor Prerequ s te PHY 334

PHY 466 Advanced Laboratory III. 1 3 F S
Cont nuat on of PHY 465. Prerequ s te PHY 465

PHY 480 Methods of Teach ng Physics. 3 S
Eva uat on of var ous appr aches to the teach ng of h gh choo phys cs Preparat on of demonstrat ons and exper ments Organ za- t on of a ab atory De gned for secondary scho phys cs tea hers Pre equ te nstruc t r approva

PHY 481 Sol d-State Physics. 3 S
Str cture e ast c propert es and dynam cs of crysta s e ectron mot ons n crysta s unde ap p ed f e ds Prerequ s tes PHY 311 315

PHY 484 Internship: Physics Teaching. 1 4 F, S SS
Preparat on for gh schoo phys cs teach ng Student works c ose y w th a facu ty member n the e ementary phys cs program May be repeated for a tota of 6 semester h urs Pre- requ s te nstructor approva

PHY 495 Project Research. 1 3 F S
Superv sed pro e t n phys cs or astrophys cs May be repeated for c ed t Pre equ s te n str ctor approva

PHY 501 Methods of Theoretical Physics. 3 F S
Prov des mathemat ca foundat ons for gradu ate students n bas c and app ed phys cs Comp ex var ab es, vector spaces, operators matr ces ord nary d fferent a eq at ons nte gra equat ons and transf rms and spec a funct ons May nc ude add t o a top cs

PHY 502 Methods of Theoretical Physics. (3 F S
Cont nuat on of PHY 501 Prerequ s te PHY 501

PHY 521 Classical Mechanics. 3 F
Var at ona pr nc p es Lagrange's and Ham ton s equat ons r g d body mot on ca non ca transf rmat ns Ham ton-Jacob theory

PHY 523 Relativity. 3 N
Spec a and genera theor es of re ativ ty Pre requ s te PHY 532 or nstruct r app ova

PHY 531 Advanced Electricity and Magne- tism. 3) F
E ectrostat cs and magnetostat cs· potent a theory and theory of const tut ve re at ons; Maxwe s equat ons the wave equat on, p ane e e tromag et c waves cav t es and wave gu des

PHY 532 Electrodynamics. 3 S
Spe a theory f re at v ty, covar ant formu a tion of e ectromagnet c nteract ons nhomo gene us wave equat ons enard W echert p tent a s and rad at on f e ds nteract ons of charged part c es and e ectr magnet c waves scatter ng d spers on Prerequ s tes PHY 412 and 531 *or* nstructor approval

PHY 541 Statistical Physics. 3 F
Pr bab ty theory and pr c p es of stat st ca ference eva uat g exper menta data, foun dat ons of stat st ca mechan cs genera aws f thermodynam cs from m croscop c theor es; ca cu at on of spec f c propert es of bu k mat te

PHY 551 X-ray and Electron Diffraction. 3 S
F es e and Fraunhofe d ffract n n ntegra formu at on d ffract on of X rays and neutrons by crysta att ces structures of so ds nc ud ng crysta structure ana ys s theory and tech n ques f e ectron m croscopy d ffract on of crysta ne noncrysta ne spec mens Prereq u s te PHY 481 or nstructor approval

PHY 561 Nuclear Phys cs. 3 F S
Two nuc eon nteract on C ebsch G rdon co eff e ts nternuc eon forces meson theory a d h gh e e gy scatter g nuc ear b nd ng energy nuc ear mode s trans t on probab ty est mates nuc ear react ons and beta decay Prerequ s te PHY 576 or nstructor approva

PHY 562 Nuclear Phys cs. (3 F S
Cont nuat on of PHY 561 Prerequ s te PHY 561 or nstructor approva

PHY 568 Elementary Particle Physics. 3 N
C ass f cat on of part c e , phenomeno ogy of strong, e ectromagnet c a d weak terac- t o s cross se t o s and decay rates soto p c sp n and h gher symmetr es structure of react o ampl tudes Prerequ s te PHY 577

PHY 569 Elementary Particle Theory. 3 N
Cont nuat on of PHY 568 Prerequ s te PHY 568

PHY 576 Quantum Theory. 3 F S
Abstract approach to quantum mechan cs in H bert space observab es and their corre spond ng operators e genstates and e gen va ue quantum dynam cs approx mat on methods systems of dent ca part c es angu- ar momentum and group representat on theory co s on processes re at v st c quan tum theory Prerequ s te PHY 521

PHY 577 Quantum Theory. 3 F S
Cont uat on of PHY 576 Prerequ site. PHY 576

PHY 578 Relativistic Quantum Theory. (3) F S
Relat v st c 1 part c e equat ons K e n Gordon equation D rac equat on 2d quant zat on theory of scatter ng S matr x Feynman dia grams quantum electrodynam cs, and renorma zat on procedures Prerequisite: PHY 577

PHY 579 Relativistic Quantum Theory. (3) F S
Cont nuat on of PHY 578 Prerequ s te PHY 578

PHY 581 Sol d-State Physics. 3) F
Quantum theory of so ds nc ud ng phonons att ce spec f c heats, band structure mode s, Ferm surfaces therma expans on, p asmons, e ectron phonon nteract ons and scatter ng by att ce defects Pre or corequ s te PHY 576

PHY 582 Solid-State Physics. 3) S
E ements of transport theory thermal conduc t on e ectro ic conduct on n meta s, mobi ty n sem conductors Hal effect, magnetores s tance and se ected top cs of current research Prerequ s te PHY 581

PHY 587 Quantum Optics. 3) F S
Quant zat on of the electromagnet c f e d. Quantum theory of coherence photon count- ng, photon states lasers density operators and atom c Raman scatter ng. Prerequ s te PHY 576

PHY 588 Quantum Optics. 3) F S
Cont nuat on of PHY 587 Prerequ s te PHY 587

Department of Plant Biology

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PROFESSORS
BACKHAUS KLOPATEK, NASH, PINKAVA SOMMERFELD, TRELEASE VERMAAS

ASSOCIATE PROFESSORS
CLARK FRASCH MART N, PIGG, ROBERSON, STROMBERG STUTZ SZAREK, TOWILL, WEBBER

ASSISTANT PROFESSORS
DAY, POGSON

ACADEMIC PROFESSIONALS
BINGHAM, LANDRUM LOBRUTTO, SHARP

PLANT BIOLOGY—B.S.

The Department of Plant Biology prov ides four curricular options to meet the needs of students whose interests are in rapidly expanding areas within the life sciences Students may choose

the general program option which al lows the opportunity to develop strength in one area or discipline. Oth ers may choose to design a broader, but interdisciplinary program in one of the following three optional concentra tions: environmental science and ecol ogy, molecular biosciences/biotechnol ogy, and urban horticulture.

Each concentration promotes interac tion between diverse groups and cap tures the growing interdisciplinary na ture of scientific investigations. When one of these options is chosen, the title will appear on transcripts and other uni versity documents.

The four curricular options prepare students for careers in technical, indus trial, and educational fields as well as professional degree programs in medi cine or research and postgraduate edu cation in the life sciences.

General Program

The B.S. degree in Plant Biology consists of 54 semester hours The required major courses are as follows:

BIO	181	General Biology *S1/S2*	4
BIO	182	General Biology *S2*	4
BIO	320	Fundamentals of Ecology or PLB 350 Applied Genetics (4	3
BIO	353	Cell Biology	3
PLB	306	Plant Anatomy	4
PLB	308	Plant Physiology	4
PLB	484	Internship or PLB 499 Independent Study 3)	3
Total			25

Additional biological or physical science elective courses, totaling 11 to 16 semester hours, are also required.

Required supplemental courses in chemistry are as follows:

CHM	113	General Chemistry *S1/S2*	4
CHM	115	General Chemistry with Qualitative Analysis *S1/S2*	5
Choose between the two 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, 332	General Organic Chemistry 6)	
CHM	335, 336	General Organic Chemistry Laboratory (2)	
Total			13 or 17

* Both CHM 231 and 235 must be taken to secure S1 or S2 credit.

Courses meeting the university numeracy requirement are as follows.

MAT	210	Brief Calculus *N1*	3
Choose one of the three courses below			
BIO	415	Biometry *N2*	4
PLB	430	Statistical Analyses in Environmental Science	3
PLB	432	Computer Applications in Biology *N3*	3

Special Concentration Programs

Three special concentration programs are optional. Students who wish to pursue the general program in Plant Biology are not obligated to choose one of these specific programs. Each special concentration program is expected to be interdisciplinary and contain course work outside both the department and the College of Liberal Arts and Sciences. Each concentration includes hands on technical training.

Environmental Science and Ecology. The B.S. degree in Plant Biology concentrating in environmental science and ecology consists of 60 semester hours The required major courses are as follows:

BIO	320	Fundamentals of Ecology	3
Choose between the two combinations of Geology courses below			4
GLG	101	Introduction to Geology I *S1/S2* (3)[1]	
GLG	103	Introduction to Geology Laboratory *S1/S2* (1 [1]	
		or	
GLG	110	Environmental Geology *S2* 3)[2]	
GLG	111	Environmental Geology Laboratory *S2* (1 [2]	
GLG	362	Geomorphology	3
		or GLG 470 Hydrogeology (3	
PLB	310	The Flora of Arizona	4
PLB	322	Environmental Science Major	3
PLB	420	Plant Ecology Organisms and Populations	3
		or PLB 421 Plant Ecology Communities and Ecosystems (3)	
PLB	484	Internship	3
		or PLB 499 Independent Study (3)	
Total			23

[1] Both GLG 101 and 103 must be taken to secure S1 or S2 credit.

[2] Both GLG 110 and 111 must be taken to secure S2 credit

Additional biological or physical science elective courses, totaling 16 hours, are also required

Required supplemental courses in biology and chemistry are as follows:

BIO	181	General Biology *S1/S2*	4
BIO	182	General Biology *S2*	4
CHM	113	General Chemistry *S1/S2*	4
CHM	115	General Chemistry with Qualitative Analysis *S1/S2*	5
CHM	231	Elementary Organic Chemistry *S1/S2**	3
CHM	235	Elementary Organic Chemistry Laboratory *S1/S2**	1
Total			21

* Both CHM 231 and 235 must be taken to secure S1 or S2 credit

Courses meeting the university numeracy requirement are as follows:

MAT	210	Brief Calculus *N1*	3
Choose one of the two courses below			3
PLB	430	Statistical Analyses in Environmental Science (3)	
PLB	432	Computer Applications in Biology *N3* (3)	

Molecular Biosciences/Biotechnology. The B.S. degree in Plant Biology concentrating in molecular biosciences/ biotechnology consists of 60 semester hours The required major courses are as follows:

BIO	353	Cell Biology	3
PLB	340	Plant Cell Physiology	4
PLB	350	Applied Genetics	4
PLB	444	Plant Growth and Development	3
PLB	484	Internship	3
		or PLB 499 Independent Study (3)	
Total			17

Additional biological or physical science elective courses, totaling 11 14 hours, are also required.

NOTE For the General Studies requirement codes (such as L1, N3 C and H) and courses see pages 84–108. For graduation requirements see pages 79–83 For omnibus courses offered but not listed in this catalog see pages 56–57

Required supplemental courses in biology, chemistry, and physics are as follows:

BIO	181	General Biology *S1/S2*	4
BIO	182	General Biology *S2*	4
CHM	113	General Chemistry *S1/S2*	4
CHM	115	General Chemistry with Qualitative Analysis *S1/S2*	5
CHM	231	Elementary Organic Chemistry *S1/S2*	3
CHM	235	Elementary Organic Chemistry Laboratory *S1/S2*[1]	1
Choose between any two combinations of courses below			4 or 8
CHM	361	Principles of Biochemistry (3	
CHM	367	Elementary Biochemistry Laboratory 1	
		or	
CHM	461	General Biochemistry (3	
CHM	462	General Biochemistry (3	
CHM	467	General Biochemistry Laboratory *L2* (2	[2]
PHY	121	University Physics I. Mechanics	3
PHY	122	University Physics Laboratory I	1
Total			29 or 33

[1] Both CHM 231 and 235 must be taken to secure S1 or S2 credit.

[2] Both CHM 464 and 467 must be taken to secure L2 credit.

Courses meeting the university numeracy requirement are as follows:

MAT	210	Brief Calculus for Life Sciences *N1*	3
Choose one of the two courses below			3–4
BIO	406	Computer Applications in Biology *N3* (3)	
BIO	415	Biometry *N2* (4)	

Urban Horticulture. The B S degree in Plant Biology concentrating in urban horticulture consists of 54 semester hours. The required major courses are as follows:

PLB	260	Plants in Cities: Introduction to Urban Horticulture *S2*	4
PLB	362	Landscape Plants I	3
PLB	364	Urban Forestry	3
PLB	370	Landscape Practices	3
PLB	414	Plant Pathology *L2*	3
PLB	484	Internship	3
PLB	498	Special Topics in Urban Horticulture	1
Choose one of the three courses below			3–4
BIO	320	Fundamentals of Ecology (3	
PLB	306	Plant Anatomy 4	
PLB	308	Plant Physiology 4	
Choose one of the three courses below			3
PLB	366	Interorscape 3	
PLB	372	Turf Management 3)	
PLB	472	Greenhouse/Nursery Management 3)	
Total			26–27

Additional elective courses from other disciplines, totaling seven to eight hours, are also required.

Required supplemental courses in biology, chemistry, and soils are as follows:

BIO	181	General Biology *S1/S2*	4
BIO	182	General Biology *S2*	4
CHM	101	Introductory Chemistry	4
CHM	231	Elementary Organic Chemistry *S1 S2**	3
CHM	235	Elementary Organic Chemistry Laboratory *S1 S2**	1
Choose between the two combinations of courses below			4
ERS	130	Soils and Environmental Quality 4	
		or	
ERS	225	Soils 3	
ERS	226	Soils Laboratory 1	
Total			2

* Both CHM 231 and 235 must be taken to secure S1 or S2 credit

Courses meeting the university numeracy requirement are as follows.

MAT	210	Brief Calculus *N1*	3
Choose one of the three courses below			3–4
BIO	415	Biometry *N2* 4	
PLB	430	Statistical Analyses in Environmental Science (3	
PLB	432	Computer Applications in Biology *N3* (3	

PLANT BIOLOGY MINOR

The minor consists of a minimum of 24 semester hours Required courses are as follows.

BIO	181	General Biology *S1/S2*	4
BIO	182	General Biology *S1/S2*	4
Choose one of the three courses below			4
PLB	306	Plant Anatomy 4	
PLB	308	Plant Physiology 4	
PLB	310	Flora of Arizona 4	

The remaining 12 hours are selected by the student through consultation with an academic advisor. Eight of these 12 hours must be in upper-division courses in the life sciences or other advisor approved areas.

The minor can be designed after one of the four curricular options offered by the department. Courses not available for credit for majors in the life sciences cannot be used for the minor. Courses in the minor may not be used to count toward a major in the life sciences

GRADUATE PROGRAMS

The faculty in the Department of Plant Biology offer programs leading to the degrees of M S. and Ph.D. The faculty also participate in programs leading to the Master of Natural Science degree when one of the concentrations is plant biology Select faculty collaborate with the faculty in the Departments of Biology, Chemistry and Biochemistry, and Microbiology in offering programs leading to the M.S and Ph.D. degrees in Molecular and Cellular Biology. Other select faculty collaborate in the interdisciplinary concentration in ecology.

PLANT BIOLOGY (PLB)

PLB 108 Concepts in Plant Biology. (4 F, S, SS
Introduction to concepts of plant biology that are of human relevance using commercially important edible, and medicinal plants as examples Not for majors in the biological sciences. 3 hours lecture 3 hours lab. *General Studies S1 S2*

PLB 300 Comparative Plant Diversity. 4) F
Survey of major plant groups and other photosynthetic organisms Emphasis on comparative data analysis evolutionary inference and phylogenetic methods 3 hours lecture, 3 hours lab Prerequisite BIO 182 or equivalent *General Studies L2/S2*

PLB 302 Plants and Civilization. (3) F
Plants and plant products used by people throughout the world. Cultivation processing and uses in modern life (beverages fibers foods medicinals, and perfumes) Prerequisite: BIO 182 or PLB 108 or equivalent

PLB 304 Biology of Algae and Fungi. 3 S
Ecology, economics and evolutionary diversity of the algae and fungi Traditional and modern biotechnological uses. 2 hours lecture 3 hours lab Prerequisite BIO 182 or equivalent

NOTE For the General Studies requirement, codes such as L1 N3 C and H) and courses see pages 84 108 For graduation requirements see pages 79–83 For omnibus courses offered but not listed in this catalog see pages 56 57

PLB 306 Plant Anatomy. (4) F
Deve opment and mature structure of t ssues of vascu ar p ants patterns and mod f cat ons of the eaf, stem root and the flower. 3 hours lecture, 3 hours ab. Prerequis te. BIO 182 or equiva ent

PLB 308 Plant Physiology. 4) S 2000
Concepts of plant funct on: carbon metabo sm, energy acqu s t on regu at'on of growth and development, stress responses, and wa ter and nutr ent uptake. Prerequ s'tes: BIO 182 (or equ va ent CHM 101 (or 115 or 231).

PLB 310 The Flora of Arizona. 4) S
Pr nc p es of taxonomy, dent f cat'on of Ar zona plants 2 hours ecture 6 hours ab Pre requ s te B O 182 or equ valent or nstructor approval

PLB 400 Lichenology. (3) S 1999
Chem stry eco ogy physio ogy, and tax onomy of ichens. 2 hours ecture 3 h urs ab. Prerequ s te B O 182 or equ valent

PLB 402 Mycology. 3) S
Funga morpho ogy and systemat cs w th an introduct on to funga cel b o ogy eco ogy econom c s gn f cance, and growth and deve opment 2 hours ecture, 3 hours tab Prereq u s te B O 182 or M C 206 or equ va ent.

PLB 404 Phycology. (4) S
The a gae (both fresh water and marine forms) emphasiz ng fie d co ection and dent ficat on of oca representat ves. Morpho og ca , eco ogica and eco om c aspects of the a gae 3 hours ecture 3 hours ab Prereq- u s te B O 182 or nstructor approva

PLB 406 Vascular Plant Structure. 4 S 2000
Comparat ve form and evolut onary trends n the major groups of vascu ar p ants 3 hours ecture, 3 hours lab P erequ s te PLB 300 or equ va ent

PLB 407 Plant Fossils and Evolution. 4) S 1999
A broad survey of p ant fe of the past, nclud ing the structure of p ant foss s the r geo og c ranges geograph c d stnbut on, and paleo env ronment 3 hours ecture 3 hours ab or f e d trip Prerequ s te B O 182 or equivalent

PLB 408 Pollen and Spores. (3) N
Sign f cance of foss l and extant pol en, spores and other pa ynomorphs to eco ogy evolut on strat graphy, and systemat cs 2 hours ecture, 1 hour lab Prerequ s te nstruc tor approva

PLB 410 Angiosperm Taxonomy. 3) S 2000
Princ ples under y ng ang osperm phy ogeny 2 hours lecture 3 hours ab Prerequis te. PLB 370 or nstructor approval.

PLB 411 Taxonomy of Southwestern Vascular Plants. (4) SS
Ident f cat on of the vascu ar p ants of the Southwest and the pr nc p es under y ng the r c ass f cat on 3 hours lecture, 6 hours ab 2 f e d trips Not open to students who have had PLB 310.

PLB 412 Cytogenetics. (3) F 1999
Chromosoma basis of nher tance. Cred t s a lowed on y for B O 441 or PLB 412. Cross l sted as B O 441 Prerequ s te B O 340

PLB 413 Cytogenetics Laboratory. 2) F 1999
Microscop c ana ys s of me'os s m tos s, and aberrant ce d v s on 6 hours ab Cred t is a owed on y for BIO 442 or PLB 413 Cross- isted as BIO 442 Pre or corequ s te B O 441 or PLB 412

PLB 414 Plant Pathology. 3 F
dentif cation and contro of b ot c and ab otic factors that cause common d sease prob ems to p ants. Prerequ s te PLB 360 *General Studies L2*

ENVIRONMENTAL SCIENCE AND ECOLOGY

PLB 320 Environmental Science (Nonmajor). (3) F
Env'ronmenta and bio ogical concepts used to understand ecolog cal systems with specif c references to prob ems caused by humans. Cannot be used for major cred t n the b o og ca sc ences Cred t s a lowed only for B O 319 or PLB 320. Cross 'sted as BIO 319 *General Studies· G.*

PLB 322 Environmental Science (Major). (3) F
The nature of env ronmental and b o og ca n- teract on: histor ca and modern examp es F e d and lab ratory tech iques for quantif ca tion support ng pr nc p es 2 hours ecture 3 hours ab Prerequ s tes B O 182 *or* GLG 101 and 103 *or* GLG 110 and 111

PLB 420 Plant Ecology: Organisms and Populations. (3) S 1999
Factors and contro s on the physio ogical ecol ogy and organization of plants and p ant popu- ations us ng emp r ca and theoretical ap proaches. 2 hours e ture 2 hours ab Pre- requ s te BIO 320 or PLB 322 or equ va ent

PLB 421 Plant Ecology: Communities and Ecosystems. (3) S 2000
Plant commun ty organ zat on f eld samp ng techn ques and the structure and funct on of terrestr a ecosystems emphas z ng the ro e of vegetat on. 2 hours lecture, 3 hours ab. Pre requ site: B O 320 or PLB 322 or equ va ent.

PLB 422 Plant Geography. (3 N
P ant commun t es of the world and the r nter- pretat on, emphas z ng North Amer can p ant assoc ations Cross l sted as GPH 425 Pre requ s te. B O 182 or GPH 111

PLB 430 Statistical Analyses in Environmental Science. (3) S 2000
ANOVAS, 1 way c ass f cat on of factoria and part a y h erarch c designs ntroductory mult var ate stat st cs 1 3 hour ecture at n ght. Prerequ s te MAT 210 or equ va ent

PLB 432 Computer Applications in Biology. (3) F
Computer ana ys s techn ques n b o ogy em phas z ng data entry, management and ana y s s and graph c portraya Emp oys mainframe and m crocomputers Cred t 's a owed on y for B O 406 or PLB 432. Cross isted as BIO 406 Prerequ s tes BIO 182 and MAT 117 or 210) *or* nstructor approva *General Stud es: N3.*

PLB 434 Ecological and Landscape Modeling. 3) S 2000
Techniques of mode ng eco og ca processes and systems using matr x and dynam c mod- e s w th computer s mulat ons Prerequ s te B O 420 or PLB 432 or equiva ent

PLB 520 Plant Structural Adaptation. 2 3 F 1998
Adapt ve tra ts of eaf s ze unique growth form on energy transfer efficiency; stomata arch tecture and water use eff c ency app cat ons of stable sotopes. Prerequ s te· B O 320 or PLB 306 (or 308 or equ va ent

PLB 522 Plant Photosynthetic Adaptation. 3 F 1999
Evo ut on and ecology of C_4 and CAM adap t ve tra ts mprov ng competit ve ab ity n natu- ra env ronments comparat ve phys ology of desert p ants Prerequ s te PLB 308 or n structor approva

PLB 524 Methods in Env'ronmental Plant Physiology. (3) S 1999
Techniques to measure and quant fy m'croc r mate and mass transfer Supporting pr n c p es 2 hours ecture 3 hours lab. Prereq- u s te B O 320 or PLB 308

MOLECULAR BIOSCIENCES/ BIOTECHNOLOGY

PLB 340 Plant Cell Physiology. (4) S 1999
Survey of structura and b'ochem cal aspects of p ant cel function and the relat onsh ps of ce l funct'on to who e plant processes 3 hours ecture, 3 hours ab Prerequ s tes BIO 182 (or equ va ent), CHM 101 (or 115 or 231)

PLB 350 Applied Genetics. (4) F, S
ntroduct on to mo ecu ar genetics with em phasis on appi cat on of genet cs 'n so v ng b o og ca questions and eng neer ng organ sms n b otechno ogy 2 hours ecture, 6 hours ab. Prerequisite: B O 181 or equ va ent

PLB 352 Genetic Engineering and Society. (4) F
Introduct on to genet'c engineering w th em- phas s on app icat ons gene therapy, DNA f ngerpr nt ng b oremed at on, transgen c an ma s and p ants Lecture ab Cred t s a owed on y for B O 343 or PLB 352. Cross sted as B O 343. Prerequ s te BIO 181 or equ va ent

PLB 440 Photobiology. (3) F 1998
Pr nc p es under y ng the effects of ight on growth, deve opment, and behavior of p ants, an mals and m croorganisms Cred t s al- owed only for BIO 464 or PLB 440. Cross- sted as B O 464. Prerequisites CHM 231 (or 331 12 hours of courses n fe sciences

PLB 442 Algal and Fungal Physiology. 3 N
Ce lular phys o ogy and b ochem stry of algae and fung responses of these organisms to chem ca and physica st mu and the r pro cess of morphogenes s Prerequ s tes: BIO 182 or equ'valent), CHM 231.

PLB 444 Plant Growth and Development. (3) S 1999
Mo ecu ar bas s of development ro e of s gna transduct on pathways gene regu at on n con tro of organ format on po nation germina t on and growth Prerequ s te B O 182 or 'n structor approva

PLB 540 Plant Metabolism. (3) N
Genera p ant metabo sm and typica p ant products emphas zing b osynthesis and func t ons f storage products ce wa const tu ents p ant ac ds p gments, hormones, and numerous secondary products Prerequ s te· PLB 340 or CHM 231 or nstructor approva

PLB 550 Plant Molecular Biology. (2 S 2000
B ochemistry and mo ecu ar b o ogy of p ant organe les nc ud ng protein target ng p ant v ruses and mo ecu ar des gns for plant 'm- provements. Prerequ site: nstructor approva .

PLB 552 Plant Genetic Engineering. (3 S 2000
P ant transformat on ut zation of transgenetic p ants, trans ent gene expression assays and appl cat ons of p ant genet c eng neer ng Prerequ site nstructor approva .

PLB 553 Plant Genetic Engineering Laboratory. 2 S 2000
P ant transformat on ut zat on of transgenet c p ants, trans ent gene express'on assays and app cat ons of plant genet c eng neer ng. 6 hours ab Prerequ s te: nstructor approva

PLB 558 Molecular Mechanisms of Photosynthesis. (3 S 2000
Structure and funct on of photosynthet c com p exes mechan sm of energy convers on in p ants, bacter a and mode systems Cross l sted as CHM 568. Prerequ s te nstructor ap prova

URBAN HORTICULTURE

PLB 260 Plants in Cities: Introduction to Urban Horticulture. (4 S
Princ p es and pract ces of hort cu ture em phas z ng deve opment growth and propaga t on of h rt cu tura p ants and env ronmental factors that affect these processes 3 hours ecture 3 hours ab Prerequ s te: BIO 182 or PLB 108 *General Stud es S2*

PLB 360 Southwest Home Horticulture. (2 F, S
Mu t med a course for nonmajors survey ng contemporary top cs in southwest home horti cu ture nc ud ng andscap ng, f ower and veg etab e garden ng c tr culture nter orscap ng, and thers

PLB 362 Landscape Plants I. 3) S
Ident f cat on cu ture and use of amen ty p ants n urban andscapes Prerequ s te PLB 260 or equ va ent.

PLB 363 Landscape Plants II. (3) S
dent f cat on culture and use of amen ty p ants in urban gardens. Prerequ s te· PLB 260 or equ va ent

PLB 364 Urban Forestry. (3 F
The estab shment care, and maintenance of ornamental trees shrubs and v nes Prerequ site PLB 260 or equ va ent

PLB 366 Interiorscape. (3) F 1999
Ident f cat on, cu ture and use of conta ner gr wn p ants f r nter or env ronments. Pre requ s te PLB 260 or nstructor approva

PLB 370 Landscape Practices. 3) S 1999
nsta at on rr gat on and ma ntenance of amen ty p ants n urban andscape w th an emphas s on ntegrated andscap ng techno o g es 2 hours ecture 3 hours ab Prereq u s te PLB 260 or equ va ent

PLB 372 Turf Management. (3) N
Se ect on estab shment and ma ntenance of turf grasses for awn and sports areas 2 hours lecture 3 hours ab Prerequisite: PLB 260 or equ va ent

PLB 472 Greenhouse/Nursery Management. 3 F 1998
Greenhouse structures env ronment and nursery operat on nc udes irr gat on, nutrit on, and other princ ples re at ve to conta ner grown spec es. Prerequ s tes ERA 325; PLB 370

PLB 554 Plant Biotechnology. (3) N
Asept c c onal propagation of p ants and in v tro cu ture of ce s organs and tissues 2 hours ecture 3 hours lab Prerequisite. PLB 308 or 340 or 370

Department of Political Science

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ASSOCIATE INSTRUCTIONAL PROFESSIONAL
KEATING

POLITICAL SCIENCE—B.A.

The B.A degree in Political Science consists of 42 semester hours, of which 30 must be in political science and 12 in related fields consisting of courses selected from the Departments of Anthropology, Chicana and Chicano Studies, Economics, Geography, History, Psychology, and Sociology, and the African American Studies and the Women's Studies programs. At least 15 hours in political science must be in upper division courses. The following courses are required

POS	101	Political Ideologies *SB*	3
POS	110	Government and Politics *SB*	3
		or POS 310 American National Government *SB*	3)
POS	150	Comparative Government *SB, G*	3
		or POS 160 Global Politics *SB, G*	3)
POS	301	Empirical Political Inquiry *SB*	3
Total			12

Students who major in Political Science must have a minimum GPA of 2.00 for all courses that count toward the major. Upper-division courses that count toward the major must have a grade of "C" or higher, no more than one "D" grade in a lower division course may be counted in the major. See "Major Requirements," page 306. No more than six hours of POS 484 In ternship may be applied to the major.

POLITICAL SCIENCE—B.S.

The B.S. degree in Political Science consists of 48 semester hours, of which 36 must be in political science and 12 in related fields consisting of courses selected from the Departments of Anthropology, Chicana and Chicano Studies, Economics, Geography, History, Psychology, and Sociology, and the African American Studies and the Women's Studies programs. At least 21 hours in political science must be in upper-division courses. The following courses are required:

POS	101	Political Ideologies *SB*	3
POS	110	Government and Politics *SB*	3
		or POS 310 American National Government *SB*	(3
POS	150	Comparative Government *SB, G*	3
		or POS 160 Global Politics *SB, G*	(3)
POS	301	Empirical Political Inquiry *SB*	3
POS	401	Political Statistics *N2*	3
Approved Electives			6
Total			21

Students who major in Political Science must have a minimum GPA of 2.00 for all courses that count toward the major. Upper division courses that count toward the major must have a grade of "C" or higher; no more than one "D" grade in a lower-division course may be counted in the major. See "Major Requirements," page 306. No more than six hours of POS 484 In ternship may be applied to the major.

Asian Studies Certificate. Students majoring in Political Science may elect to pursue an Asian Studies certificate combining courses from the major with selected outside courses of wholly Asian content See "Asian Studies," pages 307 308, for more information.

Latin American Studies Certificate. Students majoring in Political Science 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 308, for more information.

MINOR IN POLITICAL SCIENCE

The minor in Political Science consists of 18 semester hours in political science courses, 12 hours of which must be upper-division courses. Students who minor in Political Science must have two courses from among the following:

POS	101	Political Ideologies *SB*	3
POS	110	Government and Politics *SB* or POS 310 American National Government *SB*	3
POS	150	Comparative Government *SB, G*	3
POS	160	Global Politics *SB, G*	3

Students who minor in Political Science must have a minimum GPA or 2.00 for all courses that count toward the minor. Upper division courses that count toward the minor must have a grade of "C" or higher, no more than one "D" in a lower division course may be counted toward the minor. No more than three hours of POS 484 Internship and three hours of POS 499 Independent Study may be applied to the minor.

SECONDARY EDUCATION—B.A.E.

Political Science. The major teaching field consists of 45 semester hours, 30 of which must be in political science and 15 in closely related fields. The following courses are required:

POS	101	Political Ideologies *SB*	3
POS	110	Government and Politics *SB* or POS 310 American National Government *SB*	3
POS	150	Comparative Government *SB, G* or POS 160 Global Politics *SB G*	3
POS	301	Empirical Political Inquiry *SB*	3
POS	417	The Arizona Political System *SB*	3
POS	480	Methods of Teaching Government	3
Total			18

Courses may be substituted for POS 417 and 480 with departmental approval.

Students who pursue this academic specialization in political science must have a minimum GPA of 2.00 for all courses that count toward the major. Upper division courses that count toward the major must have a grade of "C" or higher; no more than one "D" grade in a lower division course may be counted in the academic specialization. No more than six hours of POS 484 Internship may be applied to the major.

The minor teaching field consists of 24 semester hours in political science courses. The following six courses are required:

POS	101	Political Ideologies *SB*	3
POS	110	Government and Politics *SB* or POS 310 American National Government *SB*	3
POS	150	Comparative Government *SB, G* or POS 160 Global Politics *SB G*	3
POS	301	Empirical Political Inquiry	3
POS	417	The Arizona Political System *SB*	3
POS	480	Methods of Teaching Government	3
Total			18

Courses may be substituted for POS 417 and 480 with departmental approval.

Students who pursue this academic specialization in political science must have a minimum GPA of 2.00 for all courses that count toward the academic specialization. Upper division courses that count toward the academic specialization must have a grade of "C" or higher; no more than one "D" grade in a lower division course may be counted in the minor.

Social Studies. See page 390.

GRADUATE PROGRAMS

The faculty in the Department of Political Science offer programs leading to the M.A. and Ph.D. degrees. Consult the *Graduate Catalog* for requirements.

POLITICAL SCIENCE (POS)

POS 101 Political Ideologies. 3 F S
Leading political ideas and belief systems e.g. Marxism, liberalism, conservatism, the rise of democracy and alternative futures *General Studies SB*

POS 110 Government and Politics. 3 F, S
Major institutions of modern government and processes of individual and group political activity with emphasis on the American experience. Meets the federal government requirement for teacher certification. Not open to students with credit for POS 310 *General Studies SB*

POS 150 Comparative Government 3 F S
Political institutions and processes in selected foreign countries including origins, strengths and weaknesses of contemporary political systems and political development *General Studies. SB G*

POS 160 Global Politics. 3 F S
The nature of contemporary world politics through the study of both general theoretical topics and specific geographical areas *General Studies SB G*

POS 220 Political Issues and Public Policy. 3) A
Contemporary social problems and political issues, particularly developments of public policy *General Studies· SB.*

POS 230 Current Issues in National Politics. 3) F S
Major issues facing national governments in the domestic field *General Studies L1 SB*

POS 240 Introduction to Southeast Asia. (3 F
An interdisciplinary introduction to the cultures, regions political systems geography and history of Southeast Asia Cross listed as ASB 240 GCU 240 HIS 240 REL 240 *General Studies G*

POS 260 Current Issues in International Politics. (3) F S
An analysis of major current problems in world politics *General Studies· L1 SB, G.*

POS 270 American Legal System. 3 F S
Concepts institutions classifications and functions of law. The role of the courts and the impact of judicial decisions making in social change *General Studies SB*

POS 301 Empirical Political Inquiry. 3 F S
Logic of political inquiry including research problems concepts hypotheses theories measurement data collection and analysis *General Studies: SB.*

POS 310 American National Government. (3 F S
Powers functions, and agents of American political institutions. Meets the federal government requirement for teacher certification Not open to students with credit for POS 110 *General Studies: SB.*

POS 311 Arizona Constitution and Government. 2 F, S
Constitution and government of the State of Arizona. Not open to students having credit for POS 316 or 417 Meets the Arizona constitution requirement for teacher certification May not be counted for the major or a teaching major or minor in Political Science

NOTE For the General Studies requirement codes such as L1 N3, C and H and courses, see pages 84–108 For graduation requirements see pages 79–83. For omnibus courses offered but not listed in this catalog see pages 56–57.

POS 313 The Congress. 3 A
Lawmak ng process n the U S Congress *Genera Stud es. SB.*

POS 314 The American Presidency. 3 A
Off ce e and p wer of the Amer can pres - dency the Amer can po t ca system *Gen era Stud es SB*

POS 315 The Supreme Court. (3) A
R e f the Supreme Court n Amer can soc ety and po t cs exam nat on f dec s on-mak ng p ocess and mpact f dec s ons, restra nt versus act v sm *Genera Stud es SB*

POS 316 State and Local Government. (3 A
Survey of the operat ons, prob ems, and po c es f tate and ca governments n the Un ted States *Genera Stud es SB*

POS 320 Public Administration. (3 A
R e of the aomin st ator n the po t ca pro cess w th an exam nat on of the bas c con cepts of bureaucracy *Genera Stud es SB*

POS 325 Public Policy Development. 3 A
Re at onsh ps between po cy deve opment and adm n strat ve processes as affected by the var ous o es of eg s ative bod es, execu- t ve and adm n strat ve agenc es *Genera Stud es· SB.*

POS 331 Public Opinion. (3 A
Format n, express on and nf uence of nd - v dua a d o gan zed op n on n pol tical nst tut ons. *Genera Stud es SB*

POS 332 American Political Parties. (3 A
De e opment of the Amer can party system Party organ zat on and funct ons *Genera Stud es· SB*

POS 333 Interest Groups. (3) A
Exam nes how m no ty corporate labor, farm consumer env ronmental, hea th edu cat o and pub c nterest groups and s ng e ssue movements nf uence government *Gen era Stud es SB*

POS 336 Electoral Behavior. (3) A
V t ng behavior and the att tudes percep t ons a d act v t es of the c tizenry n the pol t ca process *Genera Stud es SB.*

POS 340 History of Political Philosophy I. 3 A
Western po t ca ph osophers and the r theo r es to the 17th century *Genera Stud es· HU H*

POS 341 History of Political Philosophy II. 3 A
Western po t ca ph osophers and the r theo- r e from the 17th to the 20th century *Genera Stud e HU H.*

POS 346 Problems of Democracy. (3) A
ssue and prob ems n democrat c theory, e g , the nature of demo racy major ty ru e epresentat on, equa ty, and the value of po t ca part pat on. *Genera Stud es HU.*

POS 350 Comparative Politics. 3) A
Theoret ca approaches and po it ca nst tu t ns su h as part es pressure groups eg s atures, and execut ves, from a cross nat onal perspect ve *Genera Stud es: SB. G.*

POS 356 Western Europe. 3 A
Structures and behav or of governmental nst tut ons and po t ca processes in selected cou t es of Western Europe *General Stud es SB G*

POS 357 South Asia Politics. 3 A
Ana ys s of the p t cal cu ture po t cs, and po t ca systems of South As a ecture d s cuss n *Gene a Stud es SB G*

POS 358 Southeast Asia. 3 A
Po t ca background governmenta nst tu t ons po t ca dynam cs and deve opmenta prob ems of Southeast As an nat ons *Genera Stud es SB G*

POS 359 African Politics and Society. 3 N
Compa at ve ana ys s of soc o econom c f rces, po t ca pr cesses and government nst tut ons Afr ca south of the Sahara *Gen- era Stud es· SB G*

POS 360 World Politics. (3 A
The ry and pract ce of statecraft as app ed to se ected ssues eg ons or eras *Genera Stud es SB G*

POS 361 American Foreign Policy. 3 A
Un ted States n wor d affa rs fore gn po cy s nce Wor d War I Techn ques n formulat ng Amer can fore gn po c es *Genera Stud es SB, G*

POS 364 U.S. National Security Analyses. 3 A
A theoret ca and emp r ca assessment f U S nat ona secur ty po cy n the post co d war era *Genera Studies: SB*

POS 370 Law and Society. 3 A
Ana ys s f debates among soc a sc ent sts and egal theor sts concern ng the re at onsh p betwee 'law and soc ety" *Genera Stud es SB*

POS 401 Po itical Stat stics. 3 F S
Bas c concepts n stat st cs as they faci tate the descr pt on exp anat on and pred ct on of soc a and po it ca phenomena *Genera Stud es N2*

POS 410 Urban Government and Politics. 3 A
Governmenta organ zat ons deci s on mak ng structures and prob ems of urban po it ca systems *Genera Stud es SB.*

POS 417 The Arizona Political System. 3 N
C ntemporary po t ca prob ems w th n the context of Ar zona s constitutiona po t ca and soc a frameworks Meets the Ar zona Const tut on requ rement for teacher cert f ca t on. Not open to students hav ng cred t for POS 311 *Genera Stud es SB*

POS 422 Politics of Bureaucracy. 3 N
Bureaucracy as a po t ca ent ty; nterna dy nam cs of p b c agenc es; the e at onsh p be tween pub c agenc es and other po t cal enti t es *Genera Stud es SB*

POS 423 Politics of Budgeting. 3 N
The p cy process in budget ng strateg es used to nf uence th s pr cess and recent re- forms n pub c budget ng *Genera Stud es SB*

POS 426 E ements of Public Policy. (3 A
Each sect on may cover one of the fo ow ng top cs: consumer protect on natura re- sources crim na ust ce env ronmenta pro tect on sc ence and techno ogy, or theor es of pub c po cy May be repeated f r cred t when top cs vary *Genera Stud es SB*

POS 431 Campaigns and Elections. (3) A
Exam ne campaigns from a mu t tude of per spect ves nclud ng the po t c an, reporte , campa gn strategist and voter Lecture d s cuss on *Genera Stud es SB*

POS 433 Money and Politics. 3 A
The ro e of money and spec a interests in e ectio s campa gn p t cs and pub c pol cy- mak ng n Amer can pol t cs Lecture d scus- s on *General Stud es SB*

POS 434 Media and Politics. (3) A
The study f mass media and po t cs n the Un ted States, e g. med a and e ect ons, me- d a and government Lecture, d scuss on *Genera Stud es SB.*

POS 435 Women and Politics. (3) N
Women r es n var ous po t ca contexts Focus var es w th nstructor *General Studies. SB C*

POS 439 Minority Group Politics in America 3) N
Ro e of m or ty groups in Amer can po t cs. *General Stud es SB C*

POS 442 American Po itical Thought. 3) A
Po t ca the r es and movements from the co on a per od to the present *Genera Stud es. HU*

POS 443 Topics in Contemporary Political Theory. 3 A
Ma or prob ems and theories n contemporary po tica thought *General Stud es HU*

POS 445 Asian Political Thought. (3 A
Contemporary pol tical deas and theories n selected As an countr es, nc ud ng the impact of Marx st and non Marx st theories on revolu- t onary processes *Genera Stud es· SB G*

POS 450 Russia and Successor States. (3) A
Descr pt on and ana ys's of pol t ca nst tut ons and pract ces n Russ a and successor states *Genera Stud es SB G*

POS 451 China, Japan, and the Koreas. (3 A
A c mparat ve analys s of the pol t cal mod ernizat on exper ences of Ch na, Japan, and the two Koreas f cus ng on the r d ffer ng re- act ons to the West *General Studies SB G*

POS 452 China. (3 A
Background of the Commun st revo ut on po- t ca processes and deve opmenta prob ems n Ch na from a comparative perspect ve *Genera Stud es SB G*

POS 453 South America. 3 A
Governmenta nst tut ons, po tica processes and developmenta prob ems of the South Amer can states. *Gene a Stud es SB G*

POS 454 Mexico. 3 A
Mex can federa state, and oca governmen ta nst tut ns *Genera Stud es SB, G*

POS 455 Central America and the Carib- bean. (3 A
Governmenta nst tut ons po it ca processes, and deve opmental prob ems of the nat on states and dependent areas of Centra Amer ca and the Car bbean *Genera Stud es. SB G*

NOTE For the Genera Stud es requ rement codes such as L1 N3 C and H , and c urses see pages 84 108 For graduat on requ rements see pages 79–83 For omn bus courses offered but ot sted n th s cata og see pages 56–57

POS 459 South and Southern Africa. (3 A
Post-aparthe d South Afr can government and po it cs, South Afr ca and the southern Afr can reg on reg ona secu ty and deve opment *Genera Stud es SB G.*

POS 463 Inter-American Relations. 3) A
Dip omat c re ations among the Lat'n Amer can states Development of U.S fore gn po cy toward Lat n America *General Stud es SB, G*

POS 465 International Organization and Law. (3) A
H story pract ca po t ca s gn f cance, and future of nternat ona nst tut ons transnat ona reg mes, and nternationa aw *Genera Stud es SB G*

POS 467 International Security. 3 A
Exam nation of ssues affect ng the nterna- t ona secur ty of states and peop es, e g m l- tary, econom c, techno og ca env ronmenta and demograph c *Genera Stud es SB, G*

POS 468 Comparative Asian Foreign Policies. (3 A
Fore gn pol c es of the As an states empha s z ng the r security re at ons and movements toward reg ona sm *General Stud es· SB G*

POS 471 Constitutional Law I. 3) A
Deve opment of the U S. Const'tution as re flected n dec s ons of the Supreme Court ju r sd ct on and organ zation of the federa courts jud c a rev ew separat on of powers, federal sm, the commerce c ause, nat ona tax ng and spending power, state po ce power *General Stud es: SB*

POS 472 Constitutional Law II. (3 A
Development of the U S. Const tution as re flected n dec s ons of the Supreme Court. due process, equal protect on of aws individual r ghts c v l bert es *Genera Stud es SB.*

POS 480 Methods of Teaching Government. (3) N
Methods of nstruct on organ'zation and pre sentat on of subject matter n po t ca sc ence Prerequ s te 15 hours n po t ca sc ence or nstructor approva

POS 485 Political Economy. (3) A
Prob ems po c es, a d poss b ties of various po t cal-econom c systems and the nterrela t onsh p of capita sm soc a 'sm and democ racy *General Studies SB.*

POS 486 International Political Economy. 3 A
Contending approaches to histor ca and con temporary ssues of nternat ona pol tica economy, nc ud ng g oba we fare, equa ity, eco ogy, and peace. *Genera Stud es SB G.*

POS 498 Pro-Seminar. 3 A
Sma group study and research for advanced students w th n the major area Prerequ s te major n the department or instruct r approval *General Stud es L2*

POS 501 Methods of Political Science. (3) A
Prob ems of method and know edge n po t ca sc ence strategies of po t ca nquiry and ssues n phi osophy of social sc ence

POS 502 Philosophy of Political Inquiry. (3) A
Prob ems of know edge and method n po t ca sc ence, w th attent on to both emp r ca and eva uat ve ana ys s

POS 503 Empirical Political Inquiry. (3) A
Research methods and techn ques of the d s cip ne, emphas z ng emp'rical foundat ons and ana yt c methods emp oyed n subfields Prerequ s tes POS 401 or equivalent) n structor approva .

POS 530 American Politics. (3) A
Examines major debates n the study of Amer can po it ca processes Covers parties, med a, elect ons publ c op n on nom nations, and soc a cho ce theory Seminar.

POS 532 American Political Institutions. (3) N
Examines major debates n the study of Amer can governmenta nst tut ons Covers eg s at ve branch, execut ve branch, jud c a branch, and nterest groups Seminar

POS 545 Themes in Political Thought. (3) N
Exam nation of a part cular theme or prob em in po t cal thought from both a historica and contemporary perspective Sem nar Course may be repeated w th approval of the d rector of graduate stud es. Prerequ s te: instructor approva

POS 550 Comparative Politics. (3) A
Surveys major approaches across top ca ar- eas such as revolut ons author tar an sm, po icy processes nterest groups, and e ec- tora po t cs Focus varies w th nstructor Sem nar

POS 560 International Relations. (3) A
Surveys major theoret ca approaches and de bates in nternat onal relat ons Sem nar

POS 563 Comparative Asian Security Policies. (3 N
Ana yzes domestic and nternat onal con stra'nts, bel ef systems and econom'c compo- nents in secur ty dec's ons by major powers and As an nat ons. Sem nar. Prerequ'site: n- structor approva .

POS 591 Seminar. (3) A
(a) American Po tics
(b) Comparat ve Po tics
(c) G oba Pol t cs
(d) Po tica Theory

POS 598 Special Topics. (3) A
(a) American Po t'cs
(b) Comparat ve Po tics
c G oba Po it cs
(d) Po t'cal Theory

POS 601 Advanced Experimental Research. (3 N
Introduces exper mental and quas experi menta research designs in po t ca research, nc ud ng laboratory techn ques and topics n the ana ys s of var ance Prerequ s te POS 503 or equ va ent

POS 602 Advanced Survey Research. (3) N
Presents des gn and conduct of po t ca sur veys nc ud ng samp ng, nstrument design scal ng and stat st ca and graphica analys s of survey data Prerequisite: POS 503 or equ'valent

POS 603 Polimetrics I. (3) A
Introduces theory and pract ce of 'near re gress on analys s Prov des sk ls to read un- derstand and eva uate professiona iterature us ng regress on analys s Prerequisites: POS 401 and 503 *or* nstructor approva

POS 604 Polimetrics II. (3) A
Apply quant tative techniques to research top- cs produc ng publ shable papers through ex posure to t me ser es logit and prob t, and s mu taneous equations Prerequ s tes POS 401 and 503 and 603 *or* nstructor approva

POS 606 Qualitative and Textual Analysis. (3) S 1999
Method and theory for the analys s of qual ta t ve mater als systemat c approaches for case stud'es content ana ys s, critica analys s of texts Discuss on, sem nar

POS 635 State Politics and Public Policy. (3) N
ntroduct on to comparative state po cy em phas z ng po cy or performance differences among the states and the reasons for these d fferences. Seminar. Prerequ s tes: POS 530 and 603 *or* nstructor approval.

POS 636 Electoral Behavior. (3) N
ntroduces fundamental concepts of e ectora behavior. Emphasizes pres dent'al e ect ons and exam nes why people vote and how the r votes are determined Sem nar Prerequisites POS 530 and 603 *or* nstructor approva

POS 638 Law and Politics. (3) N
Emphas zes research nto such top cs as con stitutiona aw, women and the aw Amer can ega system jud cial process and jud c a se ect on Seminar Prerequ s te nstructor ap prova

POS 651 Politics of Change and Development. (3) N
Exam nes contending approaches to nationa social, and pol tical change Sem nar. Prereq u s te instructor approval

POS 660 The Modern World System. (3) N
Theoret ca ly dr ven, h stor ca ana ys s of the organ zat on and operat on of the nternat ona po t ca economy since the 16th century. Sem nar Prerequ s te nstructor approva .

POS 661 The State. (3) N
Exam nes theories of state state soc ety re a tions, and nterstate po it cs emphasiz ng quest'ons of sovere gnty terr tor a ity, vio- ence, representat on, democracy, and change. Sem nar Prerequ site nstructor ap- prova .

POS 662 International Organization. (3) N
H story pract ca po t ca sign'f cance, and fu ture of international nstitutions, transnat ona reg mes and other approaches to interna tiona organizat on. Sem nar Prerequ s te: in structor approva

POS 664 War, Peace, and Conflict Processes. (3 N
The systemat c ana ys s of the causes of war the precond t ons for peace, and approaches to the reso ution of confl ct. Sem nar Prerequi s te: nstructor approva

POS 665 Foreign Policy Theory. (3 N
Exam nes foreign pol cy theory and methods. Development and crit que of research designs analyz ng fore gn pol cy processes w th n and among nat ons Sem nar Prerequ s te instruc- tor approval

POS 792 Research. (3) F, S
Projects n various areas of po it ca sc ence Prerequ s te: doctoral student

Department of Psychology

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Chair
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REGENTS' PROFESSORS
CIALDINI, EISENBERG, RUSSO

PROFESSORS
AIKEN, BARRERA, BRAUN, BRAVER, CASTRO, CHASSIN, HOMA, KAROLY KENRICK, KILLEEN, KNIGHT, LANYON, LINDER, OKUN, PARKINSON PRESSON, REICH, SADALLA SANDLER, SOMERVILLE, VAN ORDEN WEST, WOLCHIK, ZAUTRA

ASSOCIATE PROFESSORS
CASTANEDA, CHARTIER FABRICIUS, FEHR, LESHOW TZ, MacKINNON, M LLSAP, NAGOSH , NEISEWANDER, NEMEROFF, NEUBERG, ROSS , SAENZ, STONE

ASSISTANT PROFESSORS
CONRAD, DAVIS, GEST, GOLDINGER, GONZALES, KHOO

LECTURERS
BARTON WE GAND

The Department of Psychology maintains an Undergraduate Advise ment Office staffed by trained person nel. All Psychology majors are encour aged to meet with an undergraduate advisor once each semester to ask ques tions regarding the choice of courses. Failure to do so may prevent graduation at the expected time. It is the responsi bility of the student to consult with an undergraduate advisor

PSYCHOLOGY—B.A.

The B.A degree in Psychology con sists of 31 semester hours in psychol ogy, including at least 15 upper divi- sion semester hours. Required courses, which must be passed with a minimum grade of "C," are as follows:

PGS	101	Introduction to Psychology *SB*	3
PGS	315	Personality Theory and Research *SB*	3
		or PGS 341 Developmental Psychology *SB*	3
		or PGS 350 Social Psychology *SB*	(3)
PSY	230	Introduction to Statistics *N2*	3
PSY	290	Research Methods *L1/S2*	4
PSY	323	Sensation and Perception	3
		or PSY 320 Learning and Motivation	(3)
		or PSY 324 Memory and Cognition	(3)
		or PSY 325 Physiological Psychology	(3)
Total			16

Also required are one additional up per division PSY course (excluding PSY 494, and 499); two additional up per division PGS or PSY courses; and two additional psychology courses, excluding PGS 270. No more than a total of three hours in PGS 394 and 494 and PSY 494 combined may be used to complete the 15 hours of upper-division requirements. Students may take a maximum of six hours of PGS 394 and six hours of PGS 494 and PSY 494 combined. Eighteen hours in courses related to psychology must be passed with a minimum grade of "C " They must be approved by an undergraduate advisor and include MAT 119 (or higher) in addition to one course from among the following:

CSE	180	Computer Literacy	3
CSE	185	Internet and the World Wide Web	3

See "Major Requirements," page 306.

PSYCHOLOGY—B.S.

The B.S. degree in Psychology consists of 31 semester hours in psychol ogy, including at least 15 upper divi sion hours. Required courses, which must be passed with a minimum grade of "C," are as follows.

PGS	101	Introduction to Psychology *SB*	3
PGS	315	Personality Theory and Research *SB*	3
		or PGS 341 Developmental Psychology *SB*	(3)
		or PGS 350 Social Psychology *SB*	(3)
PSY	230	Introduction to Statistics *N2*	3
PSY	290	Research Methods *L1/S2*	4
PSY	323	Sensation and Perception	3
		or PSY 320 Learning and Motivation	(3
		or PSY 324 Memory and Cognition	(3)
		or PSY 325 Physiological Psychology	3)
Total			16

Also required are one additional up per division PSY course (excluding PSY 494); two additional upper divi sion PGS or PSY courses; and two additional psychology courses excluding PGS 270 No more than a total of three hours in PGS 394 and 494 and PSY 494 combined may be used to complete the 15 hours of upper division require ments. Students may take a maximum of six hours of PGS 394 and six hours of PGS 494 and PSY 494 combined. Eighteen hours in courses related to psychology must be passed with a minimum grade of "C " They must be approved by an undergraduate advisor and include MAT 210 Brief Calculus; one life science lab course (BIO or MIC); one physical science lab course (AST, CHM, GLG, or PHY); and one course from among the following:

CSE	180	Computer Literacy	3
CSE	185	Internet and the World Wide Web	3

Further, the science courses taken to satisfy the B.S. requirements cannot be used to meet the College of Liberal Arts and Sciences natural science dis tribution requirements. See "Major Re quirements," page 306.

MINOR IN PSYCHOLOGY

The minor in Psychology consists of 22 hours in psychology, including the following:

PGS	101	Introduction to Psychology *SB*	3
PGS	315	Personality Theory and Research *SB*	3
		or PGS 341 Developmental Psychology *SB* (3)	
		or PGS 350 Social Psychology *SB* (3)	
PSY	230	Introduction to Statistics *N2*	3
PSY	290	Research Methods *L1/S2*	4

NOTE For the General Stud es requirement, codes (such as L1, N3 C and H), and courses see pages 84–108. For graduation requ rements see pages 79–83 For omn bus courses offered but not sted in th s catalog see pages 56–57

PSY 323	Sensation and Perception or PSY 320 Learning and Motivation (3 or PSY 324 Memory and Cognition (3 or PSY 325 Physiological Psychology (3)	3
Total		16

Two additional upper-division PGS or PSY courses are required.

A maximum of three hours of research (PGS 394, 494; PSY 494) may be used to meet the minor requirements. Students with an appropriate equivalent course may exclude PSY 230 from the requirements. All courses must be passed with a minimum grade of "C."

SECONDARY EDUCATION—B.A.E.

Psychology. The minor teaching field consists of 24 semester hours. See a departmental advisor.

Social Studies. See page 390.

GRADUATE PROGRAMS

The faculty in the Department of Psychology offer a program leading to the Ph.D. degree. Consult the *Graduate Catalog* for requirements.

PSYCHOLOGY (PGS)

PGS 101 Introduction to Psychology. (3 F, S SS
Major areas of theory and research in psychology. Participation in department sponsored research or an educational equivalent alternative activity required. *General Studies· SB.*

PGS 222 Human Sexual Behavior. (3) F, S
Patterns of sexual behavior, including variations and deviations; theories of sexual attraction, sex differences, and sexual dysfunction and treatment. Prerequisite: PGS 101. *General Studies SB*

PGS 270 Psychology of Adjustment. (3) F S SS
Principles of mental health, adjustment, conflict, stress and coping processes derived from clinical and experimental research. Intended for nonmajors; cannot be used for major credit. Prerequisite· PGS 101. *General Studies· SB.*

PGS 304 Effective Thinking. (3) A
Understanding and improving your intellectual and behavioral skills; information analysis, inference, logic, problem solving, and decision making. Prerequisite MAT 119 or PSY 230 or equivalent. *General Studies· L1*

PGS 306 Environmental Psychology. (3) F, S, SS
Concepts and research strategies in the study of behavior in interaction with physical environment Prerequisite PGS 101 *General Studies· SB*

PGS 315 Personality Theory and Research. 3 F, S SS
Definition and description of personality in terms of theoretical and methodological approaches Prerequisites PGS 101 PSY 290. *General Studies SB*

PGS 341 Developmental Psychology. (3 F S
Behavior development analyzed in terms of psychological principles Current research in human development Prerequisites PGS 101 PSY 290 *General Studies SB*

PGS 344 Directed Child Study. (3–4 F S SS
Theories and methods of intervention with preschool children and supervised practicum in the Child Study Laboratory. 1 hour lecture, 6–8 hours practicum. Prerequisites: CDE 232 (or PGS 341) instructor approval. *General Studies L2*

PGS 350 Social Psychology. (3) F S SS
Human social behavior including such concepts as aggression, attraction attribution conformity groups, helping, person perception and persuasion Prerequisite. PGS 101. *General Studies SB*

PGS 351 Honors Social Psychology. (3) N
A critical analysis of human social behavior for honors students topics include stereotyping social influence, attraction, aggression helping groups and attitudes Lecture, discussion Open only to students without previous credit for PGS 350 Prerequisites. PGS 101 honors standing instructor approval. *General Studies L2/SB*

PGS 365 Community Psychology. (3 F S
Mental health and psychological well being in the community emphasizing current issues and related research Prerequisite PGS 315 or 350 *General Studies. SB.*

PGS 399 Supervised Research. 1 3) F S SS
Experience with in the context of current faculty research projects. Student assigned responsibility depending on qualifications. "Y" grade only May be repeated for a total of 6 hours Prerequisites approval of faculty member before registration B" average in major Prerequisite or corequisite: PSY 230 or equivalent

PGS 414 History of Psychology. (3) F S
History of development of psychology from its philosophical beginnings to the present Prerequisites PGS 101; PSY 230 290. *General Studies L2/SB*

PGS 427 Psychology of Aging. (3) N
Analysis of loss maintenance, and gain associated with cognitive and affective aging. Individual differences in coping with normative transitions Prerequisites PGS 101, 341 *General Studies L2/SB*

PGS 430 Industrial Psychology. (3) F S SS
Organizations and management systems, motivation and work performance human factors in systems design and evaluation personnel selection and testing. Prerequisite: MGT 301 or PGS 101

PGS 441 Cognitive Development. 3) F, S
Experimental and theoretical literature in child development and behavior Prerequisite. PGS 341 or instructor approval *General Studies L2/SB*

PGS 443 Abnormal Child Psychology. (3 F, S
The major disorders of childhood and adolescence e g autism, hyperactivity phobias and delinquency are covered including cause, diagnosis treatment, and prevention Prerequisites: PGS 101 and 1 course from among PGS 315 and 341 and 350 *or* instructor approval *General Studies L2/SB*

PGS 444 Adolescent Psychology and Psychopathology. 3 N
An advanced survey of normal adolescent psychological disorders of this age period Lecture, discussion. Prerequisites PGS 101, 341 PSY 290 *General Studies: L2*

PGS 445 Child Language and Drawing. (3 F
Language acquisition and developmental changes in drawing, considered in the context of cognitive developmental stages Children's representation and communication of knowledge through language and drawing Prerequisite PGS 341 *General Studies SB*

PGS 446 Social Development. (3) N
Theory, research and issues regarding social development are discussed Example topics formation of attachments prosocial development and gender role development Lecture seminar Prerequisite PGS 341 *General Studies· L2.*

PGS 450 Social Perception and Cognition. (3) N
A critical analysis of human social perception and social cognition Topics include attribution inference, memory, attention impression formation stereotype change Lecture discussion. Prerequisites: PGS 101 350 *General Studies· L2.*

PGS 451 Stereotyping, Prejudice, and Discrimination. (3) N
A critical investigation of the processes underlying and the factors contributing to stereotyping prejudice and discrimination Lecture, discussion. Prerequisites· PGS 101 350 *General Studies L2.*

PGS 452 Applied Social Psychology. (3 F
The study of applications of social psychology and theory and concepts in natural settings research design and data analysis Lecture, laboratory activities Prerequisites PGS 101 350 PSY 230 *General Studies L2*

PGS 453 Organizational Behavior. (3) N
A survey of psychological theory and research as applied to the behavior of individuals in organizational settings Lecture discussion Prerequisites: PGS 101, 350

PGS 458 Group Dynamics. 3) F
Theories and methods of group leadership, group effectiveness communication within groups, and relations between groups and individual members Prerequisite. PGS 350.

PGS 461 Interpersonal Influence. (3) N
Principles and procedures that affect the process of social influence, consideration of attitudinal, compliance inducing and perceptual influences Prerequisite: PGS 350. *General Studies· SB*

PGS 462 Health Psychology. (3 F S
Contributions of psychology to health promotion and illness prevention, adaptation to acute and chronic illness, and to the health care system Prerequisites PSY 230, 290.

PGS 463 Advanced Psychology of Adjustment. 3) F
Cr t ca ana ys s and effect ve express on of psychologica theory and research of the top c of adjustment Lecture d scuss on wr t ng Prerequ s tes PSY 230 290 comp et n of 1st year Eng ish requ rements L1 course *General Stud es L2.*

PGS 464 Minority Issues in Psychology. 3) S
Psycho og ca ssues re at ng to the d vers ty of human cu tura exper ences and among ethn c m nor t es n the U S Prerequ s te PSY 290

PGS 465 Psychology of Stress and Coping. 3 F
Readings n theory and research n the area of stress and cop'ng Lecture, d scuss on c ass presentat ons Prerequ s tes: PGS 315 or 350); PSY 290 *General Stud es L2*

PGS 466 Abnormal Psychology. 3 F S SS
H stor ca and current def n t ons theory and research concern ng abnormal behav or. Ma jor categor es of psychopatho ogy, inc uding re ated treatment approaches Prerequ sites: PGS 101 PSY 290 *Genera Stud es SB*

PGS 467 Psychology of Magical Beliefs. 3) N
The psycho og ca nature and bases of mag ca bel efs and the r 'mpact on hea th behav ors, eat ng pract ces, and nterpersona re a t ons Lecture sem nar Prerequ s tes PGS 315 and 466 and PSY 434 *or* nstructor ap prova *General Stud es: L2*

PGS 468 Psychology and Law. (3 F S
Theor es research, and pract ce n psycho - ogy as re ated to aw nc ud ng crim na c v domestic re at ons and profess ona ssues Lecture d scuss on Prerequ site PSY 290

PGS 471 Psychological Testing. 3 S
Methods and theory of psychological test ng var ous types of psycho og ca tests, cons der- at on of eth ca soc'al, and legal aspects of test ng. Prerequ s te PSY 290

PGS 472 Clinical Psychology. 3) F S
C n ca psychology as a science and profes sion H stor ca deve opment methods of nter view ng assessment and therapeut c nter vention Prerequ s te PGS 466

PSYCHOLOGY (PSY)

PSY 230 Introduction to Statistics. 3 F S SS
Basic concepts 'n descript ve and nferentia stat st cs emphas z ng app cations to psy- cho ogy. The course has both se f-paced (PS and ecture sect'ons Prerequis tes MAT 117, PGS 101 *General Stud es. N2.*

PSY 290 Research Methods. (4) F S
P ann ng, execut on ana ys s and report ng of exper ments L terature procedures, and in struments n representative areas of psycho og ca research 3 hours ecture 3 hours ab Prerequis'te: PSY 230. *General Stud es L1 S2*

PSY 320 Learning and Motivation. (3 F, S, SS
Princ p es of condit on ng and mot vat on ap- proaches to earn ng, nc ud ng acqu s t on of verba mater a s concepts and motor sk s memory and transfer Prerequ s te PSY 290

PSY 323 Sensation and Perception. 3) F S
Under y ng processes of v s on, aud t on, and the other senses App cat on of current re search and theory n a aboratory environ ment Prerequ s te PSY 290 or nstructor ap prova

PSY 324 Memory and Cognition. (3) F S SS
Processes under y ng nformat on storage and ret eva , nc ud ng d fferent k nds of memory forgett ng, depth of process ng and contr processes Prerequis te PSY 290

PSY 325 Physiological Psychology. (3 F S, SS
Re at onsh ps of phys o og ca processes to behav or Emphas s s on nervous system function ng Prerequ sites PSY 290 or 2 courses n b o og ca sc ence nstructor ap prova

PSY 330 Statistical Methods. 3 S
Advanced app cation of stat st cs to psycho ogy. H gh y recommended for students nter ested n attend ng graduate schoo 3 hours ecture, 1 hour lab Prerequ'site· PSY 230 *Genera Stud es N2*

PSY 390 Experimental Psychology. 3 S
Cont nuat on of concepts n PSY 290 w th emphas s on mu t factor des gns and program mat c sequence of exper ments Lecture, ab Prerequ s te: PSY 290 *Genera Stud es L2*

PSY 420 Analysis of Behavior. 3 N
Research app cat ons and ph osophy of the ana ys s and contro of human behav or Pre- requ s te PSY 290 *General Stud es L2*

PSY 424 Genetic Psychology. 3 S
ntroduct on to the concepts methodo og es, and f nd ngs of behaviora genetics for Psy cho ogy majors Prerequ s tes PGS 100 PSY 230, 290 *Genera Stud es L2*

PSY 425 Biological Bases of Behavior. (3) N
Cr t ca study of phys olog'ca psycho ogy bra n mechan sms under y ng mot vat on and earn ng. Prerequ s te PSY 325 *Genera Stud es. L2*

PSY 426 Neuroanatomy. 4 N
Structure and funct'on of mamma an bra n, n c ud ng sheep bra n d ssect on. 3 hours ec ture 3 hours ab Prerequ s te PSY 325 or equ va ent *Genera Stud es L2*

PSY 434 Cognitive Psychology. (3 S
The human organ sm as a processor of nfor mat on, from percept on to cogn t on Abstract concepts semant c memory, attention and menta magery Prerequ s te PSY 323 or 324 r nstructor approva *Genera Stud es L2*

PSY 437 Human Factors. 3 F
Emphas s on human factors n h gh techno ogy systems Spec f c top cs inc ude systems deve opment systems ana ys s techn ques, d sp ays and contro s. Prerequ s tes PSY 290 and upper-d v s on stand ng *or* nstructor ap- proval *General Stud es L2*

PSY 470 Psychopharmacology. 3) F S
Basis of drug act on at phys o og ca and be hav ora leve s Psycho og ca and med cal ap p cat ons and l mitations of drugs used n the treatment of mental ness Prerequ s tes PSY 325, 1 semester each of b o ogy and chem stry

PSY 501 Supervised Teaching. 4 F
Experience in and exam nat on of perspec- t ves on teach ng undergraduate psycho ogy Prerequ s tes graduate stand ng n psycho ogy nstructor appr va

PSY 506 Survey of Research in Environmental Psychology. (3 F
Major top cs and parad gms in the study of person env ronment re at onsh ps Prerequ s te nstructor approva

PSY 512 Advanced Learning. 3) N
Pr nc p es and theories of learn ng emphas z 'ng research terature. Prerequ s te instructor approva

PSY 524 Advanced Physiological Psychology. (3) N
Contr but ons of phys o og ca processes and bra n funct on to fundamenta behaviora pro cesses Prerequ s te nstructor approva

PSY 528 Sensation and Perception. (3) N
Princ p es of sensory and perceptua pro cesses, emphas z ng research terature. Pre requ s te nstructor approva

PSY 529 Correlation and Psychometric Theory. 3 S
Pr nc p es of corre at ona techn ques nc ud ng regress on and mu t p e corre at on Psy chometr c theory nc ud ng re ab ty and va- d ty Prerequ s te nstructor approva

PSY 530 Intermediate Statistics. 3 F
Cont nuat on of PSY 529 Psycho og ca stat s t cs emphas z ng the ana ysis of var ance and the des gn of exper ments. Prerequ s te. PSY 529 or nstructor approva

PSY 535 Cognitive Processes. 3) N
Theoret ca emp r ca treatment of the human rgan sm as a processor of information, n c ud ng abstract on, memory structure, prob em so v ng, and th nking Prerequ s te n structor approva

PSY 541 Research in Cognitive Development. 3 N
Theoret ca and emp r ca ssues in the study of ch dren's kn w edge a d cogn t ve pro- cesses Compar son of research n P agetian and other trad t ons Prerequ s te adm ss on t Psychology Ph D. program or nstructor ap prova .

PSY 542 Social Development. 3 N
Major issues n the area of soc'a deve opment are top cs for rev ew and cr t que Theory re search, a d content are covered Prerequ s te nstructor approval

PSY 550 Advanced Social Psychology. (3 F S
Theory and research concern ng nterpersona percept on dec s on mak ng att tude forma t on and change group processes soc a mo t vation and nteract on processes Prerequ s'te: nstructor approva

PSY 551 Advanced Social Psychology. (3) F, S
Cont nuat on of PSY 550 Prerequ s te PSY 550 or nstructor approva

PSY 553 Social Influence. (3) N
Research terature re evant, for examp e to att tude format on and change conform ty obed ence power comp 'ance, a d a tru sm. Prerequ s te PSY 551 or nstructor approva

PSY 555 Experimental and Quasi-Experimental Designs for Research. 3 N
Rev ew of research techn ques Laboratory and f e d research analyzed, app cat ons to spec f c top cs Prerequ s te nstructor approval

PSY 569 Advanced Study of Personality. 3 N
Persona ty as a theoret ca concept n psycho ogy, nc ud ng def n t ona problems be hav ora and trad t ona appr aches the mea surement of persona ty and current research ssues Prerequ s te· nstructor approval

PSY 572 Psychological Assessment. 3) F
Theory and research on assessment of per sona ty, psychopatho ogy, and nte gence and construct on of psycho og ca assessment nstruments. Prerequ s te adm ss on to c n ca Ph D program or nstruct r pprova

PSY 573 Psychopathology. 3 F
Theory and research re at ng to the contr bu t on of psycho og ca soc a phys o og ca and genet c factors t the deve opme t and pers stence of abnorma behav or Prerequ s te adm ss on to Psycho ogy Ph D program or nstructor approva

PSY 574 Psychotherapy. 3 S
A deta ed survey of the theoret ca and em p r ca l terature re at ng to verba psychotherapy and 'nterv ew ng methods Structured o e p ay ng pract ce n the major procedures Prerequ s te adm ss on to the c n ca Ph.D program or nstructor approva

PSY 578 Child Psychopathology. 3) N
Major theo es and research re ated to the de ve opment of dev ant behav ors n ch dren n- c ud ng some superv sed exper ence n ch d assessment Prerequis te. PSY 572 or nstruc tor approva

PSY 582 Community Psychology. 3 SS
Commun ty systems ntervent on techniques consu tat on mode s, h story and current sta tus of community menta hea th movement and concept a zat on of the r es f commu n ty psycho og sts n soc a system nterven t on Prerequ s te advanced stand ng n Psy cho ogy Ph D program r nstructor approva

PSY 588 Consultation Methods. 3 N
Severa theor es and strateg es of organ za t ona consu tat on The deve opment of c n sultative sk s through s mu ation and pract ca exper ence Prerequ s te advanced stand ng n Psycho ogy Ph D program or nstructor ap prova .

PSY 624 Clinical Neuroscience. 3) S
An exam nat on of the b o og ca underp n n ngs of psychologica d sorders at the mo ecu ar ce u ar and system eve s (sch z phren a depress on anx ety, etc Lecture pro sem nar Prerequ s tes graduate standing nstructor approva

Department of Religious Studies

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ASSISTANT PROFESSORS
CLAY, FESSENDEN, UMAR

LECTURER
DAMREL

RELIGIOUS STUDIES—B.A.

The B.A. degree in Religious Studies consists of 45 semester hours, 30 of which must be in religious studies (including 21 in upper division courses) and 15 of which must be in related fields. In order for the student to become acquainted with the character and role of religions across a wide spectrum of social and historical contexts, the 30 semester hours in religious studies must include the following courses:

1. REL 305 Ritual, Symbol, and Myth;
2. at least one course from each of the following distribution areas: Religion in the Americas, Religion and Asian Cultures, and Religion and Western Cultures; and
3. two research seminars, including REL 405 Problems in Religious Studies, which may be repeated for credit.

In place of a second seminar, a student may take REL 499 in order to write an undergraduate thesis.

The Religious Studies major is an appropriate choice for students wishing to explore such areas as African/African American Studies, Islamic Studies; Myth, Ritual, and the Arts; Native American Studies; and Religion and Politics. All majors must plan their programs in consultation with a departmental advisor. A minimum GPA of 2.50 is required in the 30 semester hours of religious studies courses

MINOR IN RELIGIOUS STUDIES

The minor in Religious Studies consists of 18 semester hours, at least 12 of which must be in the upper division. Both REL 305 and 405 are required. For minor verification, students must consult a department advisor

CERTIFICATES AND EMPHASES

The following are certificate programs or emphases offered in the Department of Religious Studies. For more information on each, see pages 307–309.

Asian Studies Certificate. Students majoring in Religious Studies may elect to pursue an Asian Studies emphasis or East Asian Studies certificate combining courses from the major with selected outside courses of wholly Asian content

Jewish Studies Emphasis. Students majoring in Religious Studies may elect to pursue a Jewish Studies emphasis combining courses from the major with selected outside courses in the area of Jewish Studies.

Latin American Studies Certificate. Students majoring in Religious Studies 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. Students majoring in Religious Studies may elect to 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 309.

Southeast Asian Studies Emphasis. Students majoring in Religious Studies may elect to earn a Certificate in Southeast Asian Studies by successfully completing the requirements.

Women's Studies. Students majoring in Religious Studies may elect to earn a Certificate in Women's Studies by successfully completing the requirements.

NOTE For the General Studies requirement codes (such as L1 N3, C, and H) and courses, see pages 84–108 For graduation requirements, see pages 79–83. For omnibus courses offered but not listed in this catalog, see pages 56–57.

GRADUATE PROGRAM

The faculty in the Department of Religious Studies offer a graduate program leading to the M.A. degree for those who wish to enter a doctoral program in the study of religions, for those who wish to teach at the community college level, and for those in nonacademic careers who desire general competence in the academic study of religions. Consult the *Graduate Catalog* for requirements.

RELIGIOUS STUDIES (REL)

REL 100 Religions of the World. (3) F, S
An introduction to the history of religious traditions of the world, including Buddhism, Christianity, Hinduism, Islam, Judaism, and others. Not open to students who have completed REL 200. *General Studies: HU, G.*

REL 200 The Study of Religious Traditions. (3) A
A writing-intensive course introducing analytical skills necessary for understanding religious traditions. Beliefs, practices, and communities of several religious traditions of the world. Not open to students who have completed REL 100. *General Studies: L1/HU, G.*

REL 201 Religion and the Modern World. (3) A
An introduction to the nature and role of religious beliefs and practices in shaping the lives of individuals and societies, with particular attention to the modern world. *General Studies: L1/HU.*

REL 202 Religion and Popular Culture. (3) F, S
Explores various intersectors between religion and the popular media, including music, news, advertising, the visual arts, literature, performance, and film. Lecture, discussion. *General Studies: HU, C.*

REL 203 Saints and Sinners: Explorations in Sacred Biography. (3) F, S
A comparison of the role of biography across religions to examine the process of categorizing people as saints or sinners. Lecture, discussion. *General Studies: HU, H.*

REL 205 Living and Dying. (3) F, S
Ways that religions have understood birth, sexuality and death and the passing of generations. Examples from traditions throughout the world. Lecture, discussion. *General Studies: HU.*

REL 210 Introduction to Judaism. (3) A
The beliefs, ceremonies, festivals, and institutions of Judaism emphasizing the contemporary era. The course presupposes no previous knowledge about Judaism. *General Studies: L1/HU, H.*

REL 225 African American Religion. (3) A
Introduction to the history and development of the African American religious tradition. Lecture, discussion. *General Studies: HU, C.*

REL 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 ASB 240/GCU 240/HIS 240/POS 240. *General Studies: G.*

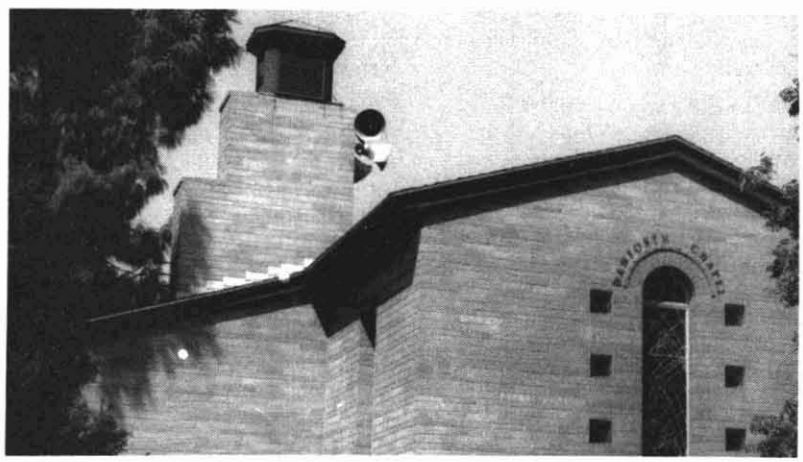
REL 270 Introduction to Christianity. (3) A
The beliefs, ceremonies, festivals, and institutions of Christianity, emphasizing the contemporary era. The course presupposes no previous knowledge about Christianity. *General Studies: HU.*

REL 305 Ritual, Symbol, and Myth. (3) A
Ritual, symbol, and myth as types of religious expression, with examples selected from the nonliterate religions of the world. *General Studies: L2/HU.*

REL 310 Western Religious Traditions. (3) F
Religious traditions of Judaism, Christianity, and Islam, comparing their doctrinal, institutional, and ritual systems and social histories. Lecture, discussion. *General Studies: HU, H.*

REL 315 Hebrew Bible (Old Testament). (3) A
The nature, content, background, historical situation, and message of the books of the Hebrew Bible in English translation. *General Studies: L2/HU, H.*

REL 317 Introduction to Rabbinic Judaism. (3) A
A historical analysis of the thought, literature, and institutions of rabbinic Judaism. *General Studies: HU, H.*



The Danforth Chapel. Tim Trumble photo

REL 320 American Religious Traditions. (3) F, S
Examination of the formation, development, and interaction of major American religious traditions (indigenous, African American, Asian American, and Euro-American). *General Studies: HU, C, H.*

REL 321 Religion in America. (3) F, S
The history of religion in America with attention to issues of historiography, pluralism, gender, race, ethnicity, politics, and social reform. *General Studies: HU, C, H.*

REL 322 Malcolm and Martin. (3) F, S
This course examines and contrasts the lives, ministries, contributions and legacies of Malcolm X and Martin Luther King, Jr. *General Studies: HU, C.*

REL 323 Black Religion: A Biographical Approach. (3) F, S
An examination of the experiences, motivations, and contributions of a number of figures associated with African American religion. *General Studies: HU, C.*

REL 330 Native American Religious Traditions. (3) A
World views and religious thought presented through the art, architecture, literature, music, mythology, ritual, and folklore of representative tribes in North America. *General Studies: HU, C.*

REL 331 History of Native American Religious Traditions. (3) N
The role of religion in Native American history, including missionization, and religious adaptation; prophetic, messianic, and religious revitalization movements. *General Studies: L2/HU, C, H.*

REL 332 South American Indian Religions. (3) F, S
An introduction to the sacred stories, ceremonies, and beliefs of Native South American peoples in their historical contexts. *General Studies: HU, G.*

REL 344 Religion and Values in Japanese Life. (3) S
Japanese values expressed in the life and annual cycles of the family, local and national identities, and popular culture. Lecture, discussion. *General Studies: HU, G.*

REL 345 Asian Religious Traditions. (3) F
Introduction to the major concepts of religious beliefs, rituals, and practices in Hinduism and Buddhism. Lecture, discussion. *General Studies: HU, G.*

REL 350 Hinduism. (3) A
The study of diverse forms of Hinduism through its institutions, literature, folklore, art, and architecture. *General Studies: L2/HU, G, H.*

REL 351 Buddhism. (3) A
Doctrines, practices, and institutions of the Buddhist religion, emphasizing its role in the history and culture of Asian societies. *General Studies: L2/HU, G.*

REL 355 Japanese Cities and Cultures to 1800. (3) S
Relations among ideas and literary, visual, and performing arts of the ancient aristocracy, medieval samurai, and early modern townspeople. Cross-listed as HUM 310. *General Studies: L1/HU, H.*

REL 365 Islamic Civilization, 700–1300. 3) F
An ntroduct on to Is amic re ig on, cu ture, and soc et es from 700 to 1300 *General Studies HU, H.*

REL 366 Islamic Civilization, 1300 to Present. (3) F
Introduct on to Is amic re ig on, cu ture and soc et es from 1300 to present Lecture discuss on. *General Stud es HU, G, H*

REL 371 New Testament. (3) A
Or g ns and terature of ear y Chr st an com mun t es; histor ca nvest gat ons of the types of ora and wr tten trad t on n the New Testa ment *General Stud es· HU*

REL 372 Formation of the Christian Tradition. (3) A
Or g ns deve opment and expans on of Chr s t an ty major themes and tens ons from the New Testament world to the beg nn ng of the M dd e Ages *Genera Stud es HU H.*

REL 373 Women in Judaism. (3) S
A study of the ega social, and cu tura status of Jew sh women in var ous h stor ca and contemporary soc et es. Cross sted as WST 372.

REL 377 Religion in Russia. 3 F, S
Examines the h story of the var ous re g ous trad t ons of Russ a and the former USSR from an 'nterd sc p inary perspect ve *General Stud es HU H.*

REL 379 Religion, Nationalism, and Ethnic Conflict. (3) F S
Exam nes the ro e of re g on n nat ona and ethn c conf ict in the contemporary wor d *Genera Stud es: HU G.*

REL 381 Religion and Moral Issues. 3 A
The manner in wh ch human re g ousness re ates to soc a concerns e g , sexua ty the environment b oeth ca ssues and v o ence *General Stud es L2/HU*

REL 385 Contemporary Western Religious Thought. (3) A
ntroduct on to contemporary Jew sh and Chr st an thought Top cs nc ude re g on and po it cs, prob em of ev nterpretat ons of God, and fem n st theo ogy *General Stud es· L2/HU.*

REL 390 Women and Religion. 3 A
The ro e of women n severa organ zed re gions and/or re g ous sects ncluding a study of myth and symbo s as they are used to es tab sh, ma nta n and enforce sex ro es w th n spec f c rel g ons. *General Stud es HU G*

REL 405 Problems in Religious Studies. (3) F, S
Se ected top cs in re g ous stud es involving students n research nterests of 'nstructor May be repeated for cred t when top cs vary Sem nar Prerequ s te at east 9 semester hours of REL courses or instructor approva

REL 410 Judaism in Modern Times. (3) N
Variety of express ons of Juda sm and Jewishness n the modern per od. Topics may nc ude Amer can Juda sm or re igious re sponses to the Ho ocaust *General Studies: HU, H*

REL 415 The Jewish Mystical Tradition. 3 A
Exam nation of some of the esoter c ore of Juda sm Movements and terature such as Has d sm and Kaba ah are stud ed *General Stud es· HU*

REL 420 Religion in American Life and Thought. 3 A
The nf uence of re gion on Amer can society cu ture, and deas the d st nct ve character of re gion n Amer ca Prerequ s te REL 320 or 321 or equ va ent *Genera Stud es: L2/HU*

REL 426 American Preachers and Preaching: The Sermon in America. 3 N
The fe and work of notab e Amer can preach ers The emergence of the preacher as repre sentat ve of Amer can re g on Prerequ s te· REL 320 or 321 or equ va ent *Genera Stud es. L2/HU*

REL 427 American Religious Thought. 3 N
The thought of representat ve Amer can re i g ous th nkers e Jonathon Edwards W l am E ery Chann'ng Horace Bushne and Re nho d N ebuhr Prerequ s te REL 320 or 321 or equ va ent *General Stud es. HU H*

REL 444 Religion in Japan. (3) F
Re ig on n Japanese h story espec a ly the deve opme t of Japanese Buddh sm and re g on n the modern transformat n f Japan Prerequ s te nstructor approva *Genera Stud es HU G H*

REL 460 Studies in Islamic Religion. 3 A
ssues n the nterpretat on and understand ng of slam c texts h story, s c ety cu ture and r tua s Prerequ s tes. REL 365 and Re g ous Stud es major *or* nstructor approva *General Stud es HU, G.*

REL 470 Religion in the Middle Ages. 3 A
Re g ous aspects of medieva ife and thought; var ety of forms of d ssent, heresy, and reform movements from the 4th to 13th centur es. *Genera Stud es HU H*

REL 471 Reformation and Modern Christianity. (3) A
Protestant Reformat on to contemporary Chr st an movements nc udes factors n the d ssolut on of the Med eva! Chr st an synthe s s variety of reform movements and reforma tion patterns Catho c counter reform mea sures, format on of bera theo ogy ecumen ca movement and the Wor d Counc of Churches *Genera Stud es HU H*

REL 486 Modern Critics of Religion. 3 A
Major theor es and crit ques of re g on among modern soc al, ph losoph ca and rel g ous th nkers *General Stud es HU*

REL 494 Special Topics in Religious Studies. 3 N
Open to a students freshmen by nstructor approva on y Top cs may be selected from var ous areas

REL 498 Pro-Seminar in Religious Studies. 3 A
For students w th a major or m nor emphasis n Re g ous Stud es.

REL 501 Research Methods in Religious Studies. (3 F
An exp orat on of the major themes and meth ods n the study of re ig on with pr mary focus on c ass cal texts Lecture d scuss on

REL 502 Research Methods 'n Religious Studies. 3 F S
An exp orat on f the ma or themes and meth ods n the study of re g on w th pr mary foc s on contemporary texts Lecture d scuss on

REL 591 Seminar. 3 N
Top cs on methodo og ca ssues n the study of re gion Prerequ s te Re g ous Stud es graduate student or instructor approva

REL 598 Special Topics. 3 F S
Top cs are se ected from the fo ow ng areas
a) Chr st an ty Greco Roman Re g on
(b Comparat ve Wester Anc ent Near East, Juda sm
(c) Is am
d Nat ve Amer can Re ig on
e Prob ems n Re g ous Stud es
f Re g on n Amer ca
(g Re ig on n East As a
g Re g on n South As a
Study of Re g on Comparat ve Re g on
(j Western Re g ous Thought Eth cs
May be repeated for cred t

Department of Sociology

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LECTURERS
EVERTS, FINE PADILLA

INSTRUCTOR
WILLIAMS

SOCIOLOGY—B.A.

The B.A. degree in Sociology requires a minimum of 30 hours of Sociology course work and 15 hours in closely related fields Of the 30 required hours, a minimum of 18 hours must be upper division with at least 12 of the 18 upper division hours taken in residence at ASU Main Campus All upper-division courses in the major

NOTE For the Genera Studies requ rement codes such as L1 N3, C, a d H and courses, see pages 84 108. For graduat on requ ements see pages 79–83 For omnibus courses offered but not sted n th s cata og see pages 56–57

must be completed with a grade of "C" or higher. The following courses are required:

SOC	101	Introductory Sociology *SB*	3
		or SOC 301 Principles of Sociology *SB* 3)	
SOC	391	Sociological Research *SB*	3
SOC	395	Social Statistics I *N2*	3
SOC	470	Racial and Ethnic Minorities *SB*	3
		or SOC 474 Afro American in Modern Society *L2/SB C* 3)	
SOC	483	History of Social Thought *L2/SB*	3
		or SOC 485 Sociology of Knowledge *L2/SB* (3	
		or SOC 486 Contemporary Theory *SB* 3)	
Total			15

Sociology majors may complete the remaining 15 required hours through selecting one of two options. For a general sociology preparation, students must choose five courses that will sample at least three of the six sociology content areas:

1. family,
2. intergroup relations and social psychology;
3. political/comparative historical,
4. social problems and processes;
5. stratification/occupations/organization; or
6. urban sociology demography.

If majors desire a narrower preparation in a specialized area of sociology, they may complete the remaining 15 hours through the focus area option. At present, five substantive focus areas have been articulated: family issues, urban issues, diversity issues, work/organizational issues, and health issues Students choosing this option to fulfill major requirements must complete two required focus area courses and select SOC 484 Internships are available within the focus area option.

Information concerning the two options for fulfilling major requirements is available in the Department of Sociology office, the Sociology Advising Center, and on the Internet at www.asu.edu/clas/sociology/undergraduate/advising.

MINOR IN SOCIOLOGY

The minor in Sociology requires 18 hours, of which 12 hours must be upper division courses, with at least 6 upper division hours completed at ASU Main Campus. The required courses are as follows:

SOC	101	Introductory Sociology *SB*	3
		or SOC 301 Principles of Sociology *SB* 3	
One of the following			3
SOC	391	Sociological Research *SB* 3)	
SOC	395	Social Statistics I *N2* 3)	
SOC	483	History of Social Thought *L2/SB* 3)	
		or SOC 485 Sociology of Knowledge *L2/SB* 3)	
		or SOC 486 Contemporary Theory *SB* (3	

The remaining four courses consist of sociology electives.

SECONDARY EDUCATION—B.A.E.

Social Studies. The major teaching field of social studies education consists of 63 semester hours, of which 30 hours may be in criminal justice, economics, geography, history, political science, psychology, and sociology and are exactly those courses required for the B.A. degree in Sociology. Of the remaining hours, two groups of 12 hours each and one of six hours are generally taken in related social sciences plus SED 480 Special Methods of Teaching Social Studies

The minor teaching field consists of 24 semester hours, at least six of which must be upper division. SOC 101 or 301, and SOC 470 Racial/Ethnic Minorities or SOC 474 Afro American in Modern Society are required. The remaining 21 hours must be approved by the sociology advisor in consultation with the student and must include at least one course from at least four of the following seven areas:

1. family,
2. intergroup relations and social psychology;
3. political/comparative-historical;
4. racial/ethnic relations;
5. social problems and processes;
6. stratification/occupations/organization; or
7. urban sociology/demography.

GRADUATE PROGRAMS

The faculty in the Department of Sociology offer programs leading to the M.A. and Ph.D. degrees. Consult the *Graduate Catalog* for requirements.

SOCIOLOGY (SOC)

SOC 101 Introductory Sociology. 3) F, S SS
Fundamentals of sociology organization of human groups and society, processes of interaction, and social change Not open to students who have credit for SOC 301 2 hours lecture 1 hour discussion *General Studies SB*

SOC 301 Principles of Sociology. (3) F, S SS
Intensive and critical analysis of the concepts of sociology Not open to students who have credit for SOC 101. *General Studies SB*

SOC 312 Sociology of Adolescence. (3 F S
Cultural values and the social processes that help explain the development of the phenomenon of modern adolescence including investigation of adolescent subcultures and cross-cultural references. Prerequisite SOC 101 or 301 or instructor approval *General Studies SB*

SOC 315 Courtship and Marriage. (3) F, S SS
An overview of courtship, marriage and related processes focusing on problematic aspects of these institutions from the sociological perspective Prerequisite SOC 101 or 301 or instructor approval *General Studies SB*

SOC 318 Overview of Aging. (3 F
Multidisciplinary introduction to gerontology Explores the characteristics experiences needs, and problems of older persons Prerequisite SOC 101 or 301 or instructor approval *General Studies SB*

SOC 321 Sociology of Work. (3 S
Social and cultural analysis of industry Occupational roles status, and social participation of workers Prerequisite: SOC 101 or 301 or instructor approval. *General Studies SB*

SOC 331 Environmental Sociology. (3) F
Analysis of human organizational responses to population growth technological change, and environmental stressors on both a national and global scale Prerequisites. SOC 101 or 301 or instructor approval *General Studies SB*

SOC 332 Urban Sociology. (3) F, S
Growth characteristics, and problems of the modern city Prerequisite SOC 101 or 301. *General Studies SB G*

SOC 333 Population. (3) F S, SS
Theories of population change births deaths, and migration population policies Prerequisite SOC 101 or 301 *General Studies. SB, G*

SOC 340 Sociology of Deviant Behavior. (3) F S, SS
A sociological analysis of stigmatized behaviors and conditions, including the causes, effects, and management of stigma Prerequisite SOC 101 or 301 or instructor approval *General Studies SB*

NOTE. For the General Studies requirement codes (such as L1 N3, C, and H and courses see pages 84–108 For graduation requirements see pages 79–83. For omnibus courses offered but not listed in this catalog see pages 56–57

SOC 341 Modern Social Problems. (3) F, S SS
Race re ations poverty, unemployment, and other current ssues. Prerequ s te SOC 101 or 301 or instructor approval. *General Stud es· SB*

SOC 352 Social Change. 3) F S
Patterns of soc a change res stance to change, and change producing agenc es and processes. Prerequ s te SOC 101 or 301 *General Stud'es: SB, G, H.*

SOC 360 Sociological Psychology. (3 F S
Interact on patterns between the soc ocu tura order and nd viduals soc a izat on process; norms, ro es and statuses co ect ve behav or Prerequ s te SOC 101 or 301 *General Stud es SB*

SOC 361 Variant Sexuality. (3) F
Soc o og'ca research and theor es dea ng w th homosexua ty transvest'sm, transsex ual sm, and other vanat ons n sexua or enta t on and gender dent ty Prerequ s te SOC 101 or 301 *General Studies SB*

SOC 365 The Sociology of Mass Communication. (3) F S
A soc o og cal exp orat on of the major mass med a as a commun cat ve process n Amer can soc ety Prerequ site. SOC 101 or 301 or nstructor approva *General Stud es SB.*

SOC 368 Sociology of Everyday Life. (3) F, S
Exam nat on of rout ne everyday behav or as t re ates to problems of soc al order control, change, dent ty and re at onsh ps Prerequ s te: SOC 101 or 301 or nstructor approva

SOC 391 Sociological Research. (3) F S SS
Methods of soc o og ca research including the fundamental assumpt ons under y ng re search and some pract ca experience in re search des gn data co ection techn ques, and data ana ysis Prerequ s te SOC 101 or 301 or instructor approva *General Studies SB*

SOC 395 Social Statistics I. (3) F, S SS
Appl cat on of descr ptive and nferent a stat s t cal methods to research prob ems n soc o - ogy. Prerequis tes. SOC 101 (or 301) 391, N1 course *General Stud es N2*

SOC 415 The Family. (3) F S, SS
The fami y considered from the nst tut ona v'ewpoint· ts h storical development and ts adaptat on to a chang ng cu ture the fam ly system n many cu tures Prerequ s te· SOC 101 or 301 or nstructor approva *Genera Stud es· SB*

SOC 416 Marriage Problems in Contemporary Society. (3) S
Marita and fam y prob ems n today s soc ety from the viewpoint of personal and cu tura adjustment Prerequ s tes SOC 101 (or 301) and an add't ona 3 hours n soc ology *or* instructor approval *General Studies L2/SB*

SOC 417 Family Violence. 3) F, S
Study of current research and theory on sev era aspects of domest c v'olence, nc ud ng chi d maltreatment, spousa aggress on, and courtsh p v o ence Prerequ s te nstructor ap proval. *General Stud es. SB*

SOC 418 Aging and the Life Course. (3) F S
Soc a aspects of ag'ng. Theoret ca and meth odo og cal perspect ves and problems of ag ng such as fe sat sfact on ret rement and adjustment to role oss Prerequ s te SOC 101 or 301 or nstructor approva *General Studies SB*

SOC 420 Sociology of Religion. (3) S
nterre at onsh p of culture soc ety, and re i g on rel g on and socia strat f cation rel g ous, econom c, and pol tical nst tutions soc al change and rel g on. Emphasis on Amerr can society and nstitutions. Prerequisites. ASB 102 (or SOC 101 or 301) and an add t ona 3 hours n soc o ogy *or* nstructor ap prova *Genera Stud es L2/SB*

SOC 421 Sociology of Education. (3) S
Contemporary socio og ca perspect ves are used to exam ne effects of schools and school ng on nd v dua s and soc ety Prerequi s te SOC 101 or 301 or instructor approval.

SOC 422 Sociology of Complex Organizations. (3 F
Soc o og ca stud es of government agenc es, industr a firms, abor un ons, m l tary estab shments, and other arge scale organ za t ons Prerequ s te 6 hours in soc o ogy n c ud ng SOC 101 or 301 *or* instructor ap prova *Genera Studies L2/SB*

SOC 423 Social Class and Stratification. (3) S
Soc a c asses and the funct on of these group ngs in a soc ety Prerequ s tes SOC 101 (or 301) and an addit ona 3 hours in soc ology *or* nstructor approva *General Stud es L2/SB.*

SOC 424 Politics of Women's Health. (3) S 1999
Women as health care workers and issues of hea th, i ness and hea th care for women. Prerequ s te SOC 101 or 301 or instructor approval

SOC 427 Sociology of Health and Illness. (3) F
Soc al aspects of physical and mental i ness and soc o og ca ana ys s of the hea th care system and 'ts pract t oners Prerequ s te: SOC 101 or 301 or nstructor approval. *Gen eral Stud'es L2/SB*

SOC 428 AIDS and Society. (3) F
Th s course provides a sociohistorical per spect ve on st gma and ness n genera and on A DS in spec f c Prerequ site: SOC 101 or 301 or nstructor approva

SOC 429 Sociology of Law. (3) S
Examinat on of aw as an nst tut on· ts ori gins operations and consequences. Empha sis on contemporary legal ssues and prob lems Prerequ s te· SOC 101 or 301 *Genera Studies SB*

SOC 433 Demographic Methods. (3) S
Science of populat on ana ys s, prob ems in measurements of size composition and changes n popu at'on Prerequ s te SOC 101 or 301. *General Stud'es. SB*

SOC 446 Sociology of Crime. (3) F
The process of cr m na 'zation exp oring the behav or of the def ners of cr me and the be hav or of those def ned as cnm nals Prerequ sites: SOC 101 (or 301) and 340 *or* nstructor approva *General Stud es SB*

SOC 451 Comparative Sociology. (3) F
Cross-cultura study of bas c soc a inst tu t ons the methodo ogy of cross-cu tura re search. Prerequ s te: ASB 102 or SOC 101 (or 301) or nstructor approval. *General Stud es: SB G*

SOC 455 Collective Behavior. (3) S
Soc al causes and consequences of such non nstitutiona zed forms of behav or as crowds cults publ cs, soc a movements, and revolut ons. Prerequ s tes SOC 101 (or 301) and an add t ona 3 hours n sociology *or* n structor approval *General Studies SB.*

SOC 456 Political Sociology. (3) S
Soc al factors assoc ated with vot ng; nature and structure of the electorate and po it ca part es and the nature of nationa and nterna t ona power structure. Prerequ s te SOC 101 or 301 or nstructor approva *Genera Studies. SB, G*

SOC 464 Women's Roles. (3) S
Soc ological analysis of the deve opment, na ture and consequences of trad t onal and a ternative ro es of women n contemporary so ciety. Prerequ s te SOC 101 or 301 or nstruc tor approva *General Stud es L2/SB, C.*

SOC 470 Racial and Ethnic Minorities. (3) F S SS
Prob ems of m nor ties n the United States and n other rac a ly and ethnica y heteroge neous societ es Evaluat on of theories of prejud ce and of research deal ng w th d s cr minat on, desegregat on and ass m ation Lecture, discuss on Prerequ site. SOC 101 or 301 or instructor approval. *General Stud es. SB*

SOC 474 Afro-American in Modern Society. (3) F, S, SS
Socia and cu tura heritage of black Amer cans, ach evements and current trends. Lec ture d scuss on Prerequ site SOC 101 or 301 or instructor approva *General Stud es L2/SB C.*

SOC 483 History of Social Thought. (3) S SS
Soc a thought n human cu ture Background of modern socio ogy Prerequ site: SOC 101 or 301 *General Studies L2/SB*

SOC 485 Sociology of Knowledge. 3) F
Re ationsh p between soc a cond t ons and the deve opment of know edge n modern so c ety Prerequisite SOC 101 or 301 or nstruc tor approva *General Studies L2/SB*

SOC 486 Contemporary Theory. (3) S
Contemporary ssues and crises 'n soc'a theory w th major focus on particular theor sts. deo og ca factors n theory ph losoph cal s sues the nature of theory and its re ationsh p with methodo ogy Prerequ site SOC 101 or 301 or nstructor approva *Genera Stud es SB*

SOC 501 Practicum in Survey Research. (3) F, S
A research practicum n survey f e d work, ana ys s, and reporting n the Phoenix Area Study Prerequisite: SOC 391 or equ va ent

SOC 502 Practicum in Survey Research. 3) F, S
Continuat on of SOC 501 Prerequisite SOC 501

SOC 503 Sociology as a Profession I. (1) F Becom ng and work ng as a soc o og st, n c ud ng how to wr te a vita choose a thes s top c or f nd dissertat on data Prerequis te· graduate Soc o ogy major.

SOC 504 Sociology as a Profession II. (1 S Becom ng and working as a soc o og st in c ud ng how to wr te a v ta choose a thes s top c or f nd d ssertat on data Prerequ s te graduate Soc o ogy major

SOC 505 Social Statistics II: Multivariate Analysis. 3) F, SS
Ana ys s of variance, mu t'p e regress on dummy variable regress on path ana ys s, and re ated top cs. Computer app cat on to p ob em solv ng Prerequisites SOC 395 (or equ va ent a prof c ency examinat on

SOC 507 Social Statistics IIIA: Categorical Data Analysis. 3 F
Log st c and og- near mode s through computer app cat ons Soc a mob ty, dynam c ana ys s and d scr m ate analys s may a so be nc uded Prerequ s te: SOC 505 or nstruc- to approva

SOC 508 Social Statistics IIIB: Structural Equation Analysis. 3) S
Structura equat on mode s are taught using L SREL and other comp ter packages Top cs nc ude mu t p e group ana yses and ord na endogenous var ab e mode s Prerequ s te SOC 505 or nstructor approva

SOC 509 Social Statistics IIIC: Event History Analysis. 3 F S
Proportiona hazards mode s and other meth ods for ana yz ng ong tud nal data and estab sh ng hazard rates of events for exp oratory var ab es Prerequ s te SOC 505 or equ va ent

SOC 515 Studies of the Family. (3 S
Current deve opments n the study of marr age and the fam y Prerequ s te nstructor ap- prova

SOC 585 Development of Sociology. 3) F
Major soc'ological theorists nc uding Durkhe m Weber Marx Parsons Merton Dahrendorf Homans, and Mead Prerequ site nstructor approva

SOC 586 Contemporary Sociological Theory. (3) S
Ana ys s of major theor es nc ud ng struc tura funct ona , conf ct soc a exchange, symbo c 'nteract on and role theory Pre requ s te· nstructor approva

SOC 587 Contemporary Issues in Sociology. 3 S
Ph osophy of soc a sc ence Contemporary ssues n soc olog ca theory and methods. Prerequ s te nstructor approva

SOC 588 Methodological Issues in Sociology. (3 S
Basic methodo og cal ssues n the appl cat on of sc entif c methods to the study of human soc a fe Emphasis on m ted number of ma jor works, w th contrast ng approaches to is- sues

Department of Speech and Hearing Science

M. Jeanne Wilcox
Chair
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www.asu.edu/clas/shs

PROFESSORS
S BACON CASE DORMAN
LaPO NTE, MOWRER, W LCOX

ASSOCIATE PROFESSOR
SINEX

ASSISTANT PROFESSORS
HADLEY LISS, RISPOL , SHARMA

CLINICAL ASSOCIATE PROFESSORS
C BACON, BROWN MiNTZ REMSON

CLINICAL ASSISTANT PROFESSORS
COOK MURPHY, WEXLER

LECTURER
HOWARD

INSTRUCTORS
BARTO BEAL-GEVARTER
BIGWOOD NEUMANN
O BRIEN, QU NN

SPEECH AND HEARING SCIENCE—B.S.

The B.S. degree in Speech and Hear ing Science consists of 45 semester hours of speech and hearing science courses emphasizing the developmental and scientific aspects of language, speech, and hearing The following courses, or their approved equivalents, are required:

SHS	250	Introduction to Phonetics	3
SHS	310	Anatomical and Physiolog cal Bases of Speech	3
SHS	311	Physical and Physiological Bases of Hearing	3
SHS	367	Language Sc ence *SB*	3
SHS	375	Speech Science	3
SHS	376	Psychoacoustics	3
SHS	384	Hear ng D sorders	3
SHS	401	Introduction to Audiologic Evaluation	3
SHS	402	Modifv ing Communicative Behavior	3
SHS	431	Developmental Speech Disorders	3
SHS	45(	Observatio	1
SHS	465	Speech and Language Acquisition *SB*	3
SHS	470	Deve opmental Language Disorders	3
SHS	496	Aural Rehabilitation	3
Total			40

The remaining speech and hearing science courses to complete the major are determined by the students in con sultation with an advisor A list of ap proved electives is available through the department Supporting courses from related fields must include the fol lowing or their equivalents

BIO	201	Human Anatomy and Ph ys ology I *S2*	4
MAT	170	Precalculus *NI*	3
PGS	10	Introduction to Psychology *SB*	3
PSY	230	Introduction to Statistics *N2*	3
Total			13

GRADUATE PROGRAMS

The faculty in the Department of Speech and Hearing Science offer pro grams leading to the M.S. degree in Communication Disorders and Ph.D. degree in Speech and Hearing Science. Consult the *Graduate Catalog* for re quirements

SPEECH AND HEARING SCIENCE (SHS)

SHS 105 Introduction to Human Communication Disorders. (3) F S
ntroduct on to hear ng anguage, and speech prob ems n ch dren and adu ts Lect re dem onstrat on

SHS 174 American Sign Language I. 4) F, S
Bas c recept ve express ve conversat ona ski s, bas c grammar a d syntax ru es Or en- tat o to deaf ess and deaf cu ture Lecture, dr practice d a og e, and d scuss on

SHS 175 American S'gn Language II. 4 F, S
Further deve opment of recept ve express ve conversat n sk s n ASL; f nger spe ng Cont nued exp orat on f deaf cu ture Lecture, d scuss on dr pract ce Prerequ s te SHS 174

SHS 250 Introduction to Phonetics. (3 F
An ntroduct on to Eng sh phonet cs with em phas s on phonet c transcr pt on art cu ation phono ogy and d sorders of speech

SHS 274 American Sign Language III. (4) F S
Develop greater fluency and speed Emphas s on deaf cu ture and fo k ore nc ud ng storyte ng and d oms Beg nn ng techn ca and nter- pret ng s gns Lecture d scuss on, dr prac t ce Prerequ s te SHS 175

NOTE For the Genera Stud es requ rement codes (such as L1 N3, C, and H), and courses, see pages 84 108 For graduat on requ rements see pages 79–83 For omn bus courses offered but not sted n th s cata og see pages 56–57

SHS 275 American Sign Language IV. (4) F S
ASL grammar and syntax conceptua y accu rate use of vocabu ary, deaf culture text analys s and translat on Presentat ons f nger spel ng, dr i s and stor e . Prerequ s te SHS 274.

SHS 310 Anatomical and Physiological Bases of Speech. 3 F
A noncadaver c study of anatom ca systems that underl e human speech and language in cluding resp rat on, phonat on art cu at on and re ated nervous system processes

SHS 311 Physical and Physio ogical Bases of Hearing. 3 F
Study of the phys ca character stics of sound and of the structure and funct on of the human auditory system Prerequ s tes MAT 117 PHY 111 113

SHS 367 Language Science. (3 F
Normative aspects and ntegrat on of an guage structure comprehens on, a d produc t on n chi dren and adu ts *Genera Studies· SB*

SHS 375 Speech Science. 3 F
Normat ve aspects of speech hearing and anguage Prerequ s tes: SHS 310, 311

SHS 376 Psychoacoustics. 3 S
ntroduct on to acoust cs cochlear anatomy and physio ogy and the percept'on of sound. Prerequ s te SHS 311 or nstructor approva

SHS 384 Hearing Disorders. 3 S
Patho og es of the ear and assoc ated pe ph eral and centra hear ng d sorders character ist cs management and effects on commu cat on. Prerequ s tes SHS 311 376

SHS 401 Introduction to Audiologic Evaluation. (3 F
Measurement of the bas c aud o ogic test bat tery 'nc ud ng aud ograms mm ttance mask ng, and speech recogn t on Cross sted as SHS 501 Prerequ s tes SHS 311 and 376 and 384 *or* equ va ents

SHS 402 Mod fying Communicative Behavior. 3) S
Princ ples and techniques of mod fying speech and anguage behavior Prerequ s te SHS 250 or equ va ent

SHS 431 Developmental Speech Disorders. (3 S
Introduct on to the nature of art cu ation f u ency, resonance, and vo ce d sorders n ch d hood. Prerequ sites· SHS 250 and 310 *or* equiva ents

SHS 450 Observation. (1 F, S
Opportun ty to obtain observat on exper ence at the ASU Speech and Hear ng Center or at externa s tes Prerequ s te nstructor ap prova

SHS 465 Speech and Language Acquisition. (3) S, SS
Speech and anguage deve opment in the nor mal ch d Cross sted as SHS 565 Prerequ s te: SHS 367 or equ va ent *Genera Studies· SB*

SHS 470 Developmental Language Disorders. (3) F
ntroduct on to the nature and treatment of language d sorders n ch dren Prerequisite: SHS 465 or instructor approval

SHS 483 Professional Issues in Communication Disorders. 3) F
Top cs re ated to profess ona cert f cat on ac cred tat on code of ethics graduate educat on and other ssues n speech- anguage patho ogy and aud o ogy

SHS 485 Acquired Speech and Language Disorders. (3) S
ntroduct on to acqu'red speech and anguage d sorders across the ifespan Prerequ s'tes: SHS 250 310

SHS 494 Special Topics. (3) F, S
Top cs may be se ected from the fo ow ng
a) Hear ng D sorders
b) Research
c) Speech and Language Disorders
May be repeated for cred t Prerequ s te n structor approva

SHS 496 Aural Rehabilitation. (3) S
Approaches to aura rehab 'tation of ch ldren and adults. ntroduction to educat ona aud o - ogy and ass stive sten ng dev ces Cross- sted as SHS 596 Prerequ s tes SHS 375 and 376 and 401 *or* equ valents.

SHS 501 Introduction to Audiologic Evaluation. 3 F
Measurement of the bas c aud o og c test bat tery nc ud ng aud ograms mm ttance mask ng, and speech recogn t on Cross sted as SHS 401 Prerequ s tes SHS 311 and 376 and 384 *or* equ va ents

SHS 502 Differential Diagnosis for Audiology. (4) F
D fferent a d agnos s of coch ear and retro coch ear disorders, and assessment of vest bu ar system. 3 hours ecture, 2 hours ab. Prerequ s te SHS 401 or 501 or equivalent.

SHS 504 Hearing Aids. (4 S
Operat on app cat on and f tt ng of amp f ca t on dev ces for the hear ng mpa red 3 hours lecture, 2 hours ab. Prerequ site: SHS 401 or 501 or equ valent.

SHS 505 Computers and Current Technology in Audiology and Speech-Language Pathology. 3) F
Computer app cat ons and current techno ogy as app ed to serv ce adm n strat on and del v ery n the f e ds of aud o ogy and speech-lan guage patho ogy Lecture ab

SHS 508 Pediatric Audiology. (3) F
Aud o og c assessment screen ng, and deve opment cons derat'ons for 'nfants and young ch dren Prerequis'te: SHS 401 or 501 or equ va ent

SHS 510 Advanced Hearing Science. (3) N
Anatom ca phys o og ca , and psychophys ca aspects of aud t on Prerequ s te SHS 376 or nstructor approva

SHS 511 Auditory Perception by the Hearing Impaired. (3) F 1998
A study of how and why sensor neura hearing oss a ters the perception of sound. Prerequ - s te SHS 376 or nstructor approval

SHS 512 Medical Aspects of Speech and Hearing. (3) F
Corre at on of h story and phys ca f nd ngs w th patho og c phys ology and test results n speech and hear ng abnorma ties

SHS 515 Audiologic Instrumentation and Calibration. (3) S
E ectron c nstruments used to produce, mod fy and measure characterist cs of sound. Measurement standards and methods for ca i brat on of aud o og c equ pment Lecture ab. Prerequ s te SHS 401 or 501 or equ va ent.

SHS 516 Auditory Evoked Potentials. (4) S
Cont nuat on of SHS 502 'nc ud ng e ectro- phys o og c assessment of per phera and cen tra aud tory nervous system Lecture, ab Prerequ s te SHS 502

SHS 545 Speech Perception by the Hearing Impaired. 3) F
Speech perceptua problems of the hear ng mpa red nc ud ng those who have cochlear mp ants. Prerequ s te SHS 375 or nstructor approva

SHS 552 Otoacoustic Emissions as a Diagnostic Tool. (3) F 1998
Study of the types of otoacoust c em ss ons their theoret cal mpl cat ons and app cat on to c in cal d agnost cs. Lecture d scuss on, ab Prerequ s te SHS 376 or nstructor approva

SHS 555 Cochlear Implants. 3) S
Current status of coch ear mp ant research and development Prerequ s tes SHS 504 and 545 *or* nstructor approva

SHS 565 Speech and Language Acquisition. (3) S
Speech and language deve opment n the nor ma chi d Cross isted as SHS 465 Prerequ s te SHS 367 or equ va ent.

SHS 566 Psychology of Language. 3 S
The psycho ngu stic study of the production and comprehens on of anguage across the fespan

SHS 567 Neural Bases of Communication Disorders. 3) F
Neuroscience and its app cat on to matters of norma and d sordered commun cat on Pre or corequ s te SHS 310 or equ va ent

SHS 571 Augmentative Communication and Language Programming. (3) S
Focus on nd v dua s across the age span who are or who are at r sk for be ng unab e to com municate w th spoken language Lecture, ab.

SHS 572 Language Assessment and Intervention in Early Childhood. (3) F
Focus on the birth to 5 year o d popu at on who are at risk for or have commun cat on and language d sab it es. Prerequ s te· SHS 470 or equ va ent

SHS 573 Language Assessment and Intervention with School-Age Populations. 3) S
Focus on ater language deve opment ngu s t c demands of academ c sett ngs assess- ment and ntervent on strateg es for o der ch dren and adolescents Prerequ s te SHS 565 or equ valent.

SHS 574 Fluency Disorders and Treatment. (3) F
Phenomena etio ogy assessment, and theo- r es of stutter ng are presented fol owed by various treatment procedures for ch dren and adu ts who stutter. Prerequ s'te: SHS 431 or equ va ent.

SHS 575 Aphasia and Related Neurogen c Language Disorders. 3 S
Assessment and treatment of acquired neuro- ingu st c impairment Prerequ s te SHS 567.

SHS 576 Neuromotor Speech Disorders. 3 S
Eva uat on and treatment of the dysarthr as and aprax a of speech. Emphas s on acqu red adu t d sorders.

SHS 577 Craniofacial Disorders of Communication. (3) S, SS
Commun cation d sorders re ated to anoma- es of the cran ofac a structures nc ud ng orofac a c eft ng of the l p and pa ate. Prereq- u s te SHS 310 or equ va ent.

SHS 578 Disorders of Voice. (3) S
Communication disorders related to dysfunction of the phonatory and resonance systems of voice production, assessment, and treatment. Prerequisite: SHS 310 or instructor approval.

SHS 579 Feeding and Swallowing Disorders Across the Lifespan. (3) F
Focus on individuals across the age span who have feeding and/or swallowing disorders. Assessment and treatment strategies are presented. Prerequisite: SHS 567.

SHS 580 Clinical Practicum. (1–6) F. S. SS
Supervised practicum in audiology or speech-language pathology. 1 hour staffing and 3 hours of client contact per week per hour of credit. May be repeated for credit. Prerequisites: instructor approval; student must not have provisional admission status.

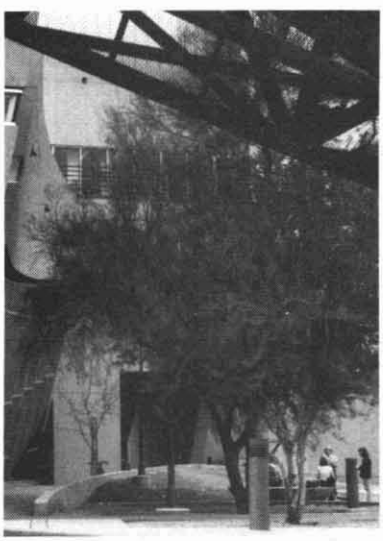
SHS 582 Differential Diagnosis of Communication Disorders. (3) S
Procedures for assessing speech/language disorders in children and adults. 3 hours lecture, 2 hours lab. Prerequisites: SHS 250 and 310 and 465 and 567 *or* equivalents.

SHS 584 Internship. (1–6) F. S. SS
Off-campus directed experiences in audiology or speech-language pathology. May be repeated for credit. Prerequisites: SHS 580; student must consult with coordinator before registration.

SHS 585 Articulation and Phonology: Assessment and Intervention. (3) S
Assessment and treatment of developmental articulation and phonological disorders. Prerequisites: SHS 250 and 310 *or* equivalents.

SHS 591 Seminar. (3) F. S. SS
Selected topics regularly offered:
(a) Autism and Pervasive Language Disorders
(b) Multiply Handicapped Child

SHS 596 Aural Rehabilitation. (3) S
Approaches to aural rehabilitation in children and adults. Introduction to educational audiology and assistive listening devices. Cross-listed as SHS 496. Prerequisite: SHS 401 or 501 or equivalent.



Exterior of the John J. Ross-William C. Blakley Law Library. Tim Trumble photo

Women's Studies Program

Mary Logan Rothschild
Director
(EC A209) 602/965–2358
www.asu.edu/clas/womens_studies

WOMEN'S STUDIES CORE FACULTY
Professor: Rothschild; Associate Professor: Ferraro; Assistant Professors: Gutierrez de Soldatenko, Klinger, Lind, Scheiner; Academic Professional: Hopkins

ANTHROPOLOGY
Professor: Koss-Chiono; Associate Professor: Brandt

ART
Professors: Codell, Magenta; Associate Professors: Fahlman, Schleif

ART HISTORY
Assistant Professor: Wolfthal

CHICANA AND CHICANO STUDIES
Professor: Ruiz

COMMUNICATION
Professor: Valentine; Associate Professors: Carlson, Nakayama; Assistant Professors: Flores, Kent

CURRICULUM AND INSTRUCTION
Professor: Edelsky; Associate Professor: Wilson

EDUCATION
Associate Professor: Guzzeti

EDUCATIONAL MEDIA AND COMPUTERS
Associate Professor: McIsaac

ENGLISH
Professors: Lightfoot, Nilsen, Parker-Rhodes, Richard; Associate Professors: Adams, DeLamotte, Gutierrez, Horan, Morgan, Sensibar; Assistant Professors: McCabe, Pritchard, Tohe

EXERCISE SCIENCE AND PHYSICAL EDUCATION
Professor: Wells; Assistant Professor: Swan

FAMILY RESOURCES AND HUMAN DEVELOPMENT
Associate Professor: Martin

GEOGRAPHY
Professor: Burns

HEALTH ADMINISTRATION AND POLICY
Professor: Kronenfeld

HISTORY
Professors: Fuchs, Giffin, Lavrin, Rothschild, Ruiz, Warnicke; Associate Professor: Stoner; Assistant Professors: Gray, Gullet, Hendricks

JUSTICE STUDIES
Professor: Johnson; Associate Professors: Romero, Zatz; Assistant Professor: Menjivar

LANGUAGES AND LITERATURES
Professors: Ahern, Foster, Losse; Assistant Professors: Galindo, Gruzinska; Instructor: Goodman

MANAGEMENT
Associate Professor: Cook

MUSIC
Associate Professor: Williamson

NURSING
Associate Professor: Kenney; Assistant Professor: Boychuck

PHILOSOPHY
Associate Professor: McGregor

PLANNING
Assistant Professor: Wasserman

POLITICAL SCIENCE
Associate Professor: Dantico; Assistant Professor: Bower

PSYCHOLOGY
Professors: Berstein, Chassin, Eisenburg, Russo; Assistant Professor: Saenz

PSYCHOLOGY IN EDUCATION
Professors: Hackett, Kerr; Associate Professor: Moore

RECREATION MANAGEMENT AND TOURISM
Professor: Allison

RELIGIOUS STUDIES
Assistant Professor: Fessenden

SOCIAL WORK
Professor: Coudroglou

SOCIOLOGY
Professors: Gordon, Laner, Miller-Loessi, Weitz; Associate Professor: Benin; Assistant Professor: Agadjanian

THEATRE
Professor: Knapp

The Women's Studies Program is an interdisciplinary university program housed in the College of Liberal Arts and Sciences. Information on faculty affiliation is provided for reference.

WOMEN'S STUDIES—B.A. OR B.S.

The B.A. or B.S. degrees in Women's Studies consists of 45 hours, of which 33 must be taken from WST prefixes or from other prefixes designated as part of the major. The other 12 must be in closely related fields chosen in consultation with an advisor. At least 36 of the 45 semester hours re-

quired for the major must be completed in upper division courses In addition, for the B.S. degree, students must complete six hours in statistics, computer science, or quantitative research methods. This sequence must be approved by the Women's Studies Program advisor.

Required Courses. Students must complete the following courses:

WST	100	Women and Society *SB, C* or WST 300 Women in Contemporary Society *SB, C*	3
WST	376	Introduction to Feminist Theory *L1, C*	3
WST	484	Internship	3
WST	498	PS Theoretical Issues in Women's Studies *L2*	3
Total			12

Students must also complete three other courses:

1. an upper division course that provides a historical perspective on the lives and contributions of women;
2. an upper division course that provides a humanities or fine arts perspective on the lives and contributions of women, and
3. an upper division course on women in non Western societies or a course on minority or ethnic women in American society.

A list of approved courses is available each term in the program office.

No course may be used to satisfy more than one requirement.

Electives in Closely Related Fields. Majors must complete 12 hours of courses in fields closely related to women's studies. These courses may be used to satisfy the general education requirements in the College of Liberal Arts and Sciences.

MINOR IN WOMEN'S STUDIES

The Women's Studies minor consists of 18 semester hours. The following courses are required:

WST	100	Women and Society *SB, C* or WST 300 Women in Contemporary Society *SB, C*	3
WST	376	Introduction to Feminist Theory *L1 C*	3
Total			6

Twelve additional hours of approved women's studies courses must be taken after consultation with a women's studies advisor.

Students pursuing a minor must register at least one semester before graduation and are encouraged to meet with the women's studies academic advisor early in their course of studies.

CERTIFICATE PROGRAM IN WOMEN'S STUDIES

The certificate program is equivalent to an interdisciplinary minor, consisting of 21 semester hours. Students pursuing a certificate must consult with the women's studies advisor. See page 309 for a description of the certificate program.

GRADUATE STUDIES

Although the Women's Studies Program does not offer a graduate degree, it is possible to pursue a graduate degree in some existing programs with a thesis or dissertation topic related to women's studies. Information on such programs can be obtained from the Women's Studies Program office

COURSES IN WOMEN'S STUDIES

Additional courses appear as Special Topics and vary semester to semester. A list of approved interdisciplinary courses that count toward the 36 hours of requirements for Women's Studies is available each term in the program office.

WOMEN'S STUDIES (WST)

WST 100 Women and Society. (3) F, S
Interdisciplinary introduction examining critical issues in women's studies Not open to students who have credit for WST 300. *General Studies SB C*

WST 300 Women in Contemporary Society. (3) F S SS
Intensive interdisciplinary examination of such topics as gender roles work, education, sexuality, politics, health and law. Not open to students who have credit for WST 100. *General Studies. SB C*

WST 372 Women in Judaism. (3) S
The impact of feminism on the legal, social and cultural status of Jewish women in various historical and contemporary societies Cross-listed as REL 373.

WST 373 Latina/Chicana Issues. (3) F, S
Course examines the roles Mexican American, Chicana, and/or Latina immigrant women play in historical, social, and political in the United States. Prerequisite WST 100 or 300 or instructor approval *General Studies SB C*

WST 375 Women and Social Change. 3) S
Combines research and theory on a contemporary social problem with a community action experience focusing on women's social change initiatives. Lecture, field placement *General Studies C*

WST 376 Introduction to Feminist Theory. 3) F S
Introduction to feminist theories and exploration of the intersection of gender, race ethnicity and class through critical analyses Prerequisite: WST 100 or 300 *General Studies L1 C*

WST 380 Gender, Race, and Class. (3) SS
Cultural diversity, class and gender issues in American social life are explored Lecture seminar analysis papers and writing *General Studies SB C*

WST 413 Lesbian Culture: Images and Realities. (3) S
Explores aspects of lesbian experience from sociological psychological, historical political and literary critical perspectives. Lecture, discussion Prerequisite WST 100 or 300 or instructor approval *General Studies· HU C.*

WST 457 Women in Developing Countries. (3) F
Economic sociopolitical and demographic contexts for understanding women's roles related to health family, work, education and community in developing countries Prerequisite 6 hours of social science credit or instructor approval *General Studies SB G*

WST 460 Women and the Body. 3) F
An interdisciplinary look at how representations of woman as body permeate culture and affect a woman's sense of self Lecture, discussion Prerequisite WST 100 or 300 or instructor approval *General Studies· SB C*

WST 464 Voices and Visions. 3) F, S
Explores the contributions of visionary women in the humanities varying from semester to semester. Repeatable for different topics. Lecture, discussion Prerequisite WST 100 or 300 or instructor approval. *General Studies HU C*

WST 470 Women and Popular Culture. (3) S
An interdisciplinary examination of how gender is constructed in popular culture forms Lecture discussion Prerequisite WST 100 or 300 or instructor approval *General Studies· HU C.*

WST 484 Internship. (1 3) A
Practical experience to enhance the academic perspectives that emerge from women's studies instruction. Prerequisite preapproval by internship coordinator required

WST 498 Pro-Seminar: Theoretical Issues in Women's Studies. (3) A
Reading and research on important theoretical issues in women's studies *General Studies. L2*

NOTE· For the General Studies requirement, codes such as L1 N3, C, and H) and courses, see pages 84 108 For graduation requirements see pages 79–83 For omnibus courses offered but not listed in this catalog see pages 56–57

College of Nursing

Barbara A. Durand, Ed.D.
Dean

PURPOSE

The faculty in the College of Nursing acknowledge their responsibility to health care consumers for the preparation of individuals who provide nursing care of professional quality through teaching, research, and service. The purpose of the College of Nursing is to provide educational programs that prepare professional nurses to meet the health care needs of individuals, groups, and communities. To achieve this purpose, the college offers undergraduate, graduate, and continuing and extended education programs. Within the context of a liberal education, the degree programs prepare professional nurses who

1. understand and respond to changing health and social needs and services;
2. influence nursing practice and health care through leadership and participation in professional and sociopolitical activities; and
3. utilize scientific knowledge to advance professional nursing practice

The continuing education program provides opportunities for registered nurses (RNs) to improve and expand their nursing practice to meet the health care needs of various populations and to further their own professional development

ORGANIZATION

The College of Nursing is organized around two major clinical divisions adult health/parent child nursing and community health/psychosocial nursing systems

The college offers an undergraduate program leading to a Bachelor of Science in Nursing degree, a graduate program leading to an M.S. degree with preparation for advanced practice in nursing, and continuing and extended education opportunities for practicing RNs.

ADMISSION

Preprofessional Admission. Students are admitted into the College of Nursing as "prenursing" students Admission to ASU as a prenursing student does not guarantee admission into the Professional Nursing Program. Admission to the professional program is competitive with the greatest emphasis placed on prerequisite grade point average

In addition to meeting the university requirements for admission, it is recommended that students complete one year each of high school chemistry and biology

Prenursing students are required to seek academic advising through the College of Nursing Student Services Office This advising includes course planning as well as information regarding application materials and deadlines.

Professional Program Admission. Professional Nursing Program courses are offered at ASU Main and ASU West Students are asked to specify location preference as part of the application process. Students are expected to complete the Professional Nursing Program on the campus assigned upon admission. In the continuing tradition of the college to be at the forefront in nursing education, curriculum revisions are in process. See an advisor for current program information.

Prenursing students are eligible for consideration for admission to the Professional Nursing Program if they meet the following criteria:

1. regular admission to the College of Nursing,
2. good standing with ASU and the College of Nursing;
3. minimum prerequisite GPA of 2.75·
4. completion of designated prerequisite courses with earned grade of "C" or higher in each course;
5. completion of the application form,
6. submission of complete health history, physical examination results, and evidence of required immunizations;
7. proof of CPR certification (Level C American Heart Association Health Care Provider),
8. proof of negative drug screen, and
9. other required materials

Admission is selective and based on available resources Meeting the minimum prerequisite GPA does not ensure admission All qualified applicants may not be admitted

Transfer Credits. While the university accepts transfer credit from other accredited institutions, all transfer credit may not apply toward a Bachelor of Science in Nursing (B S N degree.

Students completing course work at a community college or univers ty other than ASU should consult a College of Nursing academic adv isor to plan an appropriate sequence of prenursing courses and to apply to the Professional Nursing Program. The college may not accept transfer credit (especially sci ence) completed more than 10 years be fore the date of application

Professional Program Transfer. Stu dents requesting to transfer into the Professional Nursing Program with ad vanced standing may be required to submit letters of recommendation Any student enrolled in good standing at any nationally accredited baccalaureate school of nursing currently or within the past two years may apply for ad mission into the Professional Nursing Program. To be considered for adm is sion to the Professional Nursing Pro gram, students must f rst be admitted to ASU (see pages 59 66 . Transfer stu dents must also meet all Professional Nursing Program admission require ments.

Admission of Registered Nurses (RNs). All RNs are admitted as pre nursing students In the continuing tra dition of the college to be at the fore front in nursing education, curriculum revisions are in process See an advisor for current program information Sev eral alternatives are available for RNs to facilitate progress toward the B.S.N., including credit by examination and transfer of previously completed nurs ing courses. RN students must consu t with an advisor in planning their pro grams of study. Refer to page 396 for professional program admission crite ria. In addition, an RN must submit a photocopy of his or her current license to practice nursing as an RN in Ari zona. RN students are responsible for adhering to Arizona State Board of Nursing Rules and Regulations.

Readmission to the Professional Program. Students who have not been in continuous enrollment must file a peti tion requesting readmittance to the Pro fessional Nursing Program and must provide the follow ing documents:

1. proof of current enrollment or read mission to ASU and the College of Nursing,
2. transcripts from all colleges at tended, and
3. all other admission requirements as outlined on pages 396–397.

Arizona State Board of Nursing Requirement. To be eligible to write the National Council Licensure Examination for Registered Nurses (NCLEX RN , a student must have a high school diploma or GED certificate as well as proof of graduation from an accredited nursing program Applicants are ad vised that a history of a felony must be reported to the Arizona State Board of Nursing and may influence licensure eligibility.

College Health Requirements. Stu dents enrolled in the Professional Nurs ing Program are responsible for fulfill ing the requirements of the health policies of the College of Nursing. The student is responsible for providing proof to the College of Nursing Student Services Office of having met these re quirements before enrollment in the Professional Nursing Program These health policies include the following re quirements

1. completed College of Nursing Health History Inventory and Record of Physical Examination;
2. proof of measles (rubeola), mumps, and rubella immunization (MMR),
3. proof of annual tuberculosis screening;
4. completed series of Hepatitis B vaccine,
5. current American Heart Associa tion Level C CPR Certification;
6. proof of tetanus, diphtheria immu nization TD);
7. proof of Varicella (chicken pox) immunization;
8. proof of negative drug screen; and
9. annual flu vaccine is recom mended

A Nursing student may not partici pate in any clinical experience without meeting these requirements

Essential Functions. Students admit ted to the Professional Nursing Pro gram will be expected to meet the Essential Functional Abilities of the Undergraduate Nursing Student. Essen tial functions for this program include gathering data through the senses (hear ing, seeing, etc.), synthesizing informa tion from a variety of sources, making decisions regarding patient care, and performing necessary physical and mental activities to ensure safe care. For complete details, contact an advisor in the Student Services Office at NUR 108 or call 965 2987.

ASU Health Requirements. See pages 59–60.

Professional Liability Insurance. It is highly recommended that students carry their own personal professional liability insurance when enrolled in clinical nursing courses.

Health and Accident Insurance. It is strongly recommended that all students carry their own health and accident insurance Some clinical agencies require students to have current health insurance. See the *Undergraduate Student Handbook*. Each student is personally responsible for costs related to any accident or illness during or outside of school activities.

Automobile Insurance. Students are required by state law to carry automo bile insurance. Students are responsi ble for transportation to and from clini cal sites. Extensive travel may be re quired for selected clinical experiences.

ADVISING

Although the College of Nursing provides academic advising, *it is ultimately the responsibility of each student to fulfill academic and program requirements.* Professional advisors are available by appointment in the College of Nursing Student Services Office, 602/965 2987 These advisors assist students with program planning, registration, preparation of needed petitions, verification of graduation re quirements, referrals to university and community resources, and career plan ning.

Student responsibilities include fol lowing university guidelines regarding submission of transcripts from all col leges other than ASU and obtaining the necessary signatures or computer veri fications required by the university.

Mandatory Advising. Newly admit ted, readmitted, and transfer students are required to meet with an academic advisor before registering for their first semester of classes All freshmen are required to meet with an academic ad visor before registering for a second semester of classes All students are en couraged to meet with an advisor each semester

Program of Study. A program of study must be filed during the second semester of enrollment in the Professional Nursing Program and before registration for Professional Nursing Program course level Junior Two (JR2) courses.

Student Employment. Students intending to pursue the Professional Nursing Program on a full time basis should expect to spend approximately 45 hours per week in class and study. It is suggested that any additional activities or employment be kept at a minimum

DEGREES

Bachelor of Science in Nursing

The completion of the curriculum in Nursing leads to a Bachelor of Science in Nursing (B.S.N.) degree. In the continuing tradition of the college to be at the forefront in nursing education, curriculum revisions are in process. See an advisor for current program information The purpose of the program is to prepare beginning professional nurses who possess the theoretical foundation and the clinical competence to function in various health care settings The graduate is prepared to deliver nursing care services to individuals, families, population groups, and communities The undergraduate program provides a foundation for graduate studies in nursing at the master's level

Program objectives for the undergraduate curriculum are directed toward preparation of graduates with generalist abilities Based on theoretical and empirical knowledge from nursing, the humanities, and physical, biological, and behavioral sciences, graduates are prepared to

1. use theoretical knowledge from the sciences, humanities, and nursing as a base for critical thinking in professional nursing practice and to develop understanding of person, health, environment, and nursing;
2. apply nursing process to provide safe, competent, and effective nursing care utilizing principle based communication, technical/psychomotor, teaching, management, and therapeutic skills;
3. provide comprehensive therapeutic nursing care in partnership with individuals, families, groups, and communities, including those who are culturally diverse and vulnerable;
4. demonstrate professional practice which focuses on health promotion, health restorations, health maintenance, and illness care from a holistic perspective,
5 participate in critically evaluating and applying research findings to nursing practice and in identifying nursing research problems;
6. demonstrate values and behavior consistent with the culture of professional nursing;
7. demonstrate personal and leadership characteristics appropriate for professional nursing practice;
8. demonstrate responsibility and accountability for professional nursing practice;
9. collaborate with nurses, other health care providers, and clients in the delivery of holistic care that is responsive to changing needs and societal trends; and
10 participate in evaluating current nursing and health care services and trends, and in identifying future health care needs.

Nursing—M.S.

The faculty in the College of Nursing offer a program leading to an M.S. degree in Nursing with concentrations in adult health nursing, community health nursing, community mental health/psychiatric nursing, nursing administration, and parent child nursing. The program requires a minimum of 40 semester hours with an earned grade of "B" or higher in all courses on the program of study. Students in the nurse practitioner options are required to complete additional semester hours. Requirements for this program are described in the *Graduate Catalog*. Persons interested in applying for admission to the program should write to the Graduate College for a *Graduate Catalog* and application form (see page 284) and contact the College of Nursing Student Service Office.

CERTIFICATE PROGRAM

A Post Master's Family Nurse Practitioner certificate is available. For more information, see page 241.

UNIVERSITY GRADUATION REQUIREMENTS

In addition to fulfilling college and major requirements, students must meet all university graduation requirements. For more information, see pages 79 83.

First-Year Composition Requirement

Completion of both ENG 101 and 102 or ENG 105 with a grade of "C" or higher is required for graduation from ASU in any baccalaureate degree.

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 on pages 84–87. Note that all three General Studies awareness areas are required Consult your advisor for an approved list of courses. Many of the university General Studies requirements may be met through completion of College of Nursing course requirements. See an academic advisor for details General Studies courses are listed on pages 87 108.

COLLEGE DEGREE REQUIREMENTS

College requirements for graduation are consistent with those of the university.

MAJOR REQUIREMENTS

The Bachelor of Science in Nursing degree requires 120 semester hours.

Nursing Core Courses 1998–1999

Prerequisites

HCR	294	ST. Clinical Health Care Ethics	3
HCR	294	ST: Culture and Health	3
HCR	294	ST: Health Care Organization	3
HCR	294	ST Pathophysiology.	4
Total			13

NOTE For the General Studies requirement codes such as L1, N3 C and H) and courses see pages 84–108. For graduation requirements see pages 79–83 For ombus courses offered but not stedn this catalog, see pages 56–57.

Junior Year

First Semester

NUR	394	ST: Theory I: Health Integrity	4
NUR	394	ST: Pharmacology	2
NUR	394	ST: Professional Development I	3
NUR	484	Internship: Nursing Practice I	7
Total			16

Second Semester

NUR	394	ST: Theory II: Health Integrity and Alterations	5
NUR	394	ST: Professional Development II	3
NUR	484	Internship: Nursing Practice II	8
Total			16

Senior Year

First Semester

NUR	484	Internship: Nursing Practice III	7
NUR	494	ST: Theory III: Health Integrity and Alterations	6
NUR	494	ST: Professional Development III: The Art of Nursing	3
Total			16

Second Semester

NUR	484	Internship: Nursing Practice IV	8
NUR	494	ST: Theory IV: Health Integrity and Alterations	3
NUR	494	ST: Theory V: Leadership and Management	3
NUR	494	ST: Professional Development IV	2
Total			16
Nursing core total			77

In the continuing tradition of the college to be at the forefront in nursing education, curriculum revisions are in process. In the new Professional Nursing Program curriculum, each semester of courses is prerequisite to subsequent semesters. See an advisor for current program information.

ACADEMIC STANDARDS

Students are admitted into the College of Nursing as prenursing students and are subject to the general standards of academic good standing at the university. However, students who maintain standards of academic good standing do not necessarily qualify for admission into the Professional Nursing Program.

Consideration for admission into the Professional Nursing Program is contingent on achieving at least a "C" in all prerequisite courses and earning a minimum GPA of 2.75 in prerequisite courses. In addition, a grade of "C" or higher is required in all course work for the degree.

Once admitted into the Professional Nursing Program, students are allowed only two nursing course failures within the program. The third failure in a nursing course leads to an automatic disqualification from the College of Nursing.

Probation and/or disqualification is in accordance with university policies. Academic dishonesty is not tolerated in any courses and is subject to specific College of Nursing policies and procedures.

GRADING POLICY FOR NURSING COURSES

Within the undergraduate program, grades are assigned to reflect levels of achievement in relation to course objectives. Students who do not complete a required nursing course satisfactorily, receiving a grade of "D" or "E" (failing) or a mark of "W" (withdrawal), are not eligible to progress in the Professional Nursing Program. A required nursing course may be repeated only once.

Any petition for curriculum adjustment, course substitution, overload, readmission to a nursing course, or readmission to the Professional Nursing Program must be approved by the College Standards Committee.

Withdrawal is in accordance with the withdrawal policy of the university. Students who withdraw from required clinical nursing courses must complete the Interruption in Curricular Progression form. The form is completed by the student in conjunction with the faculty of record for the course(s). Re-entry requires advising assistance. See the *Undergraduate Student Handbook*. In addition, students are responsible for completing the university withdrawal procedure.

An incomplete in a required nursing course must be satisfactorily removed before progression in the Professional Nursing Program is permitted. A grade of "I" is not allowed in clinical courses. See pages 72–73 for university policy.

Audited courses are not accepted as course credit in the minimum 120 semester hour requirement for graduation.

STUDENT RESPONSIBILITIES

Health. Students in the College of Nursing who exhibit or demonstrate a lack of physical and mental health necessary to function successfully as a professional nurse may be required to complete a health examination and have the results made available to the College Standards Committee. Students whose health, behavior, and/or performance have been questioned are reviewed for continuation in clinical nursing courses by the College Standards Committee. The student may appear in person before the committee and personally present information relevant to the committee's review. Additional information may also be presented in writing without making a personal appearance.

College of Nursing building. Mark A. Culbertson photo

Professional. Students are held to the professional standards reflected in the American Nurses Association Code for Nurses Professional behavior and ap pearance are required during all nursing course activities

Student Transportation. Students are responsible for their own transportation to and from health agencies and other selected experience settings, such as home visits to clients. Extensive travel may be required for selected clinical experiences.

Clinical Comprehensive Assessment Test. In preparation for the National Council Licensure Examination for Registered Nurses (NCLEX), all senior students, except RN students, are re quired to take a comprehensive assess ment test before graduation.

Laboratory Fees. In several nursing laboratory and clinical courses, stu dents are provided an opportunity to practice and perfect nursing skills be fore contact with clients. These courses require an extensive use of equipment and supplies from the col lege Learning Resource Center. Ac cordingly, students are assessed a fee for the following courses: NUR 211, 214 (or 314 for RNs), 217, 330, 427, 428, 429, and 430 Consult with an ad visor for information on laboratory fees for Nursing courses in the revised curriculum.

SPECIAL PROGRAMS

Honors Program. The Nursing Hon ors Program provides opportunities for academically talented nursing students to engage in educational enrichment opportunities The program focuses on students in the Professional Nursing Program; however, opportunities are available in lower division nursing courses to earn honors credit For students pursuing upper division honors work, this enriched learning experience begins in the junior year Honors course work, consisting of at least 18 hours of upper division honors credit, offers a challenging curriculum. Hon ors students are guided to complete honors credit in courses that compli ment their academic and career goals. Students interested in pursuing the Nursing Honors Program are encour aged to seek advisement in the College of Nursing Student Services Office. Once admitted to the Professional Nursing Program, students receive ad visement from the honors coordinator.

For more information, call 602/965 2987 or stop by the Student Services Office at NUR 108. Interested students should also contact the University Honors College at 602 965 2359

ASU West. ASU West hosts upper di vision College of Nursing courses.

Continuing and Extended Education Program. The Continuing and Ex tended Education Program presents a variety of credit and noncredit offerings at ASU Main, ASU West, and off cam pus locations. These offerings are de signed to assist practicing professional nurses in maintaining and enhancing their competencies, to broaden their scientific knowledge base, and to im prove their skills in adapting to the changing health care environment Programs are organized in response to both the health care needs of the popu lation and the learning needs of nurses engaged in a variety of professional roles and clinical specialties. Workshops, conferences, short evening courses, and special programs are of fered at times convenient to the work ing professional Some offerings are multidisciplinary and are open to non RNs For descriptions of current con tinuing and extended education offer ings, contact the Continuing and Extended Education Program, College of Nursing at 602/965 7431 or visit www.asu edu/nursing/ceep html on the World Wide Web

Community Health Services. The College of Nursing administers a Com munity Health Services Clinic located in Scottsdale, Arizona Nurse practitio ners provide primary care with an em phasis on promotion of wellness to families and individuals of all ages. Students in the College of Nursing may receive health care through the clinic for a fee. Many students obtain the physical examination required for ad mission to the Professional Nursing Program at the clinic's facility. The fa cility also serves as a learning labora tory for both master's and baccalaure ate Nursing students.

GENERAL INFORMATION

Student Services. The Student Ser vices Office in the College of Nursing provides academic advising, general advising, and referral to university resources. The staff of the Student Ser vices Office is available to help stu dents with a variety of concerns related to academic or personal issues Pro spective students wanting more infor mation on College of Nursing programs or wanting to schedule an advising ap pointment should contact the College of Nursing Student Services Office at 602 965 2987.

Scholarship and Financial Aid. For information regarding scholarships and loans, see pages 48 50 Information about scholarship and loan funds for Nursing students may be obtained from the Student Financial Assistance Office or the College of Nursing Student Ser vices Office.

Learning Resources. The Learning Resource Center (LRC) contains a well supplied nursing laboratory, au diovisual media, a variety of comput ers and computer software related to nursing and health care

Clinical Facilities. Learning experi ences with patients clients and families are provided under the supervision of qualified faculty with the cooperation of a variety of federal, state, county, private health, and other agencies. The College of Nursing has contracts with more than 200 different agencies in the Phoenix metropolitan area and also op erates its own unique nurse managed clinic in a community setting Various clinical laboratory facilities are avail able to students in this essential component of the program.

Student Activities. All ASU students are members of the Associated Stu dents of ASU ASASU) and participate in those campus activities of interest to them. The student government of the university, ASASU, has a strong pres ence and offers a variety of services and activities It is the official repre sentative of the student body in matters of governance and budgeting.

NOTE: For the Genera Studies requirement codes such as L1 N3, C, and H , and courses see pages 84 108 For graduation requ rements see pages 79–83 For omn bus courses offered but not sted n th s catalog see pages 56–57