

# Morrison School of Agribusiness and Resource Management

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**Raymond A. Marquardt, Dean**

[www.east.asu.edu/msabr](http://www.east.asu.edu/msabr)

## **PURPOSE**

The Morrison School of Agribusiness and Resource Management provides academic programs in Agribusiness and in Environmental Resources. Agribusiness is the business of food and fiber production and the technology necessary to change a raw material (a commodity) or an idea into a new product or business for the world's consumers. Producing, financing, marketing, and providing food and fiber for the world amounts to more than one-half of the earth's global economy.

Agribusiness courses in the Morrison School are designed to prepare students for a wide range of job opportunities in agribusiness and business. More than 20 percent of all jobs in the United States are agribusiness-related, and the industry is even more important internationally, with more than half of all jobs in developing countries related to food and fiber products. Population increases worldwide have led forecasters to predict that more than nine billion food and fiber consumers will be part of the global agribusiness system by the year 2050. Forecasts also estimate that, at that time, more than 20,000 agribusiness jobs will go unfilled due to a lack of skilled professionals.

The academic programs in Agribusiness are especially designed to meet the needs of the urban student who has little or no previous agriculture experience. An interest in plants, animals, or food can be the starting point for career development in agricultural industries or resource management. The undergraduate programs also provide the necessary training for students preparing to enter graduate degree programs.

The Morrison School is strategically positioned to offer some unique programs. The concentration in professional golf management provides a student with the opportunity to qualify for the Professional Golf Association certification program in addition to majoring in Agribusiness. Similarly, for individuals more interested in the development and management of golf and other turf facilities, the golf and facilities management concentration is well suited.

Food, its marketing and safety, is a paramount importance now and in the future. The Morrison School offers specific concentrations in both of these areas. Food and agribusiness marketing is one of the signature concentrations in the school. Food science and safety are emphases stressed in the food and agribusiness marketing concentration.

For students interested in natural resource management, the school offers a major in Environmental Resources. Environmental resources is a science that applies across the ecological continuum of wilderness areas and urban lands. Students learn not only about wildlands but also about urban habitats and how people's activities affect the regenerative ability of natural resources. The Environmental Resources

curriculum provides the opportunity to develop technological skills such as remote sensing of data from aircraft or satellites, computer-based Geographic Information Systems, and techniques for ecological restoration.

Graduates of the Environmental Resources programs have employment opportunities in environmental resource management, applied ecology, wildlife biology, soil and water conservation, and land reclamation in both private firms and government agencies.

## **NATIONAL FOOD AND AGRICULTURAL POLICY PROJECT**

The National Food and Agricultural Policy Project (NFAPP) constructs a 10-year baseline forecast for the fruit and vegetable produce industry and specific commodities, responds to congressional inquiries concerning policies affecting the fruit and vegetable industry, and publishes a monthly newsletter highlighting research efforts. Areas of study include domestic and international promotion of fruits and vegetables, trade and the impact of trade agreements, and crop insurance and risk management. For more information, call the director at 480/727-1124.

## **DEGREES**

See the "Morrison School of Agribusiness and Resource Management Baccalaureate Degrees and Majors" table, page 608. For graduate degrees, see the "Morrison School of Agribusiness and Resource Management Graduate Degrees and Majors" table, page 609.

The Morrison School of Agribusiness and Resource Management offers two B.S. degrees: Agribusiness and Environmental Resources. Students interested in the Agribusiness major may select from the following concentrations: agribusiness finance, food and agribusiness marketing, food science, general agribusiness, golf and facilities management, international agribusiness, management of agribusiness, professional golf management, resource management, e-commerce, and preveterinary medicine. The Environmental Resources major offers concentrations in ecology, watershed ecology, and wildlife habitat management.

For students holding an A.A.S. degree, the school offers the Bachelor of Applied Science degree with concentrations in consumer products technology, food retailing, and resource team specialist.

The school offers the M.S. degree in Agribusiness and the M.S. degree in Environmental Resources. Agribusiness students may select either a research-oriented program, which leads to the completion of a supervised thesis, or a program consisting of course work only (nonthesis option). All M.S. candidates in Agribusiness must complete a minimum of 36 semester hours. Students in the Environmental Resources

### Morrison School of Agribusiness and Resource Management Baccalaureate Degrees and Majors

Major	Degree	Concentration	Administered By
Agribusiness	B.S.	Agribusiness finance, e-commerce, food and agribusiness marketing, food science, general agribusiness, golf and facilities management, international agribusiness, management of agribusiness, preveterinary medicine, professional golf management, resource management	Morrison School of Agribusiness and Resource Management
Applied Science	B.A.S.	Consumer products technology, food retailing, resource team specialist	Morrison School of Agribusiness and Resource Management
Environmental Resources	B.S.	Ecology, watershed ecology, wildlife habitat management	Morrison School of Agribusiness and Resource Management

degree program may study natural resource management, Geographic Information System/remote sensing, and animal/plant ecology. All M.S. candidates in Environmental Resources must complete 30 semester hours of approved graduate work. See the *Graduate Catalog* for more information.

#### ADMISSION

The Morrison School of Agribusiness and Resource Management admits students to the B.S. degree programs who meet the undergraduate admission requirements of Arizona State University; see “Undergraduate Admission,” page 54. Admission to the B.A.S. degree program is restricted to students holding an A.A.S. degree from a regionally accredited U.S. postsecondary educational institution. A GPA of 2.00 or higher is required for all resident applicants and 2.50 for nonresident applicants.

#### GRADUATION REQUIREMENTS

##### Agribusiness—B.S.

The completion of a minimum of 120 semester hours—including First-Year Composition, General Studies (“General Studies,” page 78), and the school and concentration requirements—leads to the B.S. degree. Note that all three General Studies awareness areas are required. An overall GPA of 2.00 is required for graduation and students must have completed a minimum of 45 semester hours of upper-division credit. Also see special graduation requirements under “Preveterinary Medicine,” page 611.

##### B.S. Agribusiness Prerequisite Courses

Students who select the concentrations in agribusiness finance, food and agribusiness marketing, food science, general agribusiness, golf and facilities management, international agribusiness, management of agribusiness, or professional golf management must complete the following courses, some of which can also be used to meet university General Studies requirements:

ACC 230 Uses of Accounting Information I.....	3
ACC 240 Uses of Accounting Information II.....	3
BIO 100 The Living World <i>SQ</i> .....	4
CHM 101 Introductory Chemistry <i>SQ</i> <sup>1</sup> .....	4
ECN 111 Macroeconomic Principles <i>SB</i> <sup>2</sup> .....	3
ECN 112 Microeconomic Principles.....	3
ENG 301 Writing for the Professions <i>L</i> .....	3

MAT 210 Brief Calculus <i>MA</i> .....	3
Total .....	26

<sup>1</sup> This course is not required for the professional golf management concentration.

<sup>2</sup> This course is not required for the golf and facilities management concentration.

**Core Requirements.** Agribusiness employers require their employees to possess a greater range of skills and competencies than at any time in the past. Rapid changes in information technology and the increasingly competitive food production and distribution sector mean that agribusiness needs graduates adequately equipped to deal with the business applications of these changes. The agribusiness core, required of all the concentrations, is designed to prepare students with a core set of skills that these firms demand. The core consists of courses in business principles—management, marketing, and finance—as well as in the fundamentals of agribusiness operations management.

AGB 100 Introduction to Agribusiness.....	3
AGB 161 Computer Applications in Agribusiness.....	3
AGB 310 Agribusiness Management I.....	3
AGB 320 Agribusiness Marketing I.....	3
AGB 321 Agribusiness Marketing II*.....	3
AGB 332 Agribusiness Finance I.....	3
AGB 333 Agribusiness Finance II.....	3
AGB 360 Agribusiness Statistics <i>CS</i> .....	3
AGB 364 Agribusiness Technologies I*.....	3
AGB 365 Agribusiness Technologies II.....	3
AGB 410 Agribusiness Management II.....	3
AGB 414 Agribusiness Analysis <i>L</i> .....	3
Core total.....	36

\* This course is not required for the professional golf management or golf and facilities management concentrations.

#### Concentrations

After completing the required agribusiness core, students select a concentration in their area of interest. A concentration allows a student to select a series of courses that complement the agribusiness core, supplement the student’s desire to master another area of interest, and broaden career opportunities.

Morrison School of Agribusiness and Resource Management Graduate Degrees and Majors

Major	Degree	Concentration	Administered By
Agribusiness	M.S.	Agribusiness management and marketing, food quality assurance	Morrison School of Agribusiness and Resource Management
Environmental Design and Planning*	Ph.D.	Design; history, theory and criticism; planning	Committee on Environmental Design and Planning
Environmental Resources	M.S.	GIS/remote sensing, natural resource management, and range ecology	Morrison School of Agribusiness and Resource Management

\* Doctoral courses for these interdisciplinary programs administered by ASU Main are also offered at ASU East.

**E-commerce Concentration.** The extraordinary growth of e-commerce in the business and agribusiness venues provides significant opportunities for students prepared to work in this medium. A student following this concentration builds upon the prerequisite core and the agribusiness core to prepare for this field. The opportunities for personal development, advancement, and success are present domestically and internationally.

**E-commerce**

AGB 436 Entrepreneurship in Financial Management of E-Commerce.....	3
AGB 463 Electronic Commerce in Agribusiness.....	3
AGB electives .....	8
Agribusiness core .....	36
Agribusiness prerequisite courses.....	26
Website design course.....	3
<b>Total .....</b>	<b>79</b>

**Agribusiness Finance Concentration.** Agribusiness finance concentration graduates are expected to possess a broad knowledge of financial theory and practice as it pertains to the agribusiness sector. This will involve applying quantitative and computer-based analytical techniques to real-world agribusiness problems. Specific course content includes topics in financial management, financial markets, risk management, and the evaluation of financial assets and business alternatives.

**Agribusiness Finance**

AGB 334 Agricultural Commodities .....	3
AGB 431 Intermediate Agribusiness Financial Management.....	3
AGB 434 Agricultural Risk Management and Insurance .....	3
AGB electives .....	8
Agribusiness core .....	36
Agribusiness prerequisite courses.....	26
<b>Total .....</b>	<b>79</b>

**Management of Agribusiness Concentration.** Agribusiness managers encounter many problems and opportunities on a daily basis that are unique to the agribusiness sector. Students choosing this concentration develop skills in managing people, internal resources, and external relationships in an increasingly dynamic environment.

**Management of Agribusiness**

AGB 351 Management Science CS.....	3
AGB 380 Applied Microeconomics.....	3

AGB 411 Agricultural Cooperatives.....	3
or AGB 480 Agribusiness Policy and Government Regulations (3)	
AGB electives .....	8
Agribusiness core.....	36
Agribusiness prerequisite courses.....	26
<b>Total .....</b>	<b>79</b>

**Food and Agribusiness Marketing Concentration.** Students in the food and agribusiness marketing concentration develop critical skills relevant to dealing with firms involved in food, fiber, consumer products, and pharmaceutical manufacturing; distribution; and retailing. Students also learn about the relationship between input suppliers, commodity associations, and primary producers. To this end, food and agribusiness marketing students are required to complete a series of courses that analyze the behavior and performance of both commodity and consumer food markets.

**Food and Agribusiness Marketing**

AGB 334 Agricultural Commodities .....	3
or AGB 420 Food Marketing (3)	
AGB 422 Consumer Behavior .....	3
AGB 429 Marketing Research .....	3
AGB electives .....	8
Agribusiness core.....	36
Agribusiness prerequisite courses.....	26
<b>Total .....</b>	<b>79</b>

**Food Science Concentration.** The food science concentration focuses on both scientific and technical competency skills with an emphasis on food microbiology, food chemistry, biotechnology, mathematics, and statistics. This unique program prepares graduates for employment opportunities in the food, beverage, and dairy industries; regulatory agencies such as the FDA and USDA; international organizations such as FAO and WHO; and consumer organizations. In addition, graduates may choose to pursue advanced degrees.

**Food Science**

AGB 340 Food Processing.....	3
AGB 440 Food Safety .....	3
AGB 442 Food and Industrial Microbiology .....	4
AGB upper-division electives .....	7
Agribusiness core.....	36
Agribusiness prerequisite courses.....	26
<b>Total .....</b>	<b>79</b>

**NOTE:** For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 78. For graduation requirements, see "University Graduation Requirements," page 74. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 51.



**Preveterinary Medicine.** A student studying agribusiness could also be preparing for admission to a professional veterinary school. While completing the courses needed for acceptance into veterinary school, the student is broadening his or her career potential with agribusiness courses. The major reason for the lack of success as a professional veterinarian is rarely bad medicine or science. It is often a lack of knowledge of how to run a business or practice. In addition, should a preveterinary student decide not to apply to a veterinary school, this major provides alternative career paths into human or veterinary pharmaceutical industries or the food industry. Selection of this concentration permits students to complete the preveterinary requirements for entrance to professional veterinary school. The curriculum permits the student to obtain some course work in agribusiness as it relates to professional practice and industry.

**Preveterinary Medicine**

Agribusiness core .....	21
AGB 310 Agribusiness Management I (3)	
AGB 320 Agribusiness Marketing I (3)	
AGB 332 Agribusiness Finance (3)	
AGB 360 Agribusiness Statistics (3)	
AGB 364 Agribusiness Technologies I (3)	
AGB 365 Agribusiness Technologies II (3)	
AGB 414 Agribusiness Analysis (3)	
Preveterinary medicine prerequisites .....	54-58
Total .....	75-79

**Veterinary College Acceptance.** A student who has been accepted to a school of veterinary medicine before he or she has earned a B.S. degree in the Morrison School may do so by completing a minimum of 30 semester hours at ASU and the General Studies requirement. Students must receive a written statement from the dean of the Morrison School giving senior-in-absentia privileges. A student is eligible to receive the B.S. degree after the ASU Office of the Registrar receives a recommendation from the dean of the veterinary professional school and a transcript indicating the student has completed the necessary semester hours commensurate with ASU graduation requirements.

**Veterinary Medical Schools.** There are approximately 27 schools of veterinary medicine in the United States. Each school establishes the specific prerequisites that are required for admission. Advisors in the Morrison School assist students in designing their class schedules to meet the requirements of the veterinary schools to which they plan to apply. Each school generally looks for courses in biology, chemistry, genetics, microbiology, and organic chemistry. In addition to a science foundation, all students must meet the University General Studies requirement, complete 45 semester hours of upper-division courses, and satisfy the school requirements.

**Resource Management Concentration.** The resource management concentration combines the agribusiness con-



Maintaining fairways and greens is taught in the classroom and on the course.

Tim Trumble photo

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centration core with solid technical preparation in biology, chemistry, and/or economics. There is a growing demand by industry and government for persons who understand both the technical and managerial basis for sustainable development, remediation and/or utilization of natural resources for agribusiness, conservation, and habitat restoration. Courses and field projects prepare the student to analyze, develop, and manage programs that make use of land and water in an economic as well as environmentally sustainable fashion.

#### Resource Management

AGB 455 Resource Management <i>SB</i> .....	3
AGB 480 Agribusiness Policy and Government Regulations .....	3
ETM 301 Environmental Management .....	3
Agribusiness core .....	36
Resource Management prerequisites .....	43–51
Total .....	88–96

#### Environmental Resources—B.S.

The primary emphasis of the Environmental Resources major is natural resource management and conservation. Particular attention is given to the study of ecosystem characteristics as they relate to the use of renewable resources. Students learn applications of ecological principles to resource management through examples drawn from forest, range, riparian, and urban ecosystems. The Environmental Resources major offers three concentrations: ecology, watershed ecology, and wildlife habitat management.

#### GRADUATION REQUIREMENTS

The completion of a minimum of 120 semester hours—including the First-Year Composition requirement, General Studies (“General Studies,” page 78), the Environmental Resources core, and selected concentration requirements—leads to the B.S. degree. An overall GPA of 2.00 and a minimum grade of “C” in the Environmental Resources core are required for graduation. Students must have completed a minimum of 45 semester hours of upper-division credit. Some of the Environmental Resources core courses may also be used to meet General Studies requirements.

#### Environmental Resources Core

BIO 181 General Biology <i>SQ</i> .....	4
BIO 182 General Biology <i>SG</i> .....	4
CHM 101 Introductory Chemistry <i>SQ</i> .....	4
CHM 231 Elementary Organic Chemistry <i>SQ*</i> .....	3
CHM 235 Elementary Organic Chemistry Laboratory <i>SQ*</i> .....	1
ERS 130 Introduction to Environmental Science <i>SQ</i> .....	4
ERS 207 Plant Taxonomy .....	4
ERS 225 Soils .....	3
ERS 226 Soils Laboratory .....	1
ERS 246 Environmental Conservation and Ecology <i>G</i> .....	3
ERS 301 Ecology .....	3
ERS 350 Environmental Statistics <i>CS</i> .....	3
ERS 365 Watershed Management .....	3
ERS 402 Vegetation Measurement .....	4
ERS 480 Ecosystem Management and Planning <i>L</i> .....	3
ERS 485 GIS in Natural Resources .....	3
ERS 490 Recent Advances in Environmental Resources .....	1
MAT 210 Brief Calculus <i>MA</i> .....	3
Core total .....	54

\* Both CHM 231 and 235 must be taken to secure SQ credit.

#### Ecology Concentration

The ecology concentration focuses on connections between basic ecological principles and their application to a broad array of environmental challenges across a wide range of ecosystems. Course work concentrates on the interrelationships of soil, water, and vegetation systems and the fauna that inhabit these systems. In addition to a strong foundation in these areas, students are provided with the analytical tools and skills to evaluate and apply ecological concepts to management issues. Potential employers of graduates in this field of study include federal resource management agencies, environmental protection agencies, departments of environmental quality, state land departments, and private environmental consulting firms.

This concentration is completed by taking the ERS core curriculum and 25 hours of courses listed below, with a minimum of 10 hours from each group.

##### Group A: Introduction and Backdrop to Ecology

ERS 307 Plant Identification .....	4
ERS 311 Applied Ecology .....	4
ERS 420 Ecological Restoration .....	3
ERS 425 Soil Classification and Management .....	3
ERS 433 Riparian Ecosystem Management .....	3
ERS 434 Wetland Ecosystems and Soils .....	3
ERS 460 Applied Systems Ecology .....	3
ETM 301 Environmental Management .....	3
GLG 101 Introduction to Geology I (Physical) <i>G, SQ*</i> .....	3
GLG 103 Introduction to Geology I—Laboratory <i>SQ*</i> .....	1
GPH 111 Introduction to Physical Geography <i>SQ</i> .....	4
GPH 210 Society and Environment <i>G</i> .....	3
PLB 308 Plant Physiology .....	4

##### Group B: Focus Areas and Tools of Ecology

ERS 364 Surface Water Hydrology .....	3
ERS 448 Soil Ecology .....	3
ERS 449 Landscape Ecology .....	3
ERS 474 Wildlife Ecology .....	3
ERS 475 Wildlife Management .....	4
ERS 477 Environmental Risk Assessment and Management .....	3
ERS 486 Remote Sensing in Environmental Resources .....	4
GPH 314 Global Change <i>G, HU</i> .....	3
GPH 381 Geography of Natural Resources <i>G</i> .....	3
GPH 418 Landforms of the Western United States <i>L</i> .....	3
GPH 481 Environmental Geography .....	3

\* Both GLG 101 and 103 must be taken to secure SQ credit.

Additional courses must be approved by an advisor.

#### Watershed Ecology Concentration

The watershed ecology concentration underscores the importance of understanding and placing environmental processes and problems at the watershed or landscape level. Students completing this concentration have a solid background in physical and biological sciences. Upper-division course work focuses on providing the intellectual capability and tools to address water-related management issues. Graduates may pursue careers with federal and state agencies or in the private sector as resource managers, environmental health specialists, or consultants.

This concentration is completed by taking the ERS core curriculum and 25 hours of courses listed below, with a minimum of 10 hours from each group.

##### Group A: Introduction and Backdrop to Watershed Ecology

CHM 302 Environmental Chemistry .....	3
ERS 307 Plant Identification .....	4

ERS 311 Applied Ecology .....	4
ERS 333 Water Resources Management.....	3
ERS 364 Surface Water Hydrology.....	3
ERS 425 Soil Classification and Management.....	3
ERS 460 Applied Systems Ecology .....	3
ERS 465 Surface Water Quality .....	3
ETM 302 Water and Wastewater Treatment Technology .....	3
GLG 101 Introduction to Geology I (Physical) <i>SQ</i> .....	3
GLG 103 Introduction to Geology I—Laboratory <i>SQ</i> .....	1
GPH 212 Introduction to Meteorology <i>SG*</i> .....	3
GPH 214 Introduction to Meteorology Laboratory <i>SG*</i> .....	1
<i>Group B: Focus Areas and Tools of Watershed Ecology</i>	
ERS 420 Ecological Restoration.....	3
ERS 433 Riparian Ecosystem Management.....	3
ERS 477 Environmental Risk Assessment and Management .....	3
ERS 486 Remote Sensing in Environmental Resources .....	4

\* Both GPH 212 and 214 must be taken to secure SG credit.  
 Additional courses must be approved by an advisor.

**Wildlife Habitat Management Concentration**

The wildlife habitat management concentration focuses on the connection between wildlife ecology and habitat management. The student completing this concentration gains a solid background in wildlife biology, coupled with a strong understanding of the physical and biological elements of vegetation ecology. Upper-division course work provides those necessary tools to meet the challenges of maintaining a balance between biological diversity and social pressures on the wildland resources. Potential employers of graduates from this field of study include the U.S. Fish and Wildlife Service, U.S. Forest Service, Bureau of Land Management, Department of Defense, state wildlife management departments, and private environmental consulting firms.

This option is completed by taking the ERS core curriculum and 25 hours of courses listed below, with a minimum of 10 hours from each group.

*Group A: Introduction and Backdrop to Wildlife Habitat Management*

BIO 331 Animal Behavior.....	3
BIO 340 General Genetics.....	4
BIO 360 Animal Physiology.....	4
BIO 370 Vertebrate Zoology.....	4
BIO 385 Comparative Invertebrate Zoology .....	4
BIO 426 Limnology <i>L</i> .....	4
BIO 471 Ornithology .....	3
BIO 472 Mammalogy .....	4
BIO 474 Herpetology.....	3

*Group B: Focus Areas and Tools of Wildlife Habitat Management*

ERS 307 Plant Identification.....	4
ERS 311 Applied Ecology .....	4
ERS 353 Wildlife Nutrition.....	3
ERS 420 Ecological Restoration.....	3
ERS 433 Riparian Ecosystem Management.....	3
ERS 434 Wetland Ecosystems and Soils.....	3
ERS 460 Applied Systems Ecology .....	3
ERS 474 Wildlife Ecology .....	4
ERS 475 Wildlife Management .....	3
ERS 486 Remote Sensing in Environmental Resources .....	4

Additional courses must be approved by an advisor.

**Environmental Resources Minor**

A minor in Environmental Resources is available to students who are interested in environmental courses but who wish to pursue other majors. A minimum of 27 semester hours of course work is required with 15 semester hours of upper-division courses in environmental resources. A grade of “C” or higher is required for all courses taken for the minor. Independent study and special topics courses may not be used to satisfy the minimum course requirements.

**Required courses**

BIO 181 General Biology <i>SQ</i> .....	4
BIO 182 General Biology <i>SG</i> .....	4
ERS 225 Soils .....	3
ERS 226 Soils Laboratory.....	1
ERS 301 Ecology .....	3
Additional upper division ERS courses .....	12
Total .....	27

**Applied Science—B.A.S.**

The Bachelor of Applied Science degree is a capstone degree for the Associate of Applied Science degree. The B.A.S. degree exposes students to advanced concepts and diverse critical thinking skills to prepare them for future career opportunities and professional advancement.

**Admission**

Admission to the B.A.S. degree program is restricted to students holding an A.A.S. degree from a regionally accredited U.S. postsecondary educational institution. A GPA of 2.00 or higher is required for all resident applicants and 2.50 for nonresident applicants.

**B.A.S Degree Graduation Requirements.** The B.A.S. degree program consists of 60 semester hours of upper-division courses, with 30 hours in residence. An overall GPA of 2.00 or higher is required.

A.A.S. degree transfer.....	60
Assignable credit.....	6
B.A.S. core.....	16
Concentration .....	19
General Studies .....	19
Total .....	120

**General Studies Curriculum**

The B.A.S. curriculum builds on the general education content of the A.A.S. degree. Additional General Studies courses are taken in the core or concentration. General Studies courses focus on contextual learning.

L.....	3
MA .....	3
HU.....	3
HU or SB .....	3
SB.....	3
SG .....	4
Total .....	19

**Assignable Credit**

Assignable credit allows space in the curriculum for prerequisite courses. The courses are determined by the student and advisor.

**NOTE:** For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see “General Studies,” page 78. For graduation requirements, see “University Graduation Requirements,” page 74. For an explanation of additional omnibus courses offered but not listed in this catalog, see “Classification of Courses,” page 51.

**B.A.S. Core**

AGB 310 Agribusiness Management I .....	3
AGB 320 Agribusiness Marketing I .....	3
AGB 360 Agribusiness Statistics CS .....	3
AGB 414 Agribusiness Analysis L .....	3
AGB 460 Agribusiness Management Systems .....	4
Total .....	16

**Consumer Products Technology Concentration.** Students studying consumer products technology prepare for a career in the food and consumer products industries. Students learn to develop food, drug, cosmetic, and other consumer products and to ensure product safety and marketability by obtaining a thorough mastery of courses in product and package design, manufacturing, processing, and safety.

**Consumer Products Technology**

AGB 340 Food Processing .....	3
AGB 364 Agribusiness Technologies I .....	3
AGB 440 Food Safety .....	3
AGB 490 Recent Advances in Agribusiness .....	1
MET 341 Manufacturing Analysis .....	3
MET 494 ST: Consumer Manufacturing .....	3
MET 494 ST: Packaging Design .....	3
Total .....	19

**Food Retailing Concentration.** A student studying food retailing prepares for a career in the food marketing and distribution industries. Potential employers are food manufacturing and processing companies, distribution centers, wholesalers, and all types of food retailers, e.g., supermarkets, mass merchandisers, fast food outlets, restaurants, and direct marketers of food.

**Food Retailing**

AGB 330 Agribusiness Accounting .....	3
AGB 332 Agribusiness Finance I .....	3
AGB 340 Food Processing .....	3
AGB 420 Food Marketing .....	3
AGB 440 Food Safety .....	3
AGB 445 Food Retailing .....	3
AGB 484 Internship .....	1
Total .....	19

**Resource Team Specialist Concentration.** The resource team specialist concentration combines the technical preparation acquired in an A.A.S. program with a special orientation in environmental and resource management. This concentration prepares individuals to participate as an integral part of an environmental emergency response team as well as postemergency biological and environmental rehabilitation efforts.

**Resource Team Specialist**

AGB 332 Agribusiness Finance I .....	3
AGB 456 World Agricultural Resources G .....	3
AGB 457 Resource Policy and Sustainability .....	3
AGB 458 Bioremediation .....	3
AGB 484 Internship .....	1
ETM 301 Environmental Management .....	3
ETM 303 Environmental Regulations .....	3
Total .....	19

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**PROFESSORS**

BRADY, BROCK, DANEKE, EDWARDS, KAGAN,  
MARQUARDT, SEPERICH, SHULTZ, THOR

**ASSOCIATE PROFESSOR**

GREEN, MILLER, RACCACH, RICHARDS, WHYSONG

**ASSISTANT PROFESSORS**

BURKINK, MANFREDO, PATTERSON,  
SCHMITZ, STANTON

**AGRIBUSINESS (AGB)****AGB 100 Introduction to Agribusiness. (3)**

*fall*

Overview of agribusiness industries and career opportunities.

**AGB 105 Global Resources. (3)**

*fall and spring*

Effect of quality, quantity, and cost of national food supplies on technology, marketing, and world agricultural policies.

**AGB 161 Computer Applications for Agribusiness Industries. (3)**

*spring*

Use and integration of word processing, spreadsheets, and databases as tools for managing an agribusiness firm. Lecture, lab.

*General Studies: CS*

**AGB 171 Animal Science. (3)**

*spring*

Comparative growth, development, and propagation of domestic animals.

**AGB 191 First-Year Seminar. (1-3)**

*not regularly offered*

**AGB 194 Special Topics. (1-4)**

*not regularly offered*

**AGB 210 Livestock Management. (3)**

*fall and spring*

Methods of managing livestock enterprises, economics, loss prevention, and marketing.

**AGB 211 Crop Management. (3)**

*fall and spring*

Crop production, management principles, and their application to crop growth and development.

**AGB 250 World Food Dynamics. (3)**

*spring*

Transition and development of raw agricultural commodities into nutritional food products. Emphasis given to food expansion in developing countries.

*General Studies: G*

**AGB 251 Cultural Diversity in Agribusiness. (3)**

*spring*

Promotes the awareness and appreciation of cultural diversity within the U.S. through the study of cultural and social contributions in agribusiness of women and minorities.

**AGB 258 International Agribusiness. (3)**

*fall*

Identification and analysis of methods, problems, and future of international agribusiness operations. Emphasizes special problems associated with international agribusiness systems.

*General Studies: G*

**AGB 266 Golf Course Irrigation. (3)***fall and spring*

Design, management, and maintenance of golf course irrigation systems. Lecture, lab.

**AGB 271 Veterinary Medicine Today. (3)***spring*

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

**AGB 294 Special Topics. (1–4)***not regularly offered***AGB 310 Agribusiness Management I. (3)***fall*

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

**AGB 311 Establishing an Agribusiness. (3)***fall*

Opportunities and problems associated with new firm development in agribusiness. Business plan is written and presented orally.

**AGB 320 Agribusiness Marketing I. (3)***fall and spring*

Examines marketing strategy, focusing on the marketing mix (product, price, promotion, and place) in a dynamic socioeconomic environment. Prerequisites: ACC 230, 240; AGB 360; ECN 112.

**AGB 321 Agribusiness Marketing II. (3)***fall and spring*

Examines the food marketing system with emphasis on the marketing institutions, arrangements, and methods for basic commodities. Prerequisites: ACC 230, 240; AGB 360; ECN 112.

**AGB 330 Agribusiness Accounting. (3)***fall*

Introduction to managerial accounting for agribusiness using computerized accounting systems.

**AGB 332 Agribusiness Finance I. (3)***fall and spring*

Introduction to concepts in agribusiness financial management: time value of money, risk and return, capital budgeting, and cost of capital. Prerequisites: ECN 111 and 112 (or their equivalents); introductory accounting.

**AGB 333 Agribusiness Finance II. (3)***spring*

Introduction to financial markets and institutions. Interest rate determination, money and banking, equity markets, farm credit system, vendor financing. Prerequisites: ECN 111 and 112 (or their equivalents); introductory accounting.

**AGB 334 Agricultural Commodities. (3)***fall*

Trading on futures markets. Emphasis on the hedging practices with grains and meats. Prerequisite: AGB 320.

**AGB 340 Food Processing. (3)***fall*

Introduction to processed food quality assurance, statistical sampling, and inspection procedures. Prerequisite: AGB 364.

**AGB 341 Food Analysis. (3)***not regularly offered*

Processing control and scientific instrumentation used in food quality assurance laboratories. Prerequisites: AGB 364; CHM 101.

**AGB 351 Management Science. (3)***fall*

Focus on the construction, solution, and interpretation of quantitative models used for management decision making in agribusiness firms. Prerequisites: AGB 320, 360; ECN 112; MAT 117.

*General Studies: CS***AGB 355 Sustainable Agriculture Systems. (3)***fall and spring*

Innovative developments in precision farming, irrigation, soils, tillage methods, machinery, and biotechnology in crop production. Prerequisite: AGB 211.

**AGB 360 Agribusiness Statistics. (3)***fall and spring*Statistical methods with applications in agribusiness and resource management. Lecture, computer lab. Prerequisite: college algebra. *General Studies: CS***AGB 364 Agribusiness Technologies I. (3)***fall*

Examination of methods of managing diverse crop and livestock enterprises with emphasis on growth, development, marketing, and loss prevention. Prerequisite: BIO 100.

**AGB 365 Agribusiness Technologies II. (3)***fall*

Biotechnology and other methods used in the production, processing, and distribution of food. Prerequisite: BIO 100.

**AGB 366 Golf Turf Management. (2)***fall and spring*

Selection, establishment, and maintenance of turf grasses bred specifically for golf greens, fairways, and roughs. Lecture, lab.

**AGB 367 Golf Course Landscape Plants and Design. (3)***fall and spring*

Identification, culture, and use of plants in a golf course setting. Cross-listed as PLB 363. Credit is allowed for only AGB 367 or PLB 363. Fee.

**AGB 370 Wildlife and Domestic Animal Nutrition. (3)***spring*

Survey of nutritional needs of domestic and wild animals. Prerequisites: AGB 210, 211; General Studies SQ course.

**AGB 371 Animal Genetics. (3)***fall*

Principles of animal genetics, including heritable traits, chromosomal aberrations, population genetics, molecular genetics, and gene regulation. Prerequisites: BIO 181, 182.

**AGB 380 Applied Microeconomics. (3)***fall and spring*

Emphasis on application of the theory of the firm, theory of exchange, and consumer theory.

**AGB 394 Special Topics. (1–4)***not regularly offered***AGB 410 Agribusiness Management II. (3)***spring*

Principles of human resource management in agribusiness firms. Prerequisite: AGB 310.

**AGB 411 Agricultural Cooperatives. (3)***spring*

Organization, operation, and management of agricultural cooperatives.

**AGB 414 Agribusiness Analysis. (3)***fall and spring*

Analysis of agribusiness firm decisions in the ecological, economic, social, and political environments. Special emphasis on ethical issues surrounding food production and consumption.

*General Studies: L***AGB 420 Food Marketing. (3)***spring*

Food processing, packaging, distribution, market research, new food research and development, and social implications. Prerequisite: AGB 320.

**AGB 422 Consumer Behavior. (3)***fall*

Application of behavioral concepts in analyzing consumer food purchases and their implications for marketing strategies. Prerequisite: completion of Agribusiness core (or its equivalent).

**AGB 424 Sales and Merchandising in Agribusiness. (3)***summer*

Principles and techniques of selling and merchandising in the agricultural and food industries.

**AGB 425 Agricultural Marketing Channels. (3)***fall*

Operational stages of agricultural commodities in normal distribution systems and implementation of marketing strategies. Prerequisite: AGB 320.

**NOTE:** For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 78. For graduation requirements, see "University Graduation Requirements," page 74. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 51.

**AGB 429 Marketing Research. (3)***fall*

Examines the marketing research process and its role in facilitating agribusiness decisions. Emphasizes problem identification, survey design, and data analysis. Prerequisite: completion of Agribusiness core (or its equivalent).

**AGB 431 Intermediate Agribusiness Financial Management. (3)***spring*

Comprehensive treatment of topics in financial management of agribusiness: capital structure, dividend policy, asset valuation, mergers and acquisitions, risk management. Prerequisites: AGB 332, 333.

**AGB 433 Intermediate Agribusiness Financial Markets. (3)***spring*

Role and function of agribusiness in U.S. financial system. Topics include rural banking, farm credit system, monetary policy, and federal reserve. Prerequisite: completion of Agribusiness core (or its equivalent).

**AGB 434 Agricultural Risk Management and Insurance. (3)***fall*

Strategies to manage agricultural price and business risk: derivatives, insurance, self-insurance, and public policy. Prerequisite: completion of Agribusiness core (or its equivalent).

**AGB 436 Entrepreneurship and Financial Management of E-Commerce. (3)***fall*

Uses lectures, case studies, and business plans to highlight challenges of starting and running a small business. Lecture, seminar, case studies, computer labs.

**AGB 440 Food Safety. (3)***spring*

Control, prevention, and prediction of microbial and chemical food-borne diseases. Prerequisite: AGB 442 or instructor approval.

**AGB 441 Food Chemistry. (3)***spring*

Biochemical and chemical interactions that occur in raw and processed foods. Prerequisites: CHM 115, 231.

**AGB 442 Food and Industrial Microbiology. (4)***not regularly offered*

Food- and industrial-related microorganisms; deterioration and preservation of industrial commodities. Lecture, lab. Prerequisite: microbiology course with lecture and lab.

**AGB 443 Food and Industrial Fermentations. (3)***spring*

Management, manipulation, and metabolic activities of industrial microbial cultures and their processes. Prerequisite: AGB 442 or instructor approval.

**AGB 445 Food Retailing. (3)***fall*

Food retail management. Discusses trends, problems, and functions of food retail managers within various retail institutions. Lecture, case studies.

**AGB 450 International Agricultural Development. (3)***fall*

Transition of developing countries from subsistence to modern agriculture. Emphasis placed on implications for U.S. agribusiness working abroad.

*General Studies: G***AGB 452 International Agricultural Policy. (3)***fall*

Use of international trade theory to analyze the effects of government policies, trade agreements, and exchange rates on agribusiness. Prerequisite: ECN 112.

**AGB 454 International Trade. (3)***spring*

International practices in trading of agribusiness, technology, and resource products and services.

**AGB 455 Resource Management. (3)***spring*

Explores differences between societal and individual valuations of natural resources and considers public policy versus market-based solutions to environmental concerns. Prerequisite: ECN 112.

*General Studies: SB***AGB 456 World Agricultural Resources. (3)***fall*

World production and consumption of agricultural products, international relationships, and agencies concerned with world agricultural development problems.

*General Studies: G***AGB 457 Resource Policy and Sustainability. (3)***fall*

Considers the evolution of policy design, focusing on how resource and environmental concerns have affected agricultural development and trade policies. Prerequisite: ECN 112.

**AGB 458 Bioremediation. (3)***spring*

Technical-regulatory and policy issues emanating from minetailing and animal waste. Lecture, case studies.

**AGB 460 Agribusiness Management Systems. (4)***spring*

Development and use of decision support systems for agribusiness management and marketing. Lecture, lab.

**AGB 463 Electronic Commerce Applications. (3)***fall*

Overview of electronic commerce technology with introduction to basics of design, control, operation, organization, and emerging issues. Pre- or corequisite: AGB 460 (or its equivalent).

**AGB 466 Integrated Pest Control. (2)***fall and spring*

Management of pests affecting golf turf and landscape plants. Structural Pest Control Board sprayer certification preparation offered during the semester. Lecture, lab.

**AGB 470 Comparative Nutrition. (3)***not regularly offered*

Effects of nutrition on animal systems and metabolic functions. Prerequisite: CHM 231.

**AGB 471 Diseases of Domestic Animals. (3)***spring*

Discussion of animal welfare, mechanisms of disease development, causes and classification of diseases, disease resistance, and common zoonoses. Prerequisite: BIO 181.

**AGB 473 Animal Physiology I. (3)***not regularly offered*

Control and function of the nervous, muscular, cardiovascular, respiratory, and renal systems of domestic animals. Prerequisites: BIO 181; CHM 113.

**AGB 479 Veterinary Practices. (3)***fall and spring*

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

**AGB 480 Agribusiness Policy and Government Regulations. (3)***spring*

Development and implementation of government food, drug, pesticide, and farm policies and regulations that affect the management of agribusiness.

**AGB 484 Internship. (1–12)***fall and spring***AGB 490 Recent Advances in Agribusiness. (1)***fall and spring*

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

**AGB 492 Honors Directed Study. (1–6)***not regularly offered*

Possible topics:

(a) Recent Advances in Food Science. (1)

**AGB 493 Honors Thesis. (1–6)***not regularly offered***AGB 494 Special Topics. (1–4)***not regularly offered***AGB 498 Pro-Seminar. (1–7)***not regularly offered***AGB 499 Individualized Instruction. (1–3)***not regularly offered***AGB 500 Research Methods. (1–12)***not regularly offered*

**AGB 501 Master's Thesis Preparation. (1)**

*fall and spring*

Step-by-step guidelines to major elements of a master's thesis along with practical guidelines for conducting research.

**AGB 510 Advanced Agribusiness Management I. (3)**

*fall*

Managing and financing agribusiness, emphasizing environmental and economic sustainability in a global economy undergoing radical change. Prerequisite: AGB 310.

**AGB 511 Advanced Agribusiness Management II. (3)**

*spring*

Analysis of organization behavior, change, and resource requirements within agribusiness systems. Prerequisite: AGB 310.

**AGB 512 Food Industry Management. (3)**

*spring*

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

**AGB 513 Advanced Cooperatives. (3)**

*fall*

Advanced study of cooperatives and other nongovernmental organizations (NGO) focusing on management and proposal preparation for international agencies.

**AGB 514 Advanced Agribusiness Analysis I. (3)**

*spring*

Vertical integration and differentiation in food and agricultural industries. Prerequisite: AGB 510 or 528.

**AGB 515 Agribusiness Coordination. (3)**

*spring*

Organizational alternatives for agribusiness with emphasis on cooperatives and trading companies. Prerequisite: AGB 510 or 528.

**AGB 528 Advanced Agribusiness Marketing. (3)**

*fall*

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

**AGB 529 Advanced Agribusiness Marketing Channels. (3)**

*spring*

Analysis of agribusiness market channel systems. Formulation of marketing strategies.

**AGB 532 Advanced Agribusiness Finance. (3)**

*fall*

Financial management of agribusiness firms; agribusiness financial analysis, investment analysis, agricultural risk management, and introduction to agricultural financial intermediaries. Prerequisites: both computer literacy and 1 finance course or only instructor approval.

**AGB 535 Commodity Analysis. (3)**

*fall*

Analysis of commodity markets.

**AGB 536 Small Business Finance, Entrepreneurship, and E-Commerce. (3)**

*fall*

Uses lectures, case studies, and business plans to highlight challenges of starting and running a small business. Lecture, seminar, case studies, computer labs.

**AGB 540 Advanced Food Science. (3)**

*not regularly offered*

Chemical and physical nature of processed foods. Emphasis on food product development.

**AGB 550 International Agricultural Development. (3)**

*fall*

Transition of developing countries from subsistence to modern agriculture. Emphasis placed on implications for U.S. agribusiness working abroad.

**AGB 551 Agribusiness in Developing Countries. (3)**

*spring*

Factors influencing successful development of agribusiness enterprises in developing countries, including poverty, access to capital and technology, and trade opportunities.

**AGB 552 International Agricultural Policy. (3)**

*fall*

Use of international trade theory to analyze the effects of government policies, trade agreements, and exchange rates on agribusiness.

**AGB 554 Advanced International Trade. (3)**

*fall*

Advanced international practices in trading of agribusiness, technology, and resource products and services.

**AGB 557 Resource Policy and Sustainability. (3)**

*fall*

Considers the evolution of policy design, focusing on how resource and environmental concerns have affected agricultural development and trade policies.

**AGB 558 Advanced Bioremediation. (3)**

*spring*

Management and policy issues related to bioremediation of minetailing and animal waste and replacement of chemical control with biological methods. Lecture, case studies.

**AGB 560 Advanced Agribusiness Management Systems. (3)**

*not regularly offered*

Development and use of decision support systems for agribusiness management decision making. Prerequisite: AGB 510.

**AGB 561 Agribusiness Research Methods. (3)**

*fall*

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

**AGB 570 Managerial Economics for Agribusiness. (3)**

*fall*

Concepts in micro- and macroeconomics applied to agribusiness management environments: price formation, market structure, information economics, fiscal and monetary policy. Prerequisites: introductory micro- and macroeconomics.

**AGB 580 Practicum. (1–12)**

*not regularly offered*

**AGB 581 Advanced Agribusiness Policy. (3)**

*fall*

Policy-making history, structure, and process.

**AGB 583 Field Work. (1–12)**

*not regularly offered*

**AGB 584 Internship. (1–12)**

*not regularly offered*

**AGB 587 Resource Policy and Sustainability. (3)**

*fall*

Considers the evolution of policy design, focusing on how resource and environmental concerns have affected agricultural development and trade policies.

**AGB 590 Reading and Conference. (1–12)**

*not regularly offered*

**AGB 591 Seminar. (1–12)**

*not regularly offered*

**AGB 592 Research. (1–12)**

*not regularly offered*

**AGB 593 Applied Project. (1–12)**

*not regularly offered*

**AGB 594 Conference and Workshop. (1–12)**

*not regularly offered*

**AGB 595 Continuing Registration. (1)**

*not regularly offered*

**AGB 598 Special Topics. (1–4)**

*not regularly offered*

**AGB 599 Thesis. (1–12)**

*not regularly offered*

**AGB 600 Research Methods. (1–12)**

*not regularly offered*

**AGB 690 Reading and Conference. (1–12)**

*not regularly offered*

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**NOTE:** For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 78. For graduation requirements, see "University Graduation Requirements," page 74. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 51.

## ENVIRONMENTAL RESOURCES (ERS)

### ERS 130 Introduction to Environmental Science. (4)

*fall*  
Introduction to soil resources, their physical and chemical properties, classification, energy dynamics, and the role they play in environmental quality. Lecture, lab.

*General Studies: SQ*

### ERS 191 First-Year Seminar. (1–3)

*not regularly offered*

### ERS 207 Applied Plant Taxonomy. (2)

*fall*  
Introduction to identification of vascular plants. Survey of plant families. Field trips required. 2 hours lecture. Prerequisite: BIO 182. Corequisite: ERS 208.

### ERS 208 Applied Plant Taxonomy Laboratory. (2)

*fall*  
Techniques and practices in vascular plant identification. Lab. Prerequisite: BIO 182. Corequisite: ERS 207.

### ERS 225 Soils. (3)

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

### ERS 226 Soils Laboratory. (1)

*fall*  
Selected exercises to broaden the background and understanding of basic soil principles. Lab. Corequisite: ERS 225.

### ERS 246 Environmental Conservation and Ecology. (3)

*spring*  
Principles of environmental conservation from global, historical, and ecological perspectives. Consideration of development/sustainability issues.

*General Studies: G*

### ERS 294 Special Topics. (1–4)

*not regularly offered*

### ERS 301 Ecology. (3)

*fall*  
Introduction to the principles of ecology emphasizing vegetation community ecology. Field trips required. Prerequisite: BIO 182.

### ERS 307 Plant Identification. (4)

*fall*  
Identification of key plants of western rangelands and forests. Laboratory emphasis on grass identification. Lecture, lab. Prerequisite: ERS 207 or PLB 310 (or its equivalent).

### ERS 311 Applied Ecology. (4)

*spring*  
Ecological principles and their implication for management of ecosystems. 3 hours lecture, 1 hour lab. Prerequisites: ERS 225, 301, 350.

### ERS 333 Water Resources Management. (3)

*not regularly offered*  
Sources, their development, and conservation in arid regions for agricultural, natural resources, and urban uses. Prerequisite: CHM 101 or 113.

### ERS 350 Environmental Statistics. (3)

*fall*  
Statistical methods with applications in natural resource management and the environmental sciences. Use of computers and the internet. Prerequisites: CSE 180; MAT 117.

*General Studies: CS*

### ERS 353 Wildlife Nutrition. (3)

*not regularly offered*  
Principles of nutrient metabolism in wildlife species, with emphasis on understanding the interaction of wildlife with their environment. Prerequisites: a combination of BIO 181 and 182 and CHM 101 or only instructor approval.

### ERS 360 Range Ecosystem Management. (3)

*fall*  
Ecosystem management principles applied to rangelands. Herbivory as an ecological process, evaluation of rangeland health, multiple use of rangelands. Lecture, recitation. Prerequisites: BIO 320 (or its equivalent); ERS 246.

### ERS 364 Surface Water Hydrology. (3)

*fall in even years*  
Hydrologic principles in an ecological context. Discharge measurements, open channel hydraulics, bed forms, sediment transport as applied to ecological problems. Lecture, lab, field trip. Prerequisite: ERS 350.

### ERS 365 Watershed Management. (3)

*not regularly offered*  
Hydrologic, physical, biological, and ecological principles applied to watershed management. Impact of ecosystem manipulations on water yield and quality. 1 weekend field trip. Prerequisites: ERS 225, 246.

### ERS 402 Vegetation Measurement. (4)

*spring*  
Vegetation sampling and inventory as related to animal-habitat relations. Lecture, lab, 1 weekend field trip. Prerequisites: a combination of ERS 301 and 307 and 350 and program major or only instructor approval.

### ERS 415 Wildlife Life Histories. (4)

*spring*  
Life histories of the major mammal, reptile/amphibian, and avian species found in the Southwest, with emphasis on management. Lecture, lab. Prerequisites: BIO 370 (or 385); ERS 360.

### ERS 420 Ecological Restoration. (3)

*spring*  
Techniques of ecological restoration applied for the improvement of arid and semiarid land and sensitive habitats. Weekend field trips. Prerequisite: ERS 360.

### ERS 425 Soil Classification and Management. (3)

*not regularly offered*  
Principles of soil genesis, morphology, and classification. Presents management and conservation practices. Prerequisite: ERS 225.

### ERS 433 Riparian Ecosystem Management. (3)

*not regularly offered*  
Examines the functions and components that make up riparian ecosystems and the management of these ecosystems. Lecture, field trip. Prerequisite: ERS 225 or instructor approval.

### ERS 434 Wetland Ecosystems and Soils. (3)

*not regularly offered*  
Wetland ecosystems structure and function including hydrology and biogeochemistry with special emphasis on soils. Lecture, weekend field trip. Prerequisite: ERS 225 or instructor approval.

### ERS 448 Soil Ecology. (3)

*not regularly offered*  
Soils viewed in an ecosystem context, soil-plant relationships, nutrient budgets, and abiotic factors that influence soil processes. Prerequisites: a combination of BIO 320 and ERS 225 and 226 or only instructor approval.

### ERS 449 Landscape Ecology. (3)

*not regularly offered*  
Causes and ecological consequences of spatial and temporal patterns in the environment. Prerequisite: ERS 301.

### ERS 460 Applied Systems Ecology. (3)

*not regularly offered*  
Systems approach applied to analysis and management of natural resource ecosystems. Use of simulation models. 2 hours lecture, 3 hours lab. Prerequisites: ERS 350 (or its equivalent); 1 course in ecology.

### ERS 465 Surface Water Quality. (3)

*spring in odd years*  
Examines factors that impact water quality. Surface water sampling and analysis with interpretation for wildlife, humans, and other users. Prerequisites: ERS 364, 365.

### ERS 474 Wildlife Ecology. (3)

*not regularly offered*  
Integrates ecological concepts as applied to wildlife populations and their interaction with the habitat and other species. Lecture, lab, 1 weekend field trip. Prerequisite: ERS 360.

### ERS 475 Wildlife Management. (4)

*spring*  
Principles and techniques of applied ecology for the management of wildlife populations. Lecture, lab. Prerequisites: ERS 311 and 474 (or their equivalents).

**ERS 477 Environmental Risk Assessment and Management. (3)***not regularly offered*

Survey of methods related to identification, evaluation, comparison, and management of environmental risks. Prerequisite: senior standing.

**ERS 480 Ecosystem Management and Planning. (3)***spring*

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

*General Studies: L***ERS 484 Internship. (1–12)***not regularly offered***ERS 485 GIS in Natural Resources. (3)***fall*

Principles of Geographic Information Systems (GIS) utilized in natural resource management. Use of computers for spatial analysis of natural resources. Lecture, lab. Prerequisite: CSE 180 (or its equivalent).

**ERS 486 Remote Sensing in Environmental Resources. (4)***spring*

Principles and application of remote sensing technologies in natural resource management. Integration of computerized data from aerial photography and Landsat imagery in resource management. Lecture, lab. Prerequisite: ERS 485 (or its equivalent).

**ERS 489 Undergraduate Research. (1–3)***fall and spring*

Undergraduate research under the supervision of an environmental resources faculty member. Prerequisite: junior or senior status.

**ERS 490 Recent Advances in Environmental Resources. (1)***fall and spring*

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

**ERS 492 Honors Directed Study. (1–6)***not regularly offered***ERS 493 Honors Thesis. (1–6)***not regularly offered***ERS 494 Special Topics. (1–4)***not regularly offered***ERS 498 Pro-Seminar. (1–7)***not regularly offered***ERS 499 Individualized Instruction. (1–3)***not regularly offered***ERS 500 Research Methods. (1–12)***not regularly offered***ERS 533 Riparian Ecology. (3)***not regularly offered*

Review of recent literature, developments, and methods related to riparian ecology. Applications of soil and landscape ecology to riparian systems. Lecture, discussion, field trips.

**ERS 540 Plant Responses to Environmental Stresses. (3)***not regularly offered*

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

**ERS 550 Vegetation Dynamics. (4)***fall*

Dynamics of vegetation emphasizing ecological succession, applications of landscape ecology and GIS, and analysis of vegetation data. Field trips, studio. Prerequisite: introductory statistics course.

**ERS 551 Advanced Environmental Statistics. (4)***spring*

Advanced statistical procedures for environmental resources. Techniques for analyzing research data that do not meet assumptions. Studio. Prerequisite: ERS 350 (or its equivalent).

**ERS 553 Advanced Animal Nutrition. (4)***not regularly offered*

Metabolic and physiological interactions of nutrients in wild and domesticated animals consuming natural feeds. Lecture, lab.

**ERS 560 Systems Ecology. (3)***not regularly offered*

Quantitative description and mathematical modeling of ecosystem structure and function. Techniques for model construction and simulation. Lecture, lab. Prerequisites: ERS 350 (or its equivalent); computer programming; 6 hours in ecological studies.

**ERS 561 Spatial Statistics and GIS. (3)***fall*

Dependent spatial data, analysis and description, semivariograms, variograms, kriging, and GIS analysis. Lecture, lab. Prerequisites: ERS 350 and 485 (or their equivalents).

**ERS 580 Practicum. (1–12)***not regularly offered***ERS 584 Internship. (1–12)***not regularly offered***ERS 585 Spatial Modeling with GIS. (3)***fall*

GIS technology for spatial modeling of natural resources. Practical application of GIS technology for problem solving. Lecture, lab. Prerequisite: ERS 485 (or its equivalent) or instructor approval.

**ERS 590 Reading and Conference. (1–12)***not regularly offered***ERS 591 Environmental Resources Seminar. (1–12)***not regularly offered***ERS 592 Research. (1–12)***not regularly offered***ERS 593 Applied Project. (1–12)***not regularly offered***ERS 594 Conference and Workshop. (1–12)***not regularly offered***ERS 595 Continuing Registration. (1)***not regularly offered***ERS 598 Special Topics. (1–4)***not regularly offered***ERS 599 Thesis. (1–12)***not regularly offered***ERS 691 Seminar. (1–12)***not regularly offered*

# East College

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David E. Schwalm, Dean

[www.east.asu.edu/ecollege](http://www.east.asu.edu/ecollege)

## PURPOSE

East College was created by the Arizona Board of Regents in February 1997 to serve four purposes:

1. to offer an array of upper-division General Studies and general interest courses for students enrolled in ASU East degree programs;
2. to coordinate the Partnership in Baccalaureate Education with Chandler-Gilbert Community College through which ASU East students are provided with lower-division General Studies and major prerequisite courses;
3. to offer an academic home for students who choose the unique environment of ASU East but do not wish to declare a major immediately; and
4. to develop new degree programs for ASU East.

**General Studies/General Interest.** Each semester, East College offers a selection of popular upper-division ASU General Studies and general interest courses, primarily for support of ASU East students but open to all ASU students who might find the time or location convenient. East College typically offers courses in anthropology, art, communication, economics, English, history, mathematics, music, philosophy, political science, psychology, religious studies, sociology, and women's studies. Students should refer to the current *Schedule of Classes* for specific courses offered at ASU East each semester. All credit earned at ASU East automatically transfers to ASU Main or ASU West.

East College also offers support courses for the Bachelor of Applied Science (B.A.S.) degree. The applied science core (ASC) courses are upper-division courses specifically designed to build upon the mathematics and science base acquired in the Associate of Applied Science (A.A.S.) degree.

## APPLIED SCIENCE CORE (ASC)

### ASC 301 Contextual Uses of Algebra in Technology. (1)

*fall and spring*

Uses algebra to solve real-world technological problems using currently available computer software. Prerequisite: B.A.S. major.

### ASC 302 Contextual Uses of Geometry in Technology. (1)

*fall and spring*

Uses geometrical concepts to solve real-world technological problems using currently available computer software. Prerequisite: B.A.S. major.

### ASC 303 Contextual Uses of Trigonometry in Technology. (1)

*fall and spring*

Uses trigonometry to solve real-world technological problems using currently available computer software. Prerequisite: B.A.S. major.

### ASC 315 Numeracy in Technology. (3)

*fall and spring*

Contextual uses of mathematics in applied sciences. Emphasizes using mathematical methodologies to solve technology-related problems. Prerequisite: B.A.S. major.

### ASC 325 Physical Sciences in Technology. (4)

*fall and spring*

Physical systems and their interrelationships on technology systems. Real-world applications of physical systems. Lecture, lab. Prerequisite: B.A.S. major.

**Partnership in Baccalaureate Education.** Through the partnership with Chandler-Gilbert Community College, ASU East students take first-year composition courses and courses that meet lower-division ASU General Studies requirements listed in the "General Studies," page 78. These courses are available in an innovative integrated first-year curriculum designed to foster academic success. Students can also take major prerequisite courses, introductory language courses, and other lower-division courses of general interest through the partnership.

**East College/No Preference Majors.** Students who would like to start their college careers at ASU East to benefit from the unique campus environment can declare "East College/No Preference" as an interim major while completing the General Studies requirements and searching for an ASU major that serves their personal and career objectives. East College provides advising for No Preference majors.

## DEGREE PROGRAMS

See the "East College Baccalaureate Degrees and Majors" table, page 621. For graduate degrees, see the "East College Graduate Degrees and Majors" table, page 622.

East College also offers certificate programs in Multimedia Writing and Technical Communication; minors in Food and Nutrition Management and Human Nutrition; and a concentration for the B.A.S. See the *Graduate Catalog* for more information about graduate programs.

## OTHER NEW PROGRAMS

East College has been authorized to plan a B.S. degree in Human Health, which is currently under development. For more information, access the East College Web site at [www.east.asu.edu/ecollege](http://www.east.asu.edu/ecollege).

## INTERDISCIPLINARY STUDIES—B.I.S.

The Bachelor of Interdisciplinary Studies (B.I.S.) is a university-wide program intended for the student who has academic interests that might not be satisfied with existing majors. Building on two academic concentrations and an interdisciplinary core, students in the B.I.S. are expected to take an active role in creating their educational plan and defining their career goals. The B.I.S. emphasizes written communication, versatility, and critical thinking, skills desired in a changing workplace environment. Self-assessment, and appraisal of opportunities to support academic and career goals are key elements in the core courses. The concentrations are generally based on approved academic minors, certificate programs, or special coherent clusters of

## East College Baccalaureate Degrees and Majors

Major	Degree	Concentration	Administered By
Applied Psychology	B.S.	—	East College
Applied Science	B.A.S.	Multimedia writing and technical communication	East College
Business Administration	B.S.	—	East College
Elementary Education	B.A.E.	—	East College
Exercise and Wellness	B.S.	—	East College
Interdisciplinary Studies	B.I.S.	See “B.I.S. Concentrations” table, page 109.	Bachelor of Interdisciplinary Studies Advisory Committee
Multimedia Writing and Technical Communication	B.S.	—	East College
Nutrition	B.S.	Dietetics, food and nutrition management, human nutrition	Department of Nutrition

course work. The student should be able to integrate these into a meaningful program.

The combination of areas of concentration gives students flexibility in creating unique programs to accomplish individual academic goals. Students who declare the B.I.S. as their major in East College at ASU East take their core courses and at least one concentration through ASU East. The second concentration may be taken at ASU Main, ASU West, or ASU East. The B.I.S. core courses are offered by East College. Concentrations at ASU East are offered by East College, the College of Technology and Applied Sciences, and the Morrison School of Agribusiness and Resource Management. Students interested in the B.I.S. should arrange an appointment with an East College advisor at 480/727-1515 before declaring the B.I.S. major.

### Basic Requirements

The B.I.S. requires 120 semester hours. The major is composed of a 12 hour core and a minimum of 36 hours in two concentrations (18 hours each). Throughout the core sequence, the student assembles a portfolio including self-assessment of progress toward career goals and an evaluation of key educational and personal activities that may apply. The core courses must be taken in sequence. These courses may not be transferred from other institutions. BIS 302 and 401 may be taken concurrently. All core courses must be completed with a grade of “C” or higher.

### Core Courses

BIS 301 Foundations of Interdisciplinary Studies <i>L</i> .....	3
BIS 302 Interdisciplinary Principles .....	3
BIS 401 Applied Interdisciplinary Studies .....	3
BIS 402 Senior Seminar <i>L</i> .....	3
Total .....	12

For course descriptions, see “Bachelor of Interdisciplinary Studies,” page 111.

### Other Requirements

In addition to the basic requirements, students must complete all university requirements, including First-Year Composition and General Studies. Early advising is recommended to ensure that students meet requirements efficiently and optimize their choices.

**Declaring the B.I.S. Major.** Students must receive approval from an East College advisor before declaring the B.I.S. major. In addition, the following requirements must be met:

1. 45 semester hours of college credit completed;
2. cumulative GPA of 2.00 for continuing ASU students or in-state transfer students (2.50 for out of state transfers); and
3. selection of two concentrations with a minimum of two courses in each (minimum grade of “C”) completed or one completed and one in progress (i.e., after the drop/add period) in each area.

### Approved Concentrations

Each concentration requires 18 semester hours, with each course completed with a grade of “C” or higher. Twelve of the hours must be in upper-division courses. Students should check for new information about concentrations on the Web at [www.east.asu.edu/ecollege](http://www.east.asu.edu/ecollege) or contact an East College advisor at 480/727-1515.

**NOTE:** For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see “General Studies,” page 78. For graduation requirements, see “University Graduation Requirements,” page 74. For an explanation of additional omnibus courses offered but not listed in this catalog, see “Classification of Courses,” page 51.

### East College Graduate Degrees and Majors

Major	Degree	Concentration	Administered By
Curriculum and Instruction*	Ph.D.	Exercise and wellness education	Interdisciplinary Committee on Curriculum and Instruction
Exercise and Wellness	M.S.	—	East College
Nutrition	M.S.	—	Department of Nutrition

\* Doctoral courses for this interdisciplinary program administered by ASU Main are offered at ASU East.

## Faculty of Applied Psychology

**Roger W. Schvaneveldt**  
*Faculty Head*  
(CNTR 78) 480/727-1066

### APPLIED PSYCHOLOGY—B.S.

This major offers a traditional psychology core leading to graduate school preparation and/or to applications in human factors with emphasis on human-computer interaction, aviation, or manufacturing. Although most careers in psychology require graduate training, there are some employment opportunities for B.S. students in applied settings. For example, there is a need for individuals who can help deal with problems of usability of products and systems. The Applied Psychology program offers courses and experiences to prepare students for these positions. The rigor of the major also provides strong preparation for further graduate study in psychology. The program serves students in other ASU East programs such as engineering technologies, aeronautical management technology, information management technology, and business administration.

#### Graduation Requirements

The completion of 120 semester hours—including First-Year Composition, General Studies (see “General Studies,” page 78), and major requirements—leads to the B.S. degree. The major allows for at least 24 semester hours of electives. The major requirements for the B.S. degree in Applied Psychology consist of a 25-hour core of psychology courses, 12 hours in applied psychology, and 18 hours of related course work.

**Core Courses (25 hours).** Core courses provide a general background in the basic scientific areas of psychology and provide a culminating experience to integrate the varied studies.

PGS 101	Introduction to Psychology <i>SB</i> .....	3
PGS 350	Social Psychology <i>SB</i> .....	3
PSY 230	Introduction to Statistics <i>CS</i> .....	3
PSY 290	Research Methods <i>L/SG</i> .....	4
PSY 323	Sensation and Perception .....	3
PSY 324	Memory and Cognition .....	3
PSY 325	Physiological Psychology .....	3
PSY 477	Applied Psychology Capstone Experience* .....	3
	or HON 493 Honors Thesis (3)	—
Total	.....	25

\* This PSY course is offered only by ASU East.

**Applied Psychology Courses (12 hours).** Students work with an advisor to select courses in Applied Psychology emphasizing human-computer interaction (HCI), aviation, training, manufacturing, or methods. Course work must include a minimum of four of the following courses:

AMT 410	Aviation Safety and Human Factors .....	3
PGS 471	Psychological Testing .....	3
PSY 320	Learning and Motivation.....	3
PSY 330	Statistical Methods <i>CS</i> .....	3
PSY 360	Cognitive Science* .....	3
PSY 390	Experimental Psychology <i>L</i> .....	3
PSY 437	Human Factors <i>L</i> .....	3
PSY 438	Human-Computer Interaction* .....	3
PSY 439	Training and Skill Acquisition* .....	3
PSY 440	Industrial/Organizational Psychology* .....	3
PSY 494	Special Topics .....	1–4

\* This PSY course is offered only by ASU East.

#### Sample 12-hour Course Sets

##### Human-Computer Interaction

PSY 437	Human Factors
PSY 438	Human-Computer Interaction
PSY 440	Industrial/Organizational Psychology
PSY 494	Special Topics

##### Aviation

PSY 437	Human Factors
PSY 438	Human-Computer Interaction
PSY 440	Industrial/Organizational Psychology
AMT 410	Aviation Safety and Human Factors

##### Manufacturing

PSY 437	Human Factors
PSY 438	Human-Computer Interaction
PSY 439	Training and Skill Acquisition
PSY 440	Industrial/Organizational Psychology

##### Training

PSY 320	Learning and Motivation
PSY 437	Human Factors
PSY 439	Training and Skill Acquisition
PSY 440	Industrial/Organizational Psychology

##### Methods

PSY 330	Statistical Methods
PSY 360	Cognitive Science
PSY 390	Experimental Psychology
PGS 471	Psychological Testing

##### Related Course Work

BIO 120	Human Physiology <i>SG</i> .....	4
	or BIO 181 General Biology (4)	
	or BIO 193 The Nature of Biological Science <i>SQ</i> (4)	
	or BIO 201 Human Anatomy and Physiology I <i>SG</i> (4)	
MAT 210	Brief Calculus.....	3
	A computer programming course .....	3
	Courses selected in consultation with an advisor .....	8
Total	.....	18

For more information about program requirements and courses, call an East College advisor at 480/727-1515, send e-mail to east.college@asu.edu, or access the Web site at www.east.asu.edu/ecollege/appliedpsych.

For PGS courses and additional PSY courses, see “Department of Psychology,” page 437.

### PSYCHOLOGY (PSY)

For more PSY courses, see “Department of Psychology” under “College of Liberal Arts and Sciences.”

#### E PSY 360 Cognitive Science. (3)

once a year

Examines cognition from the varied perspectives of philosophy, linguistics, psychology, computer science (artificial intelligence), and neuroscience. Lecture, discussion. Prerequisite: PSY 324.

#### E PSY 438 Human-Computer Interaction. (3)

once a year

Theories, methods, and findings concerning the usability of computer systems and the design of effective user interfaces. Lecture, discussion, projects. Prerequisite: PSY 437.

#### E PSY 439 Training and Skill Acquisition. (3)

once a year

Theories, methods, and findings concerning the acquisition of skilled performance and the design of effective training systems. Lecture, discussion, projects. Prerequisite: PSY 437.

#### E PSY 440 Industrial/Organizational Psychology. (3)

once a year

Examines personnel selection, performance assessment, job and workplace design, job satisfaction, organizational behavior, management systems, and industrial safety. Lecture, discussion, projects. Prerequisite: PSY 230 (or an equivalent statistics course).

#### E PSY 477 Applied Psychology Capstone Experience. (3)

once a year

Applied psychology from a systems perspective. Requires a report based on research and/or applied work as a culminating experience. Lecture, discussion, projects. Prerequisite: senior standing.

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## Faculty of Business Administration

**Roger W. Hutt**  
*Faculty Head*  
 (CNTR 76) 480/727-1055

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### BUSINESS ADMINISTRATION—B.S.

The B.S. degree in Business Administration offers a survey of contemporary business disciplines and additional depth in at least three disciplines. The curriculum enables students to gain essential business competencies, knowledge of business disciplines and methods, and appreciation for contemporary business environments and cultures. Students prepare for careers in business, industry, or government, as well as for career advancement and entrepreneurial enterprises. This program operates under the umbrella of the ASU Main College of Business AACSB accreditation, but it is offered through East College. Students seeking admission to the professional program must have completed 56 semester hours in good standing, including 30 hours of skill courses (see “Business Core Requirements,” page 154). The major requires an additional 33 hours, including a 15-hour

core, seven hours of professional proficiency courses, and 11 hours of business advanced electives. Students may choose to take additional business courses, related courses in industry-specific business programs at ASU East (e.g. agribusiness, information and management technology, and aeronautical management technology), or a special optional 12-hour extension of the basic major in industry-specific programs.

For the latest information about application, admissions, program requirements, and courses, call an East College advisor at 480/727-1515, or access the Web site at www.east.asu.edu/ecollege/businessadmin.

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## Faculty of Elementary Education

**Bette S. Bergeron**  
*Faculty Head*  
 (CNTR 82) 480/727-1303

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**PROFESSOR**  
 BERGERON

**LECTURER**  
 WENHART

### ELEMENTARY EDUCATION—B.A.E.

#### Program Overview

The Elementary Education program at ASU East is unique in its focus on intensive field experiences, practical application of current theory, and emphasis on technology. The newly revised curriculum is also focused on and directly aligned with Arizona’s standards for teachers. Courses are arranged sequentially and taken with peer cohorts in four semester-long blocks. Elementary Education students are immersed in field experiences each semester that directly link with course discussions and assignments. Course instructors have taught in a variety of K–8 settings and can therefore augment class experiences with practical applications. Current educational technologies are incorporated into course delivery and assignments. Additionally, students have the opportunity to choose between the Elementary Education program at the ASU East campus or participate in one of the campus’s district-based school partnerships.

#### Program Requirements

A total of 120 semester hours is required for graduation with a minimum of 45 semester hours of upper-division credit. As part of the undergraduate degree program, students will complete ASU General Studies (see “General Studies” section, page 78) requirements. In addition, Elementary Education students are required to complete 18 semester hours in an academic specialization, which is tailored to an individual student’s academic strengths (e.g., math, science, social studies, English). The remaining program hours, which specifically focus on the teaching

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**NOTE:** For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see “General Studies,” page 78. For graduation requirements, see “University Graduation Requirements,” page 74. For an explanation of additional omnibus courses offered but not listed in this catalog, see “Classification of Courses,” page 51.

profession, are outlined below. Students must first be admitted to the ASU East Elementary Education program before enrolling in the Professional Preparation Program courses (Blocks I–IV).

**Foundations (15 semester hours)\***

ECD 314	The Developing Child	.....3
EDP 310	Educational Psychology <i>SB</i>	.....3
MCE 446	Understanding the Culturally Diverse Child <i>C</i>	.....3
MTE 180	Theory of Elementary Mathematics	.....3
SPE 311	Orientation to Education of Exceptional Children <i>SB</i>	.....3

\* For foundation course descriptions see “College of Education,” page 188.

**Professional Preparation Program\***

**Block I (11–12 hours)**

EDC 320	Integrated Learning Experience I: Learning Climate	.... 2
EDC 330	Literacy I: Emerging Literacy and Phonemic Awareness	..... 3
EDC 340	Schooling and Social Context	..... 3
EDC 350	Educational Technology I: Applications	..... 1
EDC 351	Educational Technology II: Instruction and Evaluation	..... 1
EDC 352	Educational Technology III: Design	..... 1
EDC 474	Field Experience	..... 0–1

**Block II (11–12 hours)**

EDC 325	Integrated Learning Experience II: Instructional Design and Implementation	..... 2
EDC 335	Literacy II: Intermediate Literacy and Phonetic Principles	..... 3
EDC 345	Math Methods for the Elementary Classroom	..... 3
EDC 355	Accommodating Instruction for Diverse Learners	..... 3
EDC 474	Field Experience	..... 0–1

**Block III (11–12 hours)**

EDC 420	Integrated Learning Experience III: Assessment	..... 2
EDC 430	Literacy III: Interventions	..... 3
EDC 440	Science Methods for the Elementary Classroom	..... 3
EDC 450	Social Studies Methods for the Elementary Classroom	..... 3
EDC 474	Field Experience	..... 0–1

**Block IV (12–14 hours)**

EDC 425	Integrated Learning Experience IV: Professional Knowledge	..... 2
EDC 484	Student Teaching in the Elementary School	..... 10–12

\* Block courses can only be taken upon admission to the Elementary Education program.

**Postbaccalaureate Program.** Individuals who hold a bachelor’s degree from an accredited institution are encouraged to participate in the Elementary Education program as non-degree graduate students. Postbaccalaureate students complete the same professional preparation program courses as outlined above, which are augmented by the students’ unique life and work experiences.

For more information, visit CNTR 82, or call 480/727-1303.

**Application.** Applications for the ASU East Elementary Education programs are due October 15 for spring admission, and May 15 for fall admission. Students eligible for admission must meet the following criteria:

1. admission to ASU East;
2. a minimum cumulative GPA of 2.50;

3. completion of at least 56 semester hours at the time of admission (undergraduate degree-seeking students); or, completion of a bachelor’s degree from an accredited institution (postbaccalaureate students);
4. evidence of competence in written English.

Applications include two letters of recommendation and a résumé outlining work with school-age children and/or their families. Students should call the ASU East Teacher Education Office at 480/727-1103 for complete admission packet information and eligibility requirements.

**State Certification.** Students who successfully complete the undergraduate or postbaccalaureate routes to Elementary Education teacher preparation at ASU East are recommended for K–8 certification in the State of Arizona pending the completion of all other requirements mandated by the state. These additional requirements include, but are not limited to, successful completion of all appropriate areas of the Arizona Teacher Proficiency Assessment and course work in the United States and Arizona constitutions. Because of the possibility that requirements for state certification may change, students are urged to maintain close contact with their education advisor.

**Advising Information.** It is important for all students to work closely with an ASU East academic advisor to ensure that their overall curriculum is coherent and best reflects their unique academic talents. For the latest information about application, admissions, program requirements, and courses, access the Web site at [www.east.asu.edu/ecollege/elementaryed](http://www.east.asu.edu/ecollege/elementaryed), or call the ASU East Teacher Education Office at 480/727-1103.

**ELEMENTARY EDUCATION (EDC)**

**EDC 320 Integrated Learning Experience I: Learning Climate. (2)**

*fall and spring*  
Exploration of factors contributing to a positive and productive classroom learning environment. Interactive forum.

**EDC 325 Integrated Learning Experience II: Instructional Design and Implementation. (2)**

*fall and spring*  
Design and implementation of developmentally appropriate instruction, and the alignment of instruction with district and state academic standards. Interactive forum. Prerequisite: EDC 320.

**EDC 330 Literacy I: Emerging Literacy and Phonemic Awareness. (3)**

*fall and spring*  
Development of language from birth to age 8, and appropriate strategies for promoting growth in speaking, listening, reading, and writing. Applied inquiry. Corequisite: EDC 474.

**EDC 335 Literacy II: Intermediate Literacy and Phonetic Principles. (3)**

*fall and spring*  
Strategies for teaching literacy in intermediate elementary classrooms, the application of phonetic principles to instruction, and integrating literacy across disciplines. Applied inquiry. Prerequisite: EDC 330. Corequisite: EDC 474. Pre- or corequisite: EDC 325.

**EDC 340 Schooling and Social Context. (3)**

*fall and spring*  
Seminar addressing foundational issues in education, including the culture of schooling, current social contexts, and educational law. Interactive forum.  
*General Studies: L*

**EDC 345 Math Methods for the Elementary Classroom. (3)**

*fall and spring*

Developmentally appropriate practices for teaching and assessing mathematics in grades K–8. Applied inquiry. Prerequisite: MTE 180. Corequisite: EDC 474. Pre- or corequisite: EDC 325.

**EDC 350 Educational Technology I: Applications. (1)**

*fall and spring*

Module focused on basic technological skills needed for managing classroom instruction. Lab.

**EDC 351 Educational Technology II: Instruction and Evaluation. (1)**

*fall and spring*

Module focused on technology as an instructional medium, evaluation, and effective classroom use. Lab. Prerequisite: EDC 350.

**EDC 352 Educational Technology III: Design. (1)**

*fall and spring*

Module focused on instructional design utilizing a variety of technologies, including multimedia. Lab. Prerequisite: EDC 351.

**EDC 355 Accommodating Instruction for Diverse Learners. (3)**

*fall and spring*

Identifying and accommodating learners with special needs, including classroom adaptations in instruction and assessment. Forum, practicum. Prerequisite: SPE 311. Corequisite: EDC 474. Pre- or corequisite: EDC 325.

**EDC 420 Integrated Learning Experience III: Assessment. (2)**

*fall and spring*

Principles related to classroom assessment, including the alignment of assessment to curriculum, test interpretation, and a variety of assessment techniques. Interactive forum. Prerequisite: EDC 325.

**EDC 425 Integrated Learning Experience IV: Professional Knowledge. (2)**

*fall and spring*

Exploration of issues related to professional knowledge, including interdisciplinary instruction and the impact of the community on students' learning. Interactive forum. Prerequisite: EDC 420. Corequisite: EDC 484.

**EDC 430 Literacy III: Interventions. (3)**

*fall and spring*

Strategies for accommodating students struggling with learning, with a focus on the areas of literacy acquisition and assessment. Forum, practicum. Prerequisites: EDC 335, 355. Corequisite: EDC 474. Pre- or corequisite: EDC 420.

**EDC 440 Science Methods for the Elementary Classroom. (3)**

*fall and spring*

Developmentally appropriate practices for teaching and assessing sciences in grades K–8. Applied inquiry. Prerequisites: EDC 325, 345. Corequisite: EDC 474. Pre- or corequisite: EDC 420.

**EDC 450 Social Studies Methods for the Elementary Classroom. (3)**

*fall and spring*

Developmentally appropriate practices for teaching and assessing social studies in grades K–8. Applied inquiry. Prerequisites: EDC 325, 335. Corequisite: EDC 474. Pre- or corequisite: EDC 420.

**EDC 474 Field Experience. (0–1)**

*fall and spring*

Application of course content in a K–8 school. Emphasis on observation, classroom management, planning and delivery of instruction, and assessment. Practicum. Corequisite: all methods courses in the teacher preparation program must be taken with Field Experience.

**EDC 484 Student Teaching in the Elementary School. (10–12)**

*fall and spring*

Supervised teaching in the area of specialization. Capstone internship in curriculum, instruction, and classroom management. Internship. Prerequisites: 2.50 GPA; completion of professional course sequence; approval of ASU East teacher preparation office. Corequisite: EDC 425.

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## Department of Exercise and Wellness

William J. Stone

Chair

mattingl@asu.edu

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**PROFESSORS**

CORBIN, STONE

**ASSOCIATE PROFESSOR**

SWAN

**ASSISTANT PROFESSOR**

PHILLIPS

**LECTURERS**

JONES, WOODRUFF

### EXERCISE AND WELLNESS—B.S.

The B.S. degree in Exercise and Wellness consists of 66 semester hours, including 21 semester hours of required EXW core courses.

The required core courses are as follows:

**Required courses**

EXW 300 Foundations of Exercise and Wellness <i>SB, L</i> .....	3
EXW 310 Computer Skills and Technology for Exercise and Wellness .....	3
EXW 342 Health Behavior Change .....	3
EXW 450 Cultural/Social Issues in Exercise and Wellness .....	3
EXW 484 EXW Internship .....	6
NTR 241 Human Nutrition .....	3
Total .....	21

Each EXW core course has specific prerequisite courses that must be taken before taking the respective core course. These prerequisite courses include the following:

BIO 201 Human Anatomy and Physiology I <i>SG</i> .....	4
BIO 202 Human Anatomy and Physiology II .....	4
CHM 101 Introductory Chemistry <i>SQ</i> .....	4
or any equivalent chemistry	
COM 225 Public Speaking <i>L</i> .....	3
PGS 101 Introduction to Psychology <i>SB</i> .....	3
Total .....	18

All prerequisite and EXW courses must be completed with a minimum grade of “C.” Additional requirements for the major are described below.

EXW 212 Instructional Competency Laboratory .....	6
EXW 315 Physiological Foundations of Movement .....	3
EXW 320 Program Development and Leadership .....	3
EXW 330 Kinesiological Foundations of Movement .....	3
EXW 400 Stress Management for Wellness .....	3
EXW 420 Exercise Testing .....	3
EXW 425 Exercise Prescription .....	3

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**NOTE:** For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see “General Studies,” page 78. For graduation requirements, see “University Graduation Requirements,” page 74. For an explanation of additional omnibus courses offered but not listed in this catalog, see “Classification of Courses,” page 51.

Elective*.....	3
Total .....	27

\* Three semester hours must be selected from an approved list of concentration electives.

### EXERCISE AND WELLNESS MINOR

The minor in Wellness Foundations consists of the following plus all prerequisite courses:

EXW 300 Foundations of Exercise and Wellness.....	3
EXW 325 Fitness for Life.....	3
EXW 342 Health Behavior Change.....	3
EXW 450 Cultural Social Issues in Exercise and Wellness.....	3
EXW elective* .....	6
Total .....	18

\* Six semester hours must be selected from an approved list of EXW electives. See an advisor for a list of approved electives.

### GRADUATE PROGRAMS

The faculty in the Department of Exercise and Wellness offer programs leading to the M.S. degree in Exercise and Wellness. The department also participates with the Graduate College and College of Education in the program leading to the Ph.D. degree in Curriculum and Instruction with a concentration in Exercise and Wellness. See the *Graduate Catalog* for requirements.

### EXERCISE AND WELLNESS (EXW)

**EXW Note 1.** A \$5.00 towel and locker fee is required each semester by students using towel and locker facilities for physical activity courses.

**EXW Note 2.** Physical activity instruction courses (EXW 105, 205, 305) may not be taken for audit. Excessive absences and/or tardiness are considered disruptive behavior.

#### EXW 100 Introduction to Health and Wellness. (3)

*fall, spring, summer*

Current concepts in health, exercise, and wellness. Emphasis placed on personal health, theories, attitudes, beliefs, and behaviors. Cross-listed as EPE 100/HES 100. Credit is allowed only for EPE 100 or EXW 100 or HES 100.

*General Studies: SB*

#### EXW 105 Physical Activity Instruction: Beginning. (1)

*fall and spring*

Beginning instruction in a variety of physical activities such as aerobics, aquatics, racquet sports, physical conditioning, and golf. "Y" grade only. May be repeated for credit. 3 hours per week. Activity. Fee. See EXW Notes 1, 2.

#### EXW 205 Physical Activity Instruction: Intermediate. (1)

*fall and spring*

Intermediate-level instruction in a variety of physical activities. Continuation of EXW 105. "Y" grade only. May be repeated for credit. 3 hours per week. Activity. Fee. See EXW Notes 1, 2.

#### EXW 212 Instructional Competency Laboratory. (2)

*fall and spring*

Methods of instructing and leading fitness activities including aerobic, resistance, and flexibility activities. May be repeated for credit. Lab. See EXW Note 1. Prerequisite: Exercise and Wellness major.

#### EXW 215 Physical Activity and Healthy Lifestyles. (1)

*fall and spring*

Applies principles of physical activity to personal fitness testing and program planning for people of all ages. Telecampus course. Not open to Exercise and Wellness majors or to students who have credit for EXW 325.

#### EXW 280 Global Issues in Exercise and Wellness. (3)

*fall and spring*

Historical overview of health promotion and wellness models as they relate to minority, gender, social, cultural, economic, international, and environmental issues.

#### EXW 300 Foundations of Exercise and Wellness. (3)

*fall and spring*

Analysis of research in various disciplines which contribute to health promotion and wellness.

*General Studies: L/SB*

#### EXW 301 Concepts of Fitness and Wellness. (1)

*fall and spring*

Guidelines for achieving health benefits of physical activity and other healthy lifestyles. Telecampus course. Not open to Exercise and Wellness majors or to students who have credit for EXW 325.

#### EXW 305 Physical Activity Instruction: Advanced. (1)

*fall and spring*

Advanced-level instruction in a variety of physical activities. Continuation of EXW 105. May be repeated for credit. "Y" grade only. 3 hours per week. Activity. Fee. See EXW Notes 1, 2.

#### EXW 310 Computer Skills and Technology for Exercise and Wellness. (3)

*fall and spring*

Use of computers to statistically analyze data and design presentations of findings. Design of health promotion educational applications and presentations. Lecture, lab. Prerequisite: MAT 117.

#### EXW 315 Physiological Foundations of Movement. (3)

*fall and spring*

Studies human movement with emphasis on physiological function of the body in response to physical activity and fitness training. Lecture, lab. Fee. Prerequisites: BIO 201, 202.

#### EXW 320 Program Development and Leadership. (3)

*fall and spring*

Principles of planning, organizing, promoting, and leading fitness and wellness programs. Prerequisites: COM 225; Exercise and Wellness major.

#### EXW 325 Fitness for Life. (3)

*fall and spring*

Physical fitness and benefits of exercise with emphasis on self-evaluation and personalized program planning for a lifetime. Not open to Exercise and Wellness majors or to students who have credit for EXW 215 or 301.

#### EXW 330 Kinesiological Foundations of Movement. (3)

*fall and spring*

Study and consideration of human movement with emphasis on kinesiology principles and their application to movement and fitness. Lecture, lab. Prerequisites: BIO 201, 202.

#### EXW 342 Health Behavior Change. (3)

*fall and spring*

Examines major theories of health behavioral change. Develops intervention strategies and techniques employed to facilitate health behavioral change. Prerequisite: PGS 101.

#### EXW 380 Body Image and Wellness. (3)

*fall and spring*

Explores body image in American culture from physical, psychological, historical, and societal perspectives. Prerequisites: NTR 241; PGS 101.

#### EXW 400 Stress Management for Wellness. (3)

*fall and spring*

Examines the stress response and management from a behavioral perspective as it pertains to individuals or groups. Prerequisite: PGS 101.

#### EXW 420 Exercise Testing. (3)

*fall and spring*

Theoretical basis and practical application of pre-exercise screening, exercise testing, estimates of energy expenditure, and interpretation of results. Lecture, lab. Fee. Prerequisites: EXW 315; current CPR certification.

#### EXW 425 Exercise Prescription. (3)

*fall and spring*

Theoretical bases for and application of general principles of exercise prescription to various ages, fitness levels, and health states. Prerequisites: EXW 320, 330. Pre- or corequisite: EXW 420.

**EXW 442 Physical Activity in Health and Disease. (3)**

*fall and spring*

Examines the role of physical activity and fitness in the development of morbidity and mortality throughout the human life span. Prerequisite: EXW 315.

*General Studies: L*

**EXW 450 Cultural and Social Issues in Exercise and Wellness. (3)**

*fall and spring*

Examines contemporary cultural and social issues in physical activity. Focus on theories of social behavior, racial, ethnic, and cultural differences. Prerequisite: PGS 101.

**EXW 484 Exercise and Wellness Internship. (6)**

*fall, spring, summer*

Supervised practicum experience in approved exercise and wellness/health promotion agencies. Field work. Prerequisites: EXW 310, 320, 420. Pre- or corequisite: EXW 425.

**EXW 500 Research Methods. (3)**

*fall*

Introduction to the basic aspects of research, including problem selection, literature review, instrumentation, data handling, methodology, and writing the report.

**EXW 501 Research Statistics. (3)**

*spring*

Statistical procedures; sampling techniques, hypothesis testing, and experimental designs as they relate to research publications.

**EXW 505 Applied Exercise and Wellness Laboratory Techniques. (3)**

*spring*

Investigative techniques used in the applied exercise testing/prescription laboratory. Emphasis on cardiorespiratory assessment, energy balance, body composition, and electrocardiography. Lecture, lab. Fee.

**EXW 534 Sports and Fitness Conditioning. (3)**

*fall*

Bases of sports and fitness conditioning, including aerobic and anaerobic power, strength, flexibility, and analysis of conditioning components for sports and fitness.

**EXW 536 Physiological Aspects of Physical Activity and Chronic Disease. (3)**

*fall*

Role of physiological mechanisms associated with acute and long-term physical activity and its influence on chronic disease and wellness.

**EXW 542 Health Promotion. (3)**

*spring*

Theory and research concerning fitness and wellness programs in nutrition, physical activity, smoking cessation, and stress management.

**EXW 544 Fitness/Wellness Management. (3)**

*spring*

Development of the fitness/wellness industry. Planning, organizing, promoting, and managing fitness/wellness programs.

**EXW 575 Teaching Lifetime Fitness. (3)**

*spring*

Organizing and implementing physical fitness programs in the schools with emphasis on individual problem solving.

**EXW 599 Thesis. (1-12)**

*not regularly offered*

**EXW 642 Exercise Epidemiology. (3)**

*spring*

Physical activity, exercise, and physical fitness and the development of chronic disease.

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## Faculty of Multimedia Writing and Technical Communication

**Barry M. Maid**  
*Faculty Head*  
**(CNTR 80) 480/727-1190**

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**PROFESSOR**  
MAID

**ASSOCIATE PROFESSOR**  
BARCHILON

### MULTIMEDIA WRITING AND TECHNICAL COMMUNICATION—B.S.

In the Multimedia Writing and Technical Communication program, students learn how to produce, to design, and to manage information using both traditional and developing technologies.

Students learn

1. to communicate, both orally and in writing, across audiences and cultures;
2. issues of ethics in technical communications;
3. awareness of the global nature of technical communication—both culturally and economically;
4. the ability to evaluate print, oral, and electronic sources;
5. understanding of appropriate technical genres;
6. the ability to demonstrate technical editing skills in all work;
7. the ability to incorporate appropriate visual elements and design in written documents and oral presentations; and
8. the ability to work in appropriate media.

The program serves students who wish to pursue careers as technical writers, technical editors, Web page and intranet page designers, multimedia designers, and desktop publishers, publications managers, and information designers.

### GRADUATION REQUIREMENTS

To graduate with a B.S. degree in Multimedia Writing and Technical Communication, students must complete a minimum of 120 semester hours, including university graduation requirements and requirements of the major.

#### Multimedia Writing and Technical Communication Core

TWC 301 General Principles of Multimedia Writing.....	3
TWC 401 Principles of Technical Communication .....	3
TWC 411 Principles of Visual Communication .....	3
TWC 421 Principles of Writing with Technology .....	3
TWC 431 Principles of Technical Editing .....	3
TWC 490 Capstone.....	3
Total .....	18

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**NOTE:** For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 78. For graduation requirements, see "University Graduation Requirements," page 74. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 51.

**Related Area (12 hours).** Students select a related area consisting of 12 semester hours of study in one other discipline. At least nine of these 12 hours must be in the upper division. Suggested disciplines might be, but are not limited to, applied psychology, business administration, or computer graphics. Students, with the help of an advisor, may also develop a coherent interdisciplinary related area.

**Electives (15 hours).** The remaining hours will be electives in the major (TWC) at least six of which need to be in genre courses, such as TWC 443 Proposal Writing or TWC 447 Business Reports. An Internship (TWC 484) or supervised work experience is strongly recommended.

For information about program requirements and courses, access the Web at [www.east.asu.edu/ecollege](http://www.east.asu.edu/ecollege), or call an East College advisor at 480/727-1515.

## BACHELOR OF APPLIED SCIENCE DEGREE

A Bachelor of Applied Science is also offered with a concentration in multimedia writing and technical communication. The B.A.S. degree is a “capstone” degree for the Associate of Applied Science degree. The B.A.S. degree exposes students to advanced concepts and diverse critical thinking skills that prepare them for future career opportunities and professional advancement.

**Admission.** Admission to the B.A.S. degree program is restricted to students holding an A.A.S. degree or equivalent from a regionally accredited U.S. postsecondary educational institution. A GPA of 2.00 or higher is required for all resident applicants and a 2.50 for nonresident applicants.

**Degree Requirements.** In addition to the A.A.S. degree, the B.A.S. in Applied Science through East College consists of 60 semester hours of upper-division (300-level and above) courses, with 30 semester hours in residence.

Assignable credit.....	6
B.A.S. core.....	15
General Studies.....	19
MWTC concentration.....	20
Total .....	60

**General Studies Curriculum (19 hours).** The B.A.S. curriculum builds on the general education content of the A.A.S. degree. Additional General Studies (L, CS, and awareness areas) are met with courses in the core or concentration. General Studies courses focus on contextual learning.

L.....	3
MA.....	3
HU.....	3
HU or SB.....	3
SB.....	3
SG.....	4
Total .....	19

**Assignable Credit (6 hours).** Assignable credit allows space in the curriculum for prerequisite courses needed for students to succeed in the program. The courses are determined by the student and an advisor.

**B.A.S. core (15 hours).** The area core is focused on management and organization, professional communication, qualitative analysis, and computer competency.

**Multimedia Writing and Technical Communication concentration (20 hours).** In consultation with an advisor, students will select 20 hours of upper-division TWC courses.

## CERTIFICATE

A Multimedia Writing and Technical Communication Certificate is available and requires 18 semester hours.

TWC 301 General Principles of Multimedia Writing.....	3
TWC 401 Principles of Technical Communication.....	3
TWC 411 Principles of Visual Communication .....	3
or TWC 421 Principles of Writing with Technology (3)	
or TWC 431 Principles of Technical Editing (3)	
Three 400-level TWC courses, at least two of which	
must be genre courses, such as TWC 443 Proposal Writing	
or TWC 447 Business Reports .....	9
Total .....	18

## MULTIMEDIA WRITING AND TECHNICAL COMMUNICATION (TWC)

### TWC 194 Special Topics. (1–4)

*not regularly offered*

### TWC 200 Impact of Communications Technology on Society. (3)

*fall and spring*

Organizational issues and development of technical communication. Activities include research, evaluations, and presentation of oral arguments in support of positions. Prerequisites: ENG 101 (or 105); 102. *General Studies: L*

### TWC 294 Special Topics. (1–4)

*not regularly offered*

### TWC 301 General Principles of Multimedia Writing. (3)

*fall and spring*

Introduction to writing in a variety of media, understanding the consequences of integrating media, and effective editing techniques. Prerequisite: First-Year Composition.

*General Studies: L*

### TWC 351 Technical Writing and Editing. (3)

*fall and spring*

Effective style, format, and organization of technical material; editing principles and practices; copyediting versus substantive editing; and document management. Prerequisite: ENG 102.

### TWC 400 Technical Communications. (3)

*fall, spring, summer*

Planning and preparing technical publications and oral presentations based on directed library research related to current technical topics. Prerequisites: completion of first-year English requirements; General Studies L course; senior standing with a major in College of Technology and Applied Sciences.

*General Studies: L*

### TWC 401 Principles of Technical Communication. (3)

*fall and spring*

Basic information design principles to produce effective written, oral, and electronic technical communication. Understanding of rhetorical and audience analysis. Pre- or corequisite: TWC 301.

*General Studies: L*

### TWC 403 Writing for Professional Publication. (3)

*not regularly offered*

Analyzes the market and examines the publication process, including the roles of the author, editor, and reviewer. Pre- or corequisite: TWC 401.

### TWC 411 Principles of Visual Communication. (3)

*fall and spring*

Basic principles of visual communication in print and electronic media. Understanding graphic and document design, including typography and color. Pre- or corequisite: TWC 401.

*General Studies: L*

### TWC 421 Principles of Writing with Technology. (3)

*fall and spring*

Understanding historical and social impact of technology on writing, with emphasis on multimedia design, computer-mediated communication, and hypertext. Pre- or corequisite: TWC 401.

*General Studies: L*

**TWC 431 Principles of Technical Editing. (3)***fall and spring*

Basic principles of technical editing (for print and electronic media) including copyediting, reviews, standards, style, and project management. Pre- or corequisite: TWC 401.

*General Studies: L***TWC 443 Proposal Writing. (3)***once a year*

Develops persuasive strategies and themes for researching and writing professional proposals. Pre- or corequisite: TWC 401.

**TWC 444 Manual and Instructional Writing. (3)***once a year*

Design and development of a user manual, writing instructions, improving graphics and page design, and usability testing. Pre- or corequisite: TWC 401.

**TWC 445 Computer Documentation. (3)***once a year*

Introduction to writing documentation for the computer industry. Pre- or corequisite: TWC 401.

**TWC 446 Technical and Scientific Reports. (3)***once a year*

Introduction to strategies, formats, and techniques of presenting information to technical and scientific audiences. Pre- or corequisite: TWC 401.

*General Studies: L***TWC 447 Business Reports. (3)***once a year*

Introduction to strategies, formats, and techniques of presenting information to business and other workplace audiences. Pre- or corequisite: TWC 401.

*General Studies: L***TWC 484 Internship. (3)***fall and spring*

Applies classroom work in a supervised workplace environment. Pre- or corequisite: TWC 411 or 421 or 431.

**TWC 490 Capstone. (3)***fall and spring*

Development of a professional portfolio, creation of a "culminating document," and synthesis of undergraduate experience. Prerequisite: instructor approval.

**TWC 494 Special Topics. (1–4)***not regularly offered***TWC 501 Principles of Technical Communication. (3)***fall and spring*

Basic information design principles to produce effective written, oral, and electronic technical communication. Understanding of rhetorical and audience analysis. Pre- or corequisite: graduate standing.

**TWC 503 Writing for Professional Publication. (3)***not regularly offered*

Analyzes the market and examines the publication process, including the roles of the author, editor, and reviewer. Pre- or corequisite: TWC 501.

**TWC 511 Principles of Visual Communication. (3)***fall and spring*

Basic principles of visual communication in print and electronic media. Understanding graphic and document design, including typography and color. Pre- or corequisite: TWC 501.

**TWC 521 Principles of Writing with Technology. (3)***fall and spring*

Understanding historical and social impact of technology on writing, with emphasis on multimedia design, computer-mediated communication, and hypertext. Pre- or corequisite: TWC 501.

**TWC 531 Principles of Technical Editing. (3)***fall and spring*

Basic principles of technical editing for print and electronic media, including copyediting, reviews, standards, style, and project management. Pre- or corequisite: TWC 501.

**TWC 543 Proposal Writing. (3)***once a year*

Develops persuasive strategies and themes for researching and writing professional proposals. Pre- or corequisite: TWC 501.

**TWC 544 Manual and Instructional Writing. (3)***once a year*

Design and development of a user manual, writing instructions, improving graphics and page design, and usability testing. Pre- or corequisite: TWC 501.

**TWC 545 Computer Documentation. (3)***once a year*

Introduction to writing documentation for the computer industry. Pre- or corequisite: TWC 501.

**TWC 546 Technical and Scientific Reports. (3)***once a year*

Introduction to strategies, formats, and techniques of presenting information to technical and scientific audiences. Pre- or corequisite: TWC 501.

**TWC 547 Business Reports. (3)***once a year*

Introduction to strategies, formats, and techniques of presenting information to business and other workplace audiences. Pre- or corequisite: TWC 501.

**TWC 584 Internship. (3)***fall and spring*

Applies classroom work in a supervised workplace environment. Pre- or corequisites: TWC 511, 521, 531.

**TWC 598 Special Topics. (1–4)***not regularly offered*


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## Department of Nutrition

Linda A. Vaughan  
*Chair*  
 (HSC 1386) 480/727-1728

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**PROFESSORS**

JOHNSTON, MANORE, VAUGHAN

**ASSOCIATE PROFESSOR**

MONTE

**ASSISTANT PROFESSOR**

HAMPL

**SENIOR LECTURER**

MARTIN

**LECTURER**

DIXON

**NUTRITION—B.S.**

The B.S. degree in Nutrition offers three concentrations: dietetics, human nutrition, and food and nutrition management. The dietetics concentration provides students with a comprehensive range of nutrition, foods, and science courses that meet the academic (didactic) requirements necessary to become a registered dietitian. This concentration has been granted Developmental Accreditation as a Didactic Program in Dietetics (DPD) by the Commission on Accreditation for Dietetics Education of the American Dietetic Association. Graduates of a DPD may apply for Dietetic Internships to establish eligibility to write the Dietetic Registration examination.

The human nutrition concentration provides a sound foundation in the basic sciences and nutrition, but no foods

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**NOTE:** For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 78. For graduation requirements, see "University Graduation Requirements," page 74. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 51.

courses are required. This program is often used by students who, while not seeking the credential of Registered Dietitian, are working towards a career in nutrition research or completing a premedical/pre dental program of study. The food and nutrition management concentration provides a number of nutrition, foods, and business courses and is offered to students with an interest in food production, nutrition program management, and food/nutrition marketing.

**Accreditation.** The B.S. degree in Nutrition with a concentration in dietetics has been granted Developmental Accreditation as a Didactic Program in Dietetics (DPD) by the Commission on Accreditation for Dietetics Education of the American Dietetic Association. For more information, call 1-800-877-1600, extension 5400, or write

COMMISSION ON ACCREDITATION FOR  
DIETETICS EDUCATION  
AMERICAN DIETETIC ASSOCIATION  
216 W JACKSON BLVD  
CHICAGO IL 60606-6995

**Dietetics Concentration.** The following NTR courses are required of all students in the dietetics concentration:

NTR 142 Applied Food Principles .....	3
NTR 241 Human Nutrition .....	3
NTR 341 Introduction to Planning Therapeutic Diets .....	3
NTR 343 Food Service Purchasing.....	3
NTR 344 Nutrition Services Management .....	3
NTR 350 Nutrition Counseling.....	3
NTR 400 Nutrition and Health Promotion.....	3
NTR 440 Advanced Human Nutrition I.....	3
NTR 441 Advanced Human Nutrition II .....	3
NTR 444 Diet Therapy .....	3
NTR 445 Quantity Food Production .....	3
NTR 446 Human Nutrition Assessment Lecture/Laboratory .....	3
NTR 448 Community Nutrition L .....	3
Total .....	39

In addition to the required NTR courses, the following related courses are required in order to complete the academic requirements of the Didactic Program in dietetics:

BCH 361 Principles of Biochemistry.....	3
BCH 367 Elementary Biochemistry Laboratory .....	1
BIO 201 Human Anatomy and Physiology I SG .....	4
BIO 202 Human Anatomy and Physiology II.....	4
CHM 113 General Chemistry SQ .....	4
CHM 116 General Chemistry SQ .....	4
CHM 231 Elementary Organic Chemistry SQ <sup>1</sup> .....	3
CHM 235 Elementary Organic Chemistry Laboratory SQ <sup>1</sup> .....	1
MIC 205 Microbiology SG <sup>2</sup> .....	3
MIC 206 Microbiology Laboratory SG <sup>2</sup> .....	1
Statistics course.....	3
Technical writing course .....	3
Total .....	34

<sup>1</sup> Both CHM 231 and 235 must be taken to secure SQ credit.

<sup>2</sup> Both MIC 205 and 206 must be taken to secure SG credit.

Additional supporting courses in the social sciences are required for completion of the DPD and must be selected in consultation with the Nutrition academic advisor.

**Human Nutrition Concentration.** The following NTR courses are required of all students in the human nutrition concentration:

NTR 142 Applied Food Principles .....	3
NTR 241 Human Nutrition .....	3
NTR 341 Introduction to Planning Therapeutic Diets .....	3
NTR 440 Advanced Human Nutrition I.....	3
NTR 441 Advanced Human Nutrition II .....	3
NTR 444 Diet Therapy .....	3
NTR 446 Human Nutrition Assessment Lecture/Laboratory .....	3
Total .....	21

An additional nine semester hours from the Department of Nutrition are required to complete this concentration. A maximum of three semester hours of Independent Study may be used to satisfy this requirement. Students select these courses in consultation with the Nutrition academic advisor.

In addition to the required NTR courses, the following related courses are required to complete the academic requirements of this concentration:

BCH 361 Principles of Biochemistry.....	3
BCH 367 Elementary Biochemistry Laboratory.....	1
BIO 201 Human Anatomy and Physiology I SG .....	4
BIO 202 Human Anatomy and Physiology II.....	4
CHM 113 General Chemistry SQ .....	4
CHM 116 General Chemistry SQ .....	4
CHM 231 Elementary Organic Chemistry SQ <sup>1</sup> .....	3
CHM 235 Elementary Organic Chemistry Laboratory SQ <sup>1</sup> .....	1
MIC 205 Microbiology SG <sup>2</sup> .....	3
MIC 206 Microbiology Laboratory SG <sup>2</sup> .....	1
Total .....	28

<sup>1</sup> Both CHM 231 and 235 must be taken to secure SQ credit.

<sup>2</sup> Both MIC 205 and 206 must be taken to secure SG credit.

**Food and Nutrition Management Concentration.** The following NTR courses are required of all students in the food and nutrition management concentration:

NTR 100 Introductory Nutrition.....	3
or NTR 241 Human Nutrition (3)	
NTR 142 Applied Food Principles .....	3
NTR 343 Food Service Purchasing.....	3
NTR 344 Nutrition Services Management .....	3
NTR 442 Experimental Foods .....	3
NTR 445 Quantity Food Production.....	3
Total .....	18

An additional twelve semester hours from the Department of Nutrition are required to complete this concentration. A maximum of three semester hours of Independent Study may be used to satisfy this requirement. Students select these courses in consultation with the Nutrition academic advisor.

In addition to the required NTR courses, the following related courses are required to complete the academic requirements of this concentration:

CHM 101 Introductory Chemistry SQ .....	4
CHM 231 Elementary Organic Chemistry SQ <sup>1</sup> .....	3
CHM 235 Elementary Organic Chemistry Laboratory SQ <sup>1</sup> .....	1
MIC 205 Microbiology SG <sup>2</sup> .....	3
MIC 206 Microbiology Laboratory SG <sup>2</sup> .....	1
Business or technical writing course.....	3

Management (AGB 310 or MGT 301, 380, or 394).....	3
Marketing (AGB 320 or MKT 300 or 394) .....	3
Other agribusiness or business courses <sup>3</sup> .....	6
Total .....	27

- <sup>1</sup> Both CHM 231 and 235 must be taken to secure SQ credit.
- <sup>2</sup> Both MIC 205 and 206 must be taken to secure SG credit.
- <sup>3</sup> Courses taken to fulfill the final six credit business requirement should be taken from courses with the following prefixes: ACC, AGB, BUS, COB, CIS, CSE, ECN, FIN, GBS, HSA, IBS, MGT, MKT, and QBA. Students select these courses in consultation with the Nutrition academic advisor.

**MINOR**

The faculty of the Department of Nutrition also offers minors in Food and Nutrition Management and Human Nutrition, each requiring 18 semester hours. At least 12 of the 18 must be in upper-division courses.

**Food and Nutrition Management.** The Food and Nutrition Management minor requires that students take the following courses:

NTR 100 Introductory Nutrition .....	3
or NTR 241 Human Nutrition (3) .....	
NTR 142 Applied Food Principles .....	3
NTR 300 Computer Applications in Nutrition.....	3
NTR 343 Food Service Purchasing.....	3
or NTR 343 Nutrition Services Management (3) .....	
NTR 442 Experimental Foods .....	3
NTR 445 Quantity Food Production .....	3
Total .....	18

**Human Nutrition.** The Human Nutrition minor requires that students take the following courses:

NTR 241 Human Nutrition .....	3
NTR 341 Introduction to Planning Therapeutic Diets.....	3
NTR 440 Advanced Human Nutrition I.....	3
NTR 441 Advanced Human Nutrition II .....	3
NTR 444 Diet Therapy .....	3
Total .....	15

One additional upper-division (or graduate) course must be selected from among the following:

NTR 348 Cultural Aspects of Food .....	3
NTR 350 Nutrition Counseling.....	3
NTR 446 Human Nutrition Assessment Lecture/Laboratory .....	3
NTR 448 Community Nutrition L .....	3
NTR 450 Nutrition in the Life Cycle I.....	3
NTR 451 Nutrition in the Life Cycle II .....	3
NTR 531 Recent Developments in Nutrition.....	3
NTR 532 Current Research in Nutrition I.....	3
NTR 598 Special Topics .....	3

**NUTRITION (NTR)**

**NTR 100 Introductory Nutrition. (3)**

*fall, spring, summer*  
Basic concepts of human nutrition. Recent controversies in nutrition and how food choices affect personal health.

**NTR 142 Applied Food Principles. (3)**

*fall and spring*  
Applied scientific principles of food preparation and production. 2 hours lecture, 3 hours lab. Fee.

**NTR 241 Human Nutrition. (3)**

*fall, spring, summer*  
Principles of human nutrition. Emphasis on nutrient metabolism and the relationships between diet and disease. Prerequisite: CHM 101 (or its equivalent).

**NTR 300 Computer Applications in Nutrition. (3)**

*spring*  
Introduction to nutrition and food software, including dietary assessment and analysis, food inventory and control, and telecommunications. Lecture, computer lab. NTR 341 strongly recommended. Prerequisites: NTR 100 or 241; basic computer literacy.

**NTR 341 Introduction to Planning Therapeutic Diets. (3)**

*fall and summer*  
Cultural, health, and economic aspects of diet planning. Assessment of food and diet composition. Review of common therapeutic diets. Fee. Prerequisites: NTR 100 (or 241) and 142 (or their equivalents).

**NTR 343 Food Service Purchasing. (3)**

*fall*  
Introduction to purchasing systems, bid processes, receiving and storage procedures, and regulatory agencies involved in the food service industry. Prerequisite: NTR 142.

**NTR 344 Nutrition Services Management. (3)**

*spring*  
Organization, administration, and management of food and nutrition services in hospitals and other institutions. Field trips may be included. Prerequisites: NTR 100 (or 241) and 142 (or their equivalents).  
*General Studies: L*

**NTR 348 Cultural Aspects of Food. (3)**

*spring and summer*  
Origins, development, and diversity of food preferences and dietary habits; food patterns, and attitudes of global populations and U.S. immigrants. Prerequisite: NTR 100 or 241 (or its equivalent).  
*General Studies: C*

**NTR 350 Nutrition Counseling. (3)**

*spring*  
Counseling techniques in nutrition; interpersonal and communication skills in clinical and community sites; nutrition education for individuals and populations. Lecture, lab. Prerequisites: NTR 100 (or 241) and 142 (or their equivalents).

**NTR 400 Nutrition and Health Promotion. (3)**

*fall and spring*  
Role of nutrition in health promotion; application of academic knowledge in field practicum; components of professional development. Lecture, practicum. Prerequisites: NTR 341, 440 (or 441 or 444); senior standing in dietetics or human nutrition.

**NTR 440 Advanced Human Nutrition I. (3)**

*fall*  
Metabolic reactions and interrelationships of vitamins, minerals, and water. Prerequisites: BIO 202 and CHM 231 and NTR 241 (or their equivalents).

**NTR 441 Advanced Human Nutrition II. (3)**

*spring*  
Metabolic reactions and interrelationships of carbohydrate, lipid, and protein. Prerequisites: BCH 361 and BIO 202 and NTR 241 (or their equivalents).

**NTR 442 Experimental Foods. (3)**

*fall and spring*  
Food product development techniques, food evaluation and testing, and investigation of current research into food composition. 2 hours lecture, 3 hours lab. Fee. Prerequisites: CHM 231; NTR 142.

**NTR 444 Diet Therapy. (3)**

*spring and summer*  
Principles of nutritional support for prevention and treatment of disease. Prerequisites: BIO 201 and 202 and NTR 241 (or their equivalents).

**NOTE:** For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 78. For graduation requirements, see "University Graduation Requirements," page 74. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 51.

**NTR 445 Quantity Food Production. (3)***fall and spring*

Standardized methods of quantity food preparation, operation of institutional equipment, institutional menu planning, quantity food experiences. May require field trips. Lecture, lab. Fee. Prerequisites: NTR 100 (or 241) and 344 (or their equivalents).

**NTR 446 Human Nutrition Assessment Lecture/Laboratory. (3)***spring*

Clinical and biochemical evaluation of nutritional status. 2 hours lecture, 3 hours lab. Fee. Prerequisites: BCH 361, 367; NTR 440 (or 441).

**NTR 448 Community Nutrition. (3)***fall and spring*

Food-related behaviors; organization and delivery of nutrition services; program design, implementation, and evaluation strategies; nutrition assessment of populations. Prerequisite: NTR 241 (or its equivalent).

*General Studies: L***NTR 450 Nutrition in the Life Cycle I. (3)***fall*

Emphasis on nutritional needs and problems during pregnancy, lactation, infancy, and childhood. Prerequisite: NTR 100 or 241 (or its equivalent).

**NTR 451 Nutrition in the Life Cycle II. (3)***spring*

Nutritional requirements and nutrition-related disorders of adolescence, middle adulthood, and later life. Prerequisite: NTR 100 or 241 (or its equivalent).

**NTR 500 Research Methods in Nutrition. (3)***fall*

Experimental design; methods of data collection, laboratory analyses, and statistical analyses; development of thesis proposal. Lecture, lab. Fee. Prerequisites: 1 course each in advanced nutrition, biochemistry, and statistics.

**NTR 531 Recent Developments in Nutrition. (1)***fall and spring*

Selected topics addressing current issues in nutrition research. Prerequisites: 1 course each in advanced nutrition and biochemistry.

**NTR 532 Current Research in Nutrition. (3)***spring*

Vitamins and minerals. Prerequisites: 1 course each in advanced nutrition and biochemistry.

**NTR 540 Advanced Micronutrient Metabolism. (3)***fall*

Metabolism of vitamins and minerals, primarily as applied to humans, with research literature emphasized. Prerequisites: 1 course each in basic nutrition and biochemistry.

**NTR 541 Advanced Macronutrient Metabolism. (3)***spring*

Metabolism of protein, fat, and carbohydrate, primarily as applied to humans, with research literature emphasized. Prerequisites: 1 course each in basic nutrition and biochemistry.

**NTR 542 Advanced Food Product Development. (3)***fall and spring*

Food product development techniques, food evaluation and testing, and investigation of current research into food composition. 2 hours lecture, 3 hours lab. Fee. Prerequisites: CHM 231 and NTR 142 (or their equivalents).

**NTR 544 Therapeutic Nutrition. (3)***spring and summer*

Current theories of the nutritional prevention or treatment of various diseases. Prerequisites: 1 course each in basic nutrition, introduction to diet therapy, and physiology.

**NTR 545 Recent Developments in Institutional Feeding. (3)***fall and spring*

Current practices in institutional feeding, including supervised practicum with local quantity food operation. 1 hour lecture, 6 hours lab. Fee. Prerequisites: NTR 142 and 344 (or their equivalents).

**NTR 546 Assessment Techniques in Nutrition. (3)***spring*

Clinical and biochemical evaluation of nutritional status. 2 hours lecture, 3 hours lab. Fee. Prerequisites: 1 course each in advanced nutrition, biochemistry, and physiology.

**NTR 548 Nutrition Program Development. (3)***fall and spring*

Planning, development, implementation, and evaluation of community nutrition programs, including the process of grant applications. Prerequisites: 1 course each in basic nutrition and sociology.

**NTR 550 Advanced Maternal and Child Nutrition. (3)***fall*

In-depth review of metabolic characteristics and nutritional needs of the pregnant woman, lactating woman, infant, and child. Prerequisites: 1 course each in basic nutrition, biochemistry, and physiology.

**NTR 551 Advanced Geriatric Nutrition. (3)***spring*

In-depth review of metabolic characteristics and nutritional requirements of the elderly. Prerequisites: 1 course each in basic nutrition, biochemistry, and physiology.

**NTR 580 Dietetics Practicum. (3–9)***fall, spring, summer*

Structured practical experience in the Dietetic Internship, supervised by practitioners with whom the student works closely. Practicum. Prerequisite: acceptance into the Dietetic Internship.

**NTR 592 Research. (1–12)***not regularly offered***NTR 593 Applied Project. (1–12)***not regularly offered***NTR 594 Conference and Workshop. (1–12)***not regularly offered***NTR 598 Special Topics. (1–4)***not regularly offered*

In-depth review of recent research in areas including nutrition and exercise, nutrition and immunology, energy balance, vegetarianism, nutritional pathophysiology. Fee. Prerequisites: 1 course each in advanced nutrition, biochemistry, and physiology.

# College of Technology and Applied Sciences

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Albert L. McHenry, Dean

[www.east.asu.edu/ctas](http://www.east.asu.edu/ctas)

## PURPOSE

The College of Technology and Applied Sciences (CTAS) helps students develop knowledge and skill in technological fields that qualify them for career positions and leadership responsibility in industry, government, and commercial enterprise. Each student is guided to select a major that addresses short-term employment goals through state-of-the-art technological preparation. Long-term career aspirations are supported through the development of a strong base in mathematics, science, engineering, and technical principles, coupled with a solid foundation in liberal arts and a commitment to lifelong learning.

Engineering technology programs offer professional preparation through a B.S. degree that stresses state-of-the-art technological applications. Special emphasis is placed on the development of knowledge and skill in applied mathematics, natural sciences, and engineering principles with formal laboratory experiences. This mixed educational approach provides the basis for both employment and a long-term career evolution.

The other CTAS technology programs provide the opportunity for students to develop knowledge and skill in solving broad-scale industrial problems, operating modern technological systems, and managing personnel in the implementation of processes and production. Programs of study focus on the latest technologies in areas such as aviation flight training and management, environmentally hazardous waste management, graphic communications, interactive computer graphics, and industrial management.

Each student is encouraged to participate in creative activities through a close relationship with a faculty mentor. Learning through execution of the scientific method, using both inductive and deductive processes in applied research activities, is essential for both faculty and students.

## ORGANIZATION

The College of Technology and Applied Sciences is composed of the following four academic units:

- Department of Aeronautical Management Technology
- Department of Electronics and Computer Engineering Technology
- Department of Information and Management Technology
- Department of Manufacturing and Aeronautical Engineering Technology

## DEGREES

See the “College of Technology and Applied Sciences Baccalaureate Degrees and Majors” table, page 634. For graduate degrees, see the “East College Graduate Degrees and Majors” table, page 622.

The College of Technology and Applied Sciences offers programs leading to the B.S. degree and B.A.S. degree. The college also offers the Master of Science in Technology (M.S.T.) degree. For more information on courses, faculty, and programs in the M.S.T. degree, see the *Graduate Catalog*.

## ACCREDITATION

Undergraduate B.S. degree programs in Aeronautical Engineering Technology, Electronics Engineering Technology, and Manufacturing Engineering Technology are accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc. For additional information, call 410/347-7700 or write

TECHNOLOGY ACCREDITATION COMMISSION OF  
THE ACCREDITATION BOARD FOR  
ENGINEERING AND TECHNOLOGY INC  
111 MARKET PLACE SUITE 1050  
BALTIMORE MD 21202-7102

Both the airway science flight management and the airway science management concentrations in the Department of Aeronautical Management Technology are fully accredited by the Council on Aviation Accreditation. For more information call 334/844-2431, send e-mail to [caa@auburn.edu](mailto:caa@auburn.edu), or write

COUNCIL ON AVIATION ACCREDITATION  
3410 SKYWAY DRIVE  
AUBURN AL 36830

## ADMISSION—B.S. DEGREE

The College of Technology and Applied Sciences admits first-year students who meet the undergraduate admission requirements of Arizona State University. See “Undergraduate Admission,” page 54. High school precalculus, physics, and chemistry are recommended. Transfer applicants must meet the university requirements for transfer students as specified under “Transfer Credit,” page 57, with the exception that Arizona resident transfer students must have a 2.25 GPA.

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**NOTE:** For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see “General Studies,” page 78. For graduation requirements, see “University Graduation Requirements,” page 74. For an explanation of additional omnibus courses offered but not listed in this catalog, see “Classification of Courses,” page 51.

**College of Technology and Applied Sciences Baccalaureate Degrees and Majors**

Major	Degree	Concentration	Administered By
Aeronautical Engineering Technology*	B.S.	—	Department of Manufacturing and Aeronautical Engineering Technology
Aeronautical Management Technology*	B.S.	Airway science flight management, airway science management	Department of Aeronautical Management Technology
Applied Science	B.A.S.	Aviation maintenance management technology, aviation management technology, computer systems administration, digital media management, digital publishing, emergency management, fire service management, instrumentation, microcomputer systems, municipal operations management, operations management, production technology, semiconductor technology, software technology applications, technical graphics	Bachelor of Applied Science Advisory Committee
Computer Engineering Technology*	B.S.	Computer hardware technology, embedded systems technology, software technology	Department of Electronics and Computer Engineering Technology
Electronics Engineering Technology*	B.S.	Electronic systems, microelectronics, telecommunications	Department of Electronics and Computer Engineering Technology
Industrial Technology	B.S.	Environmental technology management, graphic information technology, industrial technology management	Department of Information and Management Technology
Manufacturing Engineering Technology*	B.S.	Manufacturing engineering technology, mechanical engineering technology	Department of Manufacturing and Aeronautical Engineering Technology

\* This major requires more than 120 semester hours to complete.

Students admitted to a B.S. degree program in CTAS begin study under one of two student classifications, professional or preprofessional.

### Professional Status

First-year students (new freshmen) are admitted to CTAS with professional status if they meet the general aptitude criteria for admission and have no deficiencies in the basic competency requirements for admission. First-year students admitted upon completion of the GED are admitted with professional status if they have also achieved the minimum ACT or SAT scores required for undergraduate admission to the university.

Students transferring from other ASU colleges are admitted to CTAS with professional status if they have no remaining admissions deficiencies and meet the required GPA.

Transfer students from other institutions must meet the minimum admission requirements for college transfer students as described under "Transfer Credit," page 57. The CTAS also requires resident transfer students to have a cumulative GPA of 2.25.

All international students must have a minimum 500 TOEFL score to be admitted with professional status.

### Preprofessional Status

All other students are admitted with preprofessional status and may apply for professional status after they have removed the deficiency that disallows awarding professional

status. Students with preprofessional status may not register for 300- and 400-level courses in the college until they have been awarded professional status. See an advisor for details.

### Transfer Credit

Credit for courses taken at a community college or another four-year institution is awarded according to the guidelines under "Transfer Credit," page 57. Students who are transferring from an Arizona community college and have been in continuous residence may continue under the catalog in effect at the time of their entrance into the community college. Students should be aware that some course work that transfers to ASU may not be applicable toward CTAS degree requirements. Students should confer with an advisor. The College of Technology and Applied Sciences maintains a cooperative agreement with most Arizona community colleges and with selected out-of-state colleges and universities to structure programs that are directly transferable into the technology programs at ASU East. For assistance in the transfer from Arizona community colleges, transfer guides are available at [www.asu.edu/provost/articulation](http://www.asu.edu/provost/articulation).

Courses taken more than five years before admission to a CTAS degree program are not normally accepted for transfer credit at the option of the department in which the applicant wishes to enroll. Courses completed within the five years preceding admission are judged as to their applicability to the student's curriculum.

## College of Technology and Applied Sciences Graduate Degrees and Majors

Major	Degree	Concentration	Administered By
Technology	M.S.Tech.	Global technology and development Aviation human factors, aviation management technology Computer systems engineering technology, electronic systems engineering technology, instrumentation and measurement technology, microelectronics engineering technology Environmental technology management, fire service administration, information technology, management of technology Aeronautical engineering technology, manufacturing engineering technology, mechanical engineering technology, security engineering technology	College of Technology and Applied Sciences Department of Aeronautical Management Technology Department of Electronics and Computer Engineering Technology Department of Information and Management Technology Department of Manufacturing and Aeronautical Technology

**ADMISSION—B.A.S. DEGREE**

Admission to the B.A.S. degree program is restricted to students holding an A.A.S. degree from a regionally accredited U.S. postsecondary educational institution. A GPA of 2.00 or higher is required for all resident applicants and a 2.50 for nonresident applicants.

**ADVISING**

New incoming and transfer students should seek initial advising from the academic advisor in the Dean's Office. CTAS students are then assigned faculty advisors who assist them with planning a program of study in the department of their major. The college requires that students consult with advisors before registering each semester. Advisors should be made aware of any employment obligations or special circumstances that may affect a student's ability to successfully handle a full course load. CTAS students may register for a maximum of 19 semester hours per semester. Any student wishing to take more than the maximum must petition the CTAS Standards Committee and have an approval on file before registering for an overload.

**GRADUATION REQUIREMENTS**

Students must meet all university graduation requirements given in "University Graduation Requirements," page 74, as well as degree requirements of their major in the College of Technology and Applied Sciences. For detailed information on the degree requirements of a major in CTAS, refer to that department's individual description.

**COLLEGE STANDARDS****Pass/Fail Grades**

The College of Technology and Applied Sciences does not offer pass/fail grades. Courses graded on a pass/fail basis do not count toward degree credit in CTAS. Students may request credit for pass/fail courses by petitioning the CTAS Standards Committee.

**Entry into Upper-Division Courses (B.S. Degree)**

Before enrolling in courses at the 300 level and above, CTAS students must be in the professional status within the college. Students who are not in good academic standing must petition the CTAS Standards Committee. Students enrolled in another ASU college may not register for any 300- and 400-level CTAS courses unless those courses are required in the degree program and the students have the proper course prerequisites.

**ACADEMIC STANDARDS**

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

1. a semester or summer session with a GPA less than or equal to 1.50;
2. two successive semesters with GPAs less than 2.00; or
3. an ASU cumulative GPA less than 2.00.

A student on probation is subject to disqualification if (1) a semester GPA of 2.25 is not attained and the cumulative GPA is below 2.00 at the end of the probationary semester or (2) the student is placed on probation for two consecutive semesters and is unable to achieve the standard GPAs stated in number one.

Students on academic probation are not allowed to register for more than 13 semester hours. Probationary students may not register for the semester following the semester in which they were declared probationary without a special permit from an advisor in the dean's office. Special permits are given only after the registrar records grades for the current semester.

**NOTE:** For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 78. For graduation requirements, see "University Graduation Requirements," page 74. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 51.

**Disqualification.** During a semester on academic probation, a student who fails to meet the retention standards is disqualified. Students may request a review of their disqualification status by contacting the CTAS associate dean in the Academic Center Building (CNTR), room 10. Any disqualified student who is accepted by another college at ASU may not register for courses in CTAS unless the courses are required in the new major. Disqualified students who register for courses in CTAS may be withdrawn from these courses any time during the semester.

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

## STUDENT RESPONSIBILITIES

**Course Prerequisites.** Students should consult the *Schedule of Classes* and the catalog for course prerequisites. Students who register for courses without the designated prerequisites may be withdrawn without their consent at any time before the final examination. The instructor, the chair of the department, or the dean of the college may initiate such withdrawals. In such cases, students do not receive monetary reimbursement. Such withdrawals are considered to be unrestricted as described under "Unrestricted Course Withdrawal," page 68, and do not count against the number of restricted withdrawals allowed.

## SPECIAL PROGRAMS

**Academic Recognition.** Students completing baccalaureate degree requirements receive the appropriate honors designations on their diplomas consistent with the requirements specified by the university.

Students in the college are encouraged to seek information concerning entry into honor societies that enhance their professional stature. Tau Alpha Pi is the engineering technology honor society, and Alpha Eta Rho is available for aeronautical management technology students.

**Barrett Honors College.** The College of Technology and Applied Sciences participates in the programs of the Craig and Barbara Barrett Honors College, which provides enhanced educational experiences to academically superior undergraduate students. Participating students can major in any academic program. For more information see "The Craig and Barbara Barrett Honors College," page 112.

**Scholarships.** Information and applications for academic scholarships for continuing students may be obtained by contacting departmental offices. Other scholarships may be available through the university Student Financial Assistance Office.

**ROTC Students.** Students pursuing a commission through either the Air Force or Army ROTC program must take from 12 to 20 semester hours of courses in the Department of Aerospace Studies or Department of Military Science. To preclude excessive overloads, these students should plan on

at least one additional semester to complete degree requirements. Because of accreditation requirements, aerospace studies (AES) or military science (MIS) courses are not accepted in the engineering technology majors.

## ENGINEERING TECHNOLOGY CORE (ETC)

### ETC 100 Languages of Technology. (4)

*fall and spring*

Introduction to computer-aided design, programming, modeling, and technical documentation. Lecture, lab.

*General Studies: CS*

### ETC 191 First-Year Seminar. (1-3)

*not regularly offered*

### ETC 194 Special Topics. (1-4)

*not regularly offered*

### ETC 201 Applied Electrical Science. (4)

*fall, spring, summer*

Principles of electricity, passive elements, and AC/DC circuit analysis. Laboratory exploration of circuits using instrumentation and the computer as tools. Lecture, lab. Prerequisites: ETC 100; MAT 170; PHY 112, 114.

### ETC 211 Applied Engineering Mechanics: Statics. (3)

*fall and spring*

Vectors, forces and moments, force systems, equilibrium, analysis of basic structures and structural components, friction, centroids, and moments of inertia. Prerequisites: MAT 260; PHY 111, 113.

### ETC 340 Applied Thermodynamics and Heat Transfer. (3)

*fall and spring*

Thermodynamic systems and processes, first and second laws of thermodynamics, properties of pure substances, and applications to heat engines and special systems. Fundamentals of conduction, radiation, and convection. Prerequisites: MAT 261; PHY 112, 114.

### ETC 492 Honors Directed Study. (1-6)

*not regularly offered*

### ETC 493 Honors Thesis. (1-6)

*not regularly offered*

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## Department of Aeronautical Management Technology

William K. McCurry

*Chair*

(SIM 205) 480/727-1381

Fax 480/727-1730

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PROFESSOR

GESELL

ASSOCIATE PROFESSORS

JACKSON, McCURRY, TURNEY

ASSISTANT PROFESSORS

KARP, PEARSON

LECTURER

O'BRIEN

## PURPOSE

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

**ADMISSION**

New and transfer students who have been admitted to the university and who meet the requirements for admission to the College of Technology and Applied Sciences may be admitted without separate application to the Department of Aeronautical Management Technology. Students are cleared for enrollment in Airway Science Flight Management flight courses on a competitive basis. Transfer credits are reviewed by department faculty advisors. To be acceptable for department credit, transfer courses must be equivalent in both content and level of offering.

**DEGREES**

The faculty in the Department of Aeronautical Management Technology offer a B.S. degree in Aeronautical Management Technology with concentrations in airway science flight management and airway science management. A B.A.S. degree in Applied Science is also offered with concentrations in aviation maintenance management technology and aviation management technology.

A Master of Science in Technology degree is offered for graduate study with concentrations in aviation management technology and aviation human factors. For more information, see the *Graduate Catalog*.

**AERONAUTICAL MANAGEMENT TECHNOLOGY—B.S.**

The Aeronautical Management Technology curricula are designed to provide a thorough technical background combined with an interdisciplinary general university education. The graduate is prepared to assume responsibilities in a wide area of managerial and technically related areas of aviation. The student gains a background in aircraft structures, reciprocating and turbine engines, aircraft performance and design, management skills, business principles, systems analysis, and a variety of course work specific to aircraft flight, airport operations, and air transportation systems. The degree offers two concentrations: airway science flight management and airway science management, both of which have been accredited by the Council on Aviation Accreditation. The concentrations are described separately on the following pages.

All degree requirements are shown on curriculum check sheets for the concentrations that are available by visiting the department or by accessing the department Web site at eastair.east.asu.edu. Requirements include First-Year Composition, university General Studies (see “General Studies,” page 78), and the Aeronautical Management Technology Core. Note that all three General Studies awareness areas are required. Consult your advisor for an approved list of courses. Refer to individual concentration degree requirements for additional required courses. Students must complete each Aeronautical Management Technology course with a grade of “C” or higher.

**Aeronautical Management Technology Core**

AMT 101 Introduction to Aeronautical Management Technology.....	1
AMT 182 Private Pilot Ground School .....	3
AMT 201 Air Traffic Control .....	3

AMT 220 Aviation Meteorology .....	3
AMT 280 Aerospace Structures, Materials, and Systems .....	4
AMT 287 Aircraft Powerplants .....	4
AMT 308 Air Transportation G .....	3
AMT 396 Aviation Professional .....	1
AMT 410 Aviation Safety and Human Factors .....	3
AMT 442 Aviation Law/Regulations.....	3
ETC 100 Languages of Technology CS .....	4
ETC 201 Applied Electrical Science .....	4
Total .....	36

**Airway Science Flight Management Concentration**

Flight training is certified by the Federal Aviation Administration. Students in the airway science flight management concentration must pass an FAA medical examination before flying solo. While this physical examination is not required for admission to the program, it must be completed before flying solo as the medical certificate becomes the student pilot certificate. An FAA Class II medical examination is required to complete the certificates and ratings necessary to meet graduation requirements. It is recommended that a Class I FAA medical examination be completed by an aviation medical examiner of the student’s choice before the start of classes.

Airway science flight management combines academic studies and flight training to prepare graduates for a wide variety of positions within the air transportation industry, including general, airline, and military aviation. Ground school and flight training are available, allowing the student to obtain private pilot, commercial pilot, and flight instructor certificates and also the instrument pilot, instrument instructor, and multiengine pilot ratings.

This curriculum concentrates on flying plus the technical management and computer-related applications necessary to operate in the high-density environment of modern airspace. The program also emphasizes critical thinking, analytical skills, and oral and written communication skills. A career in airway science flight management leads to the development, administration, and enforcement of safety regulations, including airworthiness and operational standards in civil aviation.

While enrolled at ASU, students do not receive college credit for flight activity or instruction received at flight schools other than those entities with which the university has currently contracted for such instruction. Consideration is given for flight experience received before enrollment at the university through the private pilot certificate only.

Flight instruction costs are not included in university tuition and fees. The estimated cost of flight training is \$36,000 in addition to normal university costs.

**Degree Requirements**

Airway science flight management students are required to complete 128 semester hours with a 2.00 cumulative GPA, including a minimum of 50 semester hours of upper-division courses. All degree requirements are shown on the student’s curriculum check sheet.

**Concentration Requirements**

In addition to the required courses for First-Year Composition, university General Studies (see “General Studies,”

**NOTE:** For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see “General Studies,” page 78. For graduation requirements, see “University Graduation Requirements,” page 74. For an explanation of additional omnibus courses offered but not listed in this catalog, see “Classification of Courses,” page 51.

page 78), and the Aeronautical Management Technology core, the following additional courses are required for the airway science flight management concentration:

AET 300 Aircraft Design I.....	3
AMT 100 Flight Safety I.....	1
AMT 200 Flight Safety II.....	2
AMT 214 Commercial/Instrument Ground School I.....	3
AMT 300 Flight Safety III.....	2
AMT 322 Commercial/Instrument Ground School II.....	3
AMT 382 Air Navigation.....	3
AMT 385 Flight Instructor Ground School.....	3
AMT 387 Multiengine Pilot Ground School.....	1
AMT 392 Flight Instructor Instrument Ground School.....	2
AMT 400 Flight Safety IV.....	1
AMT 408 National Aviation Policy.....	3
AMT 444 Airport Management and Planning.....	3
AMT 482 Airline Instrument Procedures.....	3
AMT 489 Airline Administration.....	3
AMT 496 Airline Aircraft Systems Capstone.....	3
IMC 346 Management Dynamics.....	3
Technical electives.....	6
Total.....	48

#### Suggested Course Pattern for Freshmen

##### First Semester

AMT 100 Flight Safety I.....	1
AMT 101 Introduction to Aeronautical Management Technology.....	1
AMT 182 Private Pilot Ground School.....	3
AMT 220 Aviation Meteorology.....	3
ENG 101 First-Year Composition.....	3
MAT 170 Precalculus <i>MA</i> .....	3
Total.....	14

##### Second Semester

AMT 214 Commercial/Instrument Ground School I.....	3
ENG 102 First-Year Composition.....	3
ETC 100 Languages of Technology <i>CS</i> .....	4
MAT 260 Technical Calculus I <i>MA</i> .....	3
PHY 111 General Physics <i>SQ*</i> .....	3
PHY 113 General Physics Laboratory <i>SQ*</i> .....	1
Total.....	17

\* Both PHY 111 and 113 must be taken to secure SQ credit.

#### Airway Science Management Concentration

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

#### Degree Requirements

Airway science management students are required to complete 128 semester hours with a 2.00 cumulative GPA, including a minimum of 50 semester hours of upper-division courses. All degree requirements are shown on the student's curriculum check sheet.

#### Concentration Requirements

In addition to the required courses for First-Year Composition, university General Studies (see "General Studies," page 78), and the Aeronautical Management Technology

core, the following additional courses are required in the airway science management concentration:

ACC 230 Uses of Accounting Information I.....	3
AMT 408 National Aviation Policy.....	3
AMT 444 Airport Management and Planning.....	3
AMT 489 Airline Administration.....	3
AMT 491 Aviation Management Capstone.....	3
IMC 346 Management Dynamics.....	3
ITM 343 Occupational Safety and Ergonomics.....	3
ITM 430 Ethical Issues in Technology.....	3
ITM 452 Industrial Human Resource Management.....	3
ITM 456 Introduction to Organized Labor.....	3
ITM 480 Organizational Effectiveness.....	3
Technical electives.....	15
Total.....	48

#### Suggested Course Pattern for Freshmen

##### First Semester

AMT 101 Introduction to Aeronautical Management Technology.....	1
AMT 182 Private Pilot Ground School.....	3
AMT 220 Aviation Meteorology.....	3
ENG 101 First-Year Composition.....	3
MAT 170 Precalculus <i>MA</i> .....	3
Total.....	13

##### Second Semester

ENG 102 First-Year Composition.....	3
ETC 100 Languages of Technology <i>CS</i> .....	4
MAT 260 Technical Calculus I <i>MA</i> .....	3
PHY 111 General Physics <i>SQ*</i> .....	3
PHY 113 General Physics Laboratory <i>SQ*</i> .....	1
General Studies elective.....	3
Total.....	17

\* Both PHY 111 and 113 must be taken to secure SQ credit.

#### APPLIED SCIENCE—B.A.S.

The Bachelor of Applied Science degree is a "capstone" degree for the Associate of Applied Science degree. The B.A.S. degree exposes students to advanced concepts and diverse critical thinking skills that prepare students for future career opportunities and professional advancement.

#### Admission

Admission to the B.A.S. degree program is restricted to students holding an A.A.S. degree from a regionally accredited U.S. postsecondary educational institution. A GPA of 2.00 or higher is required for all resident applicants and a 2.50 for nonresident applicants.

#### Degree Requirements

The B.A.S. degree in the College of Technology and Applied Sciences consists of 60 semester hours of upper-division (300 level and above) courses, with 30 hours in residence.

A.A.S. degree transfer.....	60
Assignable credit.....	6
B.A.S. core.....	15
General Studies.....	19
Technical concentration.....	20
Total.....	120

**General Studies Curriculum**

The B.A.S. curriculum builds on the general education content of the A.A.S. degree. Additional General Studies (L, CS and awareness areas) are met with courses in the core concentration. General Studies courses focus on contextual learning.

L .....	3
MA .....	3
HU .....	3
HU or SB .....	3
SB .....	3
SG .....	4
<hr/>	
Total .....	19

**Assignable Credit**

Assignable credit allows space in the curriculum for pre-requisite courses needed to succeed in the program. The courses are determined by the student and the advisor.

**B.A.S. Core**

The area core is focused on management and organization, professional communication, quantitative analysis, and computer competency.

GIT 494 ST: Computer Systems Applications .....	3
IMC 346 Management Dynamics .....	3
or ITM 344 Industrial Organization (3)	
or ITM 452 Industrial Human Resource	
Management (3)	
IMC 470 Project Management .....	3
STP 420 Introductory Applied Statistics <i>CS</i> .....	3
TWC 400 Technical Communications <i>L</i> .....	3
<hr/>	
Total .....	15

**Technical Concentrations**

**Aviation Maintenance Management Technology.** This concentration is for those students who have completed an airframe and powerplant certification as part of their A.A.S. degree. Students receive an orientation in management practices that prepares them for progressively more responsible positions in the field of aviation maintenance management.

**Aviation Management Technology.** This concentration is for those students who have received training and education in some aspect of the air transportation industry (other than aviation maintenance), such as flight certificates and ratings as part of their A.A.S. degree. Students receive an orientation in management practices that prepares them for progressively more responsible positions in the field of aviation management.

**STUDENT ORGANIZATIONS**

The department hosts the local chapter of Alpha Eta Rho, an international professional aviation fraternity open to all students with an interest in aviation. The American Association for Airport Executives is open to all students with an interest in airport management. The Student Advisory Council is a leadership organization that facilitates student communication with faculty, departmental leaders, and university administrative personnel. The Precision Flight Team competes in regional and national flying safety competi-

tions. Women in Aviation is an international organization that is open to all students.

**AERONAUTICAL MANAGEMENT TECHNOLOGY (AMT)**

**AMT Note 1.** Flight instruction costs are not included in university tuition and fees.

**AMT 100 Flight Safety I. (1)**

*fall, spring, summer*

Supervised private pilot flight training and flight safety briefings. Continuous enrollment required until completion of the FAA Private Pilot Certificate. Lecture, lab. Fee. See AMT Note 1. Corequisite: AMT 182 or 220 (or its equivalent).

**AMT 101 Introduction to Aeronautical Management Technology. (1)**

*fall and spring*

Facilitates entry into Aeronautical Management Technology programs. Emphasizes *General Catalog* and concentration requirements, registration, careers, and ASU East facilities.

**AMT 182 Private Pilot Ground School. (3)**

*fall, spring, summer*

Ground school preparation for Private Pilot Certificate. Aerodynamics, navigation, performance, and regulations. Lecture, lab. Corequisite: AMT 220.

**AMT 194 Special Topics. (1-4)**

*not regularly offered*

**AMT 200 Flight Safety II. (2)**

*fall, spring, summer*

Supervised commercial instrument flight training and safety briefings. Continuous enrollment required until completion of FAA Commercial Pilot Certificate with Instrument Rating. Lecture, lab. Fee. See AMT Note 1. Prerequisites: AMT 100; Private Pilot Certificate. Pre- or corequisite: AMT 214 or 322.

**AMT 201 Air Traffic Control. (3)**

*fall*

Ground and air operations; weather services communications and routing; flight plans, IFR operations, departures and arrivals; and airport conditions and emergencies. Prerequisite: AMT 182.

**AMT 214 Commercial/Instrument Ground School I. (3)**

*fall and spring*

Ground school leading to FAA Instrument Pilot Rating/Commercial Pilot Certificate (part 1 of 2). 10 hours ground trainer included. Lecture, lab. Fee. Pre- or corequisites: AMT 182, 220.

**AMT 220 Aviation Meteorology. (3)**

*fall, spring, summer*

Evaluation, analysis, and interpretation of atmospheric phenomena. Low- and high-altitude weather from the pilot's viewpoint. Corequisite: AMT 182.

**AMT 280 Aerospace Structures, Materials, and Systems. (4)**

*fall*

Basic aerodynamics, incompressible/compressible airflow, wind tunnel testing, wing theory; analysis of aircraft structures; properties and applications of materials, and aircraft systems. Lecture, lab. Fee. Prerequisites: PHY 111, 113.

**AMT 287 Aircraft Powerplants. (4)**

*spring*

Theory and performance analysis of gas turbine and reciprocating aircraft engines. Engine accessories, systems, and environmental control. Lecture, lab. Prerequisite: AMT 280.

**AMT 300 Flight Safety III. (2)**

*fall, spring, summer*

Supervised instructor flight training and safety briefings. Continuous enrollment required until completion of FAA Flight Instructor Certificate with Instrument Instructor Rating. Lecture, lab. Fee. See AMT Note 1. Prerequisite: AMT 200. Pre- or corequisite: AMT 385.

**NOTE:** For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 78. For graduation requirements, see "University Graduation Requirements," page 74. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 51.

**AMT 308 Air Transportation. (3)***fall*

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

*General Studies: G*

**AMT 322 Commercial/Instrument Ground School II. (3)***spring*

Ground school leading to FAA Instrument Pilot Rating/Commercial Pilot Certificate (part 2 of 2). 10 hours ground trainer included. Lecture, lab. Fee. Prerequisite: Private Pilot Certificate. Pre- or corequisite: AMT 214.

**AMT 360 Introduction to Helicopter Technology. (3)***not regularly offered*

Introduction to the working functions of modern rotary wing aircraft, rotary wing flight theory, aerodynamics, controls, flight, and power requirements. Prerequisites: PHY 111, 113.

**AMT 370 Air Freight Operations. (3)***not regularly offered*

Air freight operations in National Aviation System; ramp operations, loading, weight and balance, and administration of airside and ground-side operations. Prerequisite: junior standing.

**AMT 382 Air Navigation. (3)***spring*

Theory and application of modern advanced navigation and flight instrument systems. Introduction to crew resource management in multiplace cockpits. Lecture, lab. Prerequisite: AMT 322.

**AMT 385 Flight Instructor Ground School. (3)***fall and spring*

Ground school in preparation for the FAA Flight Instructor Certificate. Lecture, lab. Pre- or corequisite: AMT 322.

**AMT 387 Multiengine Pilot Ground School. (1)***fall and spring*

Ground school preparation for the FAA Multiengine Rating. Lecture, lab. Fee. See AMT Note 1. Pre- or corequisite: AMT 200 or instructor approval.

**AMT 391 Multiengine Instructor Ground School. (2)***not regularly offered*

Ground school preparation for the FAA Multiengine Flight Instructor Rating. Lecture, lab. See AMT Note 1. Prerequisites: AMT 300, 387, 400.

**AMT 392 Flight Instructor Instrument Ground School. (2)***fall and spring*

Ground school preparation for the FAA Instrument Flight Instructor Rating. Lecture, lab. See AMT Note 1. Prerequisite: AMT 385. Pre- or corequisite: AMT 200.

**AMT 395 Multiengine Land, Airplane Flight Instructor Rating. (1)***not regularly offered*

Normal and emergency flight operations. Instruction techniques and procedures for light multiengine land, airplane. CFIIAME Rating required for course completion. Lecture, lab. See AMT Note 1. Prerequisite: AMT 391.

**AMT 396 Aviation Professional. (1)***fall and spring*

Career focus for management and flight students, including internships, résumé writing, interviews, and employment search in aviation industry. Prerequisite: junior standing.

**AMT 400 Flight Safety IV. (1)***fall, spring, summer*

Multiengine and crew training and safety briefings. Continuous enrollment required until completion of rating and multicrew training. Lecture, lab. Fee. See AMT Note 1. Prerequisite: AMT 300. Pre- or corequisite: AMT 387.

**AMT 408 National Aviation Policy. (3)***fall*

Examination of aviation and airspace policies and policy process, including agencies involved in formulation, implementation, and evaluation of aviation policy. Prerequisite: AMT 308.

**AMT 409 Nondestructive Testing and Quality Assurance. (1)***not regularly offered*

Purpose of inspection and quality assurance. Theory and application of nondestructive inspection methods. Application of pertinent standards, specifications, and codes. Lecture, lab. Cross-listed as AET 409. Credit is allowed for only AET 409 or AMT 409. See AMT Note 1. Prerequisite: AMT 280 or MET 230.

**AMT 410 Aviation Safety and Human Factors. (3)***fall*

Aviation accident prevention, human factors, life support, fire prevention, accident investigation, and crash survivability. Development and analysis of aviation safety programs. Prerequisites: junior standing; completion of 1 semester of General Studies L requirement.

**AMT 412 Air Transportation Research. (1)***fall*

Survey of practical research methodology in use in the air transportation industry. Topics include planning and design considerations.

**AMT 419 Aviation Logistical Management. (3)***spring*

Survey of FAA requirements for personnel and facilities. Topics include parts supply, quality control, product liability, pricing, profitability, and administration. Lecture, lab. Prerequisite: junior standing.

**AMT 442 Aviation Law/Regulations. (3)***fall*

Aviation within context of U.S. Common Law system. Public law, administrative rule making, sovereignty, enforcement, and case law analysis. Prerequisite: junior standing.

**AMT 444 Airport Management and Planning. (3)***spring*

Orientation to administration and management of modern public airports, including overview of planning, funding, and development of airport facilities. Prerequisite: AMT 308.

**AMT 482 Airline Instrument Procedures. (3)***fall*

Advanced instrument flight using airline instrument procedures and airline crew and cockpit resource management. Lecture, lab. Prerequisites: AMT 322, 382.

**AMT 484 Aeronautical Internship. (1–12)***fall, spring, summer*

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

**AMT 489 Airline Administration. (3)***spring*

Administrative organizations, economics of airline administration, operational structure, and relationship with federal government agencies. Prerequisites: AMT 308; instructor approval.

**AMT 491 Aviation Management Capstone. (3)***spring*

Integration and overview of management tools, current business problems and topics related to aviation industry. Group project with industry and government and business partners. Prerequisite: senior standing.

**AMT 494 Special Topics. (1–4)***not regularly offered***AMT 496 Airline Aircraft Systems Capstone. (3)***spring*

Commercial airline aircraft systems and flight procedures. Includes theoretical education for large, commercial passenger aircraft. Lecture, lab. Prerequisite: senior standing.

**AMT 498 Pro-Seminar. (1–7)***not regularly offered***AMT 499 Individualized Instruction. (1–3)***not regularly offered***AMT 521 Air Transportation Regulation. (3)***not regularly offered*

Reviews evolutionary history of government regulations. Explores alternatives for economic, safety, social, and administrative regulatory reform in air transportation. Prerequisite: AMT 444 or 489 (or its equivalent).

**AMT 523 Aviation Systems Management. (3)***not regularly offered*

Systems theory applied to intermodal transportation networks. Survey of air and ground transportation infrastructure, institutional frameworks, and intermediaries promoting connections between modes. Prerequisite: AMT 444 or 489 (or its equivalent).

**AMT 525 Airport Planning and Design. (3)***not regularly offered*

Students complete various phases of airport master planning process. Provides guidance for logical and timely development of airports. Project work groups assigned. Prerequisite: AMT 444 or 489 (or its equivalent).

**AMT 527 Airline Management Strategies. (3)***not regularly offered*

Since deregulation, airlines have undergone profound changes through mergers, consolidation, and acquisition. In-depth look at airline management strategies for the 21st century. Prerequisite: AMT 444 or 489 (or its equivalent).

**AMT 528 International Aviation. (3)***not regularly offered*

Major issues of international aviation, historical review of institutional framework. Bilateral route agreements, freedom versus sovereignty, current legal and political arrangements. Prerequisite: AMT 444 or 489 (or its equivalent).

**AMT 529 Fixed-Base Operations Management. (3)***not regularly offered*

Examination of FBO role in the national aviation system. Organization of flight line operations, aircraft maintenance, and administration for multiple aircraft types. Prerequisite: AMT 444 or 489 (or its equivalent).

**AMT 541 Aviation Physiology. (3)***not regularly offered*

Survey of human physiology and human performance principles related to modern aircraft and aircraft systems operating in multiple environments. Prerequisite: AMT 410 (or its equivalent).

**AMT 543 Ergonomics in High-Technology Environments. (3)***not regularly offered*

Examination of ergonomic design principles regarding man-machine interface requirements of high-technology workstations. Emphasis on computer workstation design issues. Prerequisite: AMT 410 (or its equivalent).

**AMT 545 Human Factors in Aviation. (3)***not regularly offered*

Overview of human role in aviation. Issues, problems of unsafe acts and attitudes in human behavior. Human engineering capabilities and limitations. Prerequisite: AMT 410 (or its equivalent).

**AMT 546 Crew Resource Management/Line-Oriented Flight Training. (3)***not regularly offered*

Evaluation of in-depth, multicrew coordination issues for commercial aviation pilots. Stresses importance of critical thinking, decision making, integrated resource utilization. Prerequisite: AMT 410 (or its equivalent).

**AMT 547 Modern Human Factors Design Issues. (3)***not regularly offered*

Research and discussion of current human factors issues. State-of-the-art analyses of information regarding rapidly evolving designs and applications. Prerequisite: AMT 410 (or its equivalent).

**AMT 549 Human Factors Research. (3)***not regularly offered*

Aviation human factors research principles applied and tested in operational settings. Group projects assigned in conjunction with industry partners. Prerequisite: AMT 410 (or its equivalent).

**AMT 580 Practicum. (1–12)***not regularly offered***AMT 584 Internship. (1–12)***not regularly offered***AMT 590 Reading and Conference. (1–12)***not regularly offered***AMT 591 Seminar. (1–12)***not regularly offered***AMT 592 Research. (1–12)***not regularly offered***AMT 593 Applied Project. (1–12)***not regularly offered***AMT 595 Continuing Registration. (1)***not regularly offered***AMT 598 Special Topics. (1–4)***not regularly offered***AMT 599 Thesis. (1–12)***not regularly offered*


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## Department of Electronics and Computer Engineering Technology

**Timothy E. Lindquist**  
*Chair*  
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**Fax 480/727-1723**

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**PROFESSORS**

LINDQUIST, McHENRY, MUNUKUTLA, NOWLIN

**ASSOCIATE PROFESSORS**ABUELYAMAN, MACIA, MILLARD,  
SUNDARARAJAN, ZENG**ASSISTANT PROFESSORS**

LIPARI, PETERSON

**PURPOSE**

The Department of Electronics and Computer Engineering Technology prepares graduates to apply scientific and engineering knowledge, methods, and techniques in support of technological applications in electronics and computer engineering activities and processes.

The engineering technology curriculum is applications oriented and builds upon a background of applied science and mathematics, including the concepts and applications of calculus. Graduates are prepared to produce practical, workable, and safe solutions to technologically challenging problems. Graduates are employed in the electronics and computer industries with responsibilities such as designing, installing and operating technical systems, analyzing and (re) engineering systems that embed computer hardware and software for unique applications, developing and producing products, managing manufacturing processes, and providing customer support for technical products and systems.

**DEGREES**

The faculty in the Department of Electronics and Computer Engineering Technology offer the B.S. degree in Electronics Engineering Technology (B.S./EET) and the B.S. degree in Computer Engineering Technology (B.S./CET).

For students holding an A.A.S. degree, the department offers the B.A.S. degree with a major in Applied Science. Five concentrations are available: computer systems administration, instrumentation, microcomputer systems, semiconductor technology, and software technology applications.

A Master of Science in Technology degree program with concentrations in electronics engineering technology, computer systems engineering technology, instrumentation and measurement technology, and microelectronics engineering technology is available for qualified B.S. graduates. See the *Graduate Catalog* for more information.

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**NOTE:** For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 78. For graduation requirements, see "University Graduation Requirements," page 74. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 51.

### Electronics Engineering Technology—B.S.

Students interested in the B.S. degree in Electronics Engineering Technology may choose to specialize in one of the following three concentrations: electronic systems, microelectronics, and telecommunications.

The *electronic systems* concentration is aimed at preparing persons for careers in control, electronics, instrumentation, and power systems applications. This concentration allows a student to develop a broad-based knowledge of electrical/electronic fundamentals with an applications perspective.

The *microelectronics (UET)* concentration combines applied electronics, monolithic and hybrid integrated circuit processing and applications, device and component fabrication, and manufacturing. The objective of this concentration is to prepare persons to assume positions in the area of microelectronics manufacturing with immediately applicable knowledge as well as to develop a strong foundation of electronic fundamentals and methods. Graduates of this concentration secure positions in processing, manufacturing operations, and applications areas in industry as members of the diverse scientific engineering team.

The *telecommunications* concentration encompasses the fundamentals of information and signal processing, modern bandwidth-efficient digital radio analysis with RF and microwave circuits and systems. Applications include telephone pulse code modulation, cable TV, fiber optic links, and satellite transmission circuits and systems.

The departmental curriculum is organized into two categories, technical studies and General Studies. Technical studies consist of core areas and the concentration specialty area. General Studies consist of courses selected to meet the university General Studies requirement (see "General Studies," page 78) as well as the math/science requirement of TAC of ABET. Note that all three General Studies awareness areas are required. Consult your advisor for an approved list of courses.

A minimum of 50 upper-division hours is required, including at least 24 semester hours of EET, CET, or UET upper-division hours to be taken at ASU. A minimum of 128 semester hours with a 2.00 cumulative GPA is required for graduation. Complete program of study guides with typical four-year patterns are available from the department.

The General Studies portion of the B.S./EET curriculum has been carefully structured to meet the specific requirements of the university and to include the content required by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology, the professional accrediting agency for such curricula.

### ELECTRONICS ENGINEERING TECHNOLOGY— B.S. DEGREE REQUIREMENTS

In addition to the courses listed for First-Year Composition and university General Studies, the following courses are required.

#### ENGINEERING TECHNOLOGY CORE

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

ETC 100 Languages of Technology CS .....	4
ETC 211 Applied Engineering Mechanics: Statics .....	3

ETC 340 Applied Thermodynamics and Heat Transfer .....	3
Total .....	10

#### Electronics Engineering Technology Core and Major Requirements

CET 150 Digital Systems I CS .....	4
CET 256 C Programming for Engineering Technology .....	3
CET 350 Digital Systems II .....	4
CET 354 Microcomputer Architecture and Programming .....	4
EET 208 Electric Circuit Analysis I .....	4
EET 301 Electric Circuit Analysis II .....	4
EET 310 Electronic Circuits I .....	4
EET 372 Communication Systems .....	4
EET 396 Professional Orientation* .....	1
EET 407 Energy Conversion and Applications .....	4
EET 410 Electronic Circuits II .....	3
UET 331 Electronic Materials .....	3
UET 415 Electronic Manufacturing Engineering Principles .....	3
Total .....	45

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

#### Electronics Engineering Technology Concentrations

##### Electronic Systems

CET 483 UNIX with C Applications .....	3
EET 406 Control System Technology .....	4
EET 430 Instrumentation Systems .....	4
EET 460 Power Electronics .....	4
Approved technical electives .....	8
Total .....	23

##### Microelectronics

CHM 116 General Chemistry SQ .....	4
UET 416 Monolithic Integrated Circuit Devices .....	3
UET 417 Monolithic Integrated Circuit Laboratory .....	2
UET 418 Hybrid Integrated Circuit Technology .....	4
UET 421 Applied Device Physics .....	3
UET 432 Semiconductor Packaging and Heat Transfer .....	3
Approved technical electives .....	4
Total .....	23

##### Telecommunications

CET 473 Digital/Data Communications .....	4
EET 304 Microwave Technology .....	4
EET 401 Digital Filters and Applications .....	3
EET 470 Communication Circuits .....	4
Approved technical electives .....	8
Total .....	23

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

##### First Semester

CET 150 Digital Systems I CS .....	4
ENG 101 First-Year Composition .....	3
MAT 170 Precalculus MA .....	3
PHY 111 General Physics SQ <sup>1</sup> .....	3
PHY 113 General Physics Laboratory SQ <sup>1</sup> .....	1
Total .....	14

**Second Semester**

ENG 102 First-Year Composition.....	3
ETC 100 Languages of Technology <i>CS</i> .....	4
MAT 260 Technical Calculus I <i>MA</i> .....	3
PHY 112 General Physics <i>SQ</i> <sup>2</sup> .....	3
PHY 114 General Physics Laboratory <i>SQ</i> <sup>2</sup> .....	1
HU, SB, or awareness area course.....	3
Total .....	17

**Second Year**

**First Semester**

CET 256 C Programming for Engineering Technology.....	3
CHM 113 General Chemistry <i>SQ</i> .....	4
ECN 111 Macroeconomic Principles <i>SB</i> .....	3
EET 208 Electric Circuit Analysis I.....	4
MAT 261 Technical Calculus II <i>MA</i> .....	3
Total .....	17

**Second Semester**

EET 301 Electric Circuit Analysis II.....	4
ETC 211 Applied Engineering Mechanics: Statics.....	3
MAT 262 Technical Calculus III <i>MA</i> .....	3
L1 course.....	3
HU, SB, or awareness area course.....	3
Total .....	16

<sup>1</sup> Both PHY 111 and 113 must be taken to secure SQ credit.

<sup>2</sup> Both PHY 112 and 114 must be taken to secure SQ credit.

**COMPUTER ENGINEERING TECHNOLOGY—  
B.S. DEGREE REQUIREMENTS**

Students interested in the B.S. degree in Computer Engineering Technology (B.S./CET) may choose to specialize in one of the following three concentrations: computer hardware technology, embedded systems technology, and software technology.

The *computer hardware technology* concentration is designed to provide students with an opportunity to develop broad-based knowledge and skills in digital systems, interfacing techniques and computer hardware applications.

The *embedded systems technology* concentration prepares students for the application, interconnection, design, analysis, and realization of systems that involve both software and hardware components. This concentration balances the hardware concerns of computer engineering with the processes and technologies involved in producing reliable software solutions.

The *software technology* concentration prepares students for careers in software applications in the context of an industry in which software solutions are increasingly distributed, using object-oriented languages and frameworks, and in which the Internet, Web and wireless technologies play an important role.

Each student must satisfy the courses listed for First-Year Composition and the university General Studies requirement. In addition, the following courses are required.

**Lower-Division Core**

CET 100 Object-Oriented Software Development I.....	3
CET 150 Digital Systems I <i>CS</i> .....	4
CET 230 Applied Data Structures.....	3

CET 256 C Programming for Engineering Technology.....	3
EET 208 Electric Circuit Analysis I.....	4
ETC 100 Languages of Technology <i>CS</i> .....	4
Core total.....	21

**Major**

CET 350 Digital Systems II.....	4
CET 354 Microcomputer Architecture and Programming.....	4
CET 456 Assembly Language Applications.....	3
CET 483 UNIX with C Applications.....	3
CET 486 Hardware Description Languages: VHDL.....	3
CET 494 ST: Computer Project.....	3
EET 396 Professional Orientation.....	1
Total .....	21

**Computer Hardware Technology Concentration**

CET 452 Digital Logic Applications.....	4
CET 454 Microcontrollers.....	3
CET 457 Microcomputer Systems Interfacing.....	4
CET 473 Digital/Data Communications.....	4
CHM 113 General Chemistry <i>SQ</i> .....	4
EET 301 Electric Circuit Analysis II.....	4
EET 310 Electronic Circuits I.....	4
EET 372 Communication Systems.....	4
UET 331 Electronic Materials.....	3
Technical electives.....	5
Total .....	39

**Embedded Systems Technology Concentration**

CET 200 Object-Oriented Software Development II.....	3
CET 300 Object-Oriented Software Development III.....	3
CET 386 Operating Systems Principles.....	3
CET 452 Digital Logic Applications.....	4
CET 457 Microcomputer Systems Interfacing.....	4
CET 473 Digital/Data Communications.....	4
CET 488 UNIX Systems Administration.....	3
CHM 113 General Chemistry <i>SQ</i> .....	4
EET 301 Electric Circuit Analysis II.....	4
Technical electives.....	7
Total .....	39

**Software Technology Concentration**

CET 200 Object-Oriented Software Development II.....	3
CET 236 Introduction to Visual BASIC.....	3
CET 300 Object-Oriented Software Development III.....	3
CET 326 Modern Programming Languages.....	3
CET 386 Operating Systems Principles.....	3
CET 400 Software Engineering Technology.....	3
CET 425 Server Software Programming.....	3
CET 488 UNIX Systems Administration.....	3
CET 489 Network Programming.....	3
Technical electives.....	12
Total .....	39

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

**First Semester**

CET 100 Object-Oriented Software Development I.....	3
ENG 101 First-Year Composition.....	3
MAT 170 Precalculus <i>MA</i> .....	3
PHY 111 General Physics <i>SQ</i> <sup>1</sup> .....	3

**NOTE:** For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 78. For graduation requirements, see "University Graduation Requirements," page 74. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 51.

PHY 113 General Physics Lab <i>SQ</i> <sup>1</sup> .....	1
Total .....	13

**Second Semester**

CET 200 Object-Oriented Software Development II .....	3
ENG 102 First-Year Composition .....	3
ETC 100 Languages of Technology <i>CS</i> .....	4
MAT 260 Technical Calculus I <i>MA</i> .....	3
PHY 112 General Physics <i>SQ</i> <sup>2</sup> .....	3
PHY 114 General Physics Lab <i>SQ</i> <sup>2</sup> .....	1
Total .....	17

**Second Year****First Semester**

CET 150 Digital Systems <i>CS</i> .....	4
CET 230 Applied Data Structures .....	3
CET 256 C Programming for Engineering Technology .....	3
CHM 113 General Chemistry <i>SQ</i> .....	4
MAT 261 Technical Calculus II .....	3
Total .....	17

**Second Semester**

CET 300 Object-Oriented Software Development III .....	3
CET 350 Digital Systems II .....	4
ECN 111 Macroeconomic Principles <i>SB</i> .....	3
EET 208 Electric Circuit Analysis I .....	4
MAT 243 Discrete Mathematical Structures .....	3
or MAT 262 Technical Calculus III <i>MA</i> (3) .....	
Total .....	17

<sup>1</sup> Both PHY 111 and 113 must be taken to secure SQ credit.

<sup>2</sup> Both PHY 112 and 114 must be taken to secure SQ credit.

**APPLIED SCIENCE—B.A.S.**

The Bachelor of Applied Science degree is a “capstone” degree for the Associate of Applied Science degree. The B.A.S. degree exposes students to advanced concepts and diverse critical thinking skills that prepare them for future career opportunities and professional advancement.

**Admission**

Admission to the B.A.S. degree program is restricted to students holding an A.A.S. degree from a regionally accredited U.S. postsecondary educational institution. A GPA of 2.00 or higher is required for all resident applicants and a 2.50 for nonresident applicants.

**Degree Requirements**

The B.A.S. degree in the College of Technology and Applied Sciences consists of 60 semester hours of upper-division (300-level and above) courses, with 30 hours in residence.

A.A.S. degree transfer .....	60
Assignable credit .....	6
B.A.S. core .....	15
General Studies .....	19
Technical concentration .....	20
Total .....	120

**General Studies Curriculum**

The B.A.S. curriculum builds on the general education content of the A.A.S. degree. Additional General Studies (L, CS and awareness areas) are met with courses in the core or

concentration. General Studies courses focus on contextual learning.

L .....	3
MA .....	3
HU .....	3
HU or SB .....	3
SB .....	3
SG .....	4
Total .....	19

**Assignable Credit**

Assignable credit allows space in the curriculum for prerequisite courses needed to succeed in the program. The courses are determined by the student and the advisor.

**B.A.S. Core**

The area core focuses on management and organization, professional communication, quantitative analysis, and computer competency.

CET 300 Object-Oriented Software Development III .....	3
EET 494 ST: Data Analysis .....	3
GIT 352 Technical Presentations and Visual Literacy .....	3
IMC 346 Management Dynamics .....	3
TWC 400 Technical Communication <i>L</i> .....	3
Total .....	15

**Technical Concentrations**

**Computer Systems Administration.** This concentration is designed to broaden and provide more in-depth knowledge in computer networks. Graduates from this concentration will be prepared to specify, install, maintain, and administer various computer networking systems.

**Instrumentation.** This concentration studies instrumentation, power systems, and computer systems. The curriculum prepares the graduate to specify and prepare solutions for a wide variety of electrical and electronic instrumentation systems. Graduates from this concentration are primed for technical leadership positions in the various segments of the electronics industry.

**Microcomputer Systems.** This concentration prepares graduates for product specification and marketing positions in microcomputer applications. The B.A.S. degree provides additional technical skills in microcomputer systems to prepare graduates for responsible and productive positions in the support of computer systems.

**Semiconductor Technology.** This concentration prepares graduates for careers in the semiconductor industry. The B.A.S. degree provides graduates with an understanding of integrated circuit processing, mask making, packaging, and the software tools used in this industry.

**Software Technology Applications.** This concentration prepares graduates for careers in the software industry. The B.A.S. degree furnishes additional technical expertise in software technology to prepare graduates to design, specify, and provide software solutions for industry and the consumer market. This concentration also prepares graduates for computer systems and network administration careers.

**COMPUTER ENGINEERING TECHNOLOGY (CET)****CET 100 C/C++ Programming. (3)***fall and spring*

Applied and practical problem solving using the C programming language. Introduction to C++. Prerequisite: ETC 100.

**CET 150 Digital Systems I. (4)***fall and spring*

Number systems, Boolean algebra, combinational logic, K-maps, flip-flops, sequential circuits, state machines, and minimization techniques.

*General Studies: CS***CET 191 First-Year Seminar. (1–3)***not regularly offered***CET 200 JAVA Programming. (3)***fall*

Concepts of JAVA programming language addressing advanced topics such as JAVA archive files, threads, inheritance, dialog boxes, and JAVA beans. Prerequisite: CET 100.

**CET 230 Applied Data Structures. (3)***fall*

Introduction to data structures: strings, stacks, queues, binary trees, recursion, searching, and sorting. Prerequisite: CET 100.

**CET 236 Introduction to Visual BASIC. (3)***fall*

Introduction to BASIC and programming in the Visual BASIC environment. Prerequisite: CET 100.

**CET 250 Computer and Network Technology. (3)***spring*

Computer technology as related to digital communications and networking. Network operating systems, protocols, and routing technology. Prerequisite: CET 100, 150.

**CET 256 C Programming for Engineering Technology. (3)***fall, spring, summer*

Applied and practical problem solving using the C programming language. Prerequisite: ETC 100.

**CET 294 Special Topics. (1–4)***not regularly offered***CET 300 Object-Oriented Software Development. (3)***fall*

Increases skills in OO concepts and present C++. Covers JAVA concepts of threads, serialization, and JAVA beans. C++ language concepts. Prerequisites: CET 200, 256.

**CET 326 Modern Programming Languages. (3)***fall*

Concepts and semantical and syntactical construction of modern programming languages. Prerequisite: CET 200.

**CET 350 Digital Systems II. (4)***fall*

Analysis and design of synchronous and asynchronous state machines. Introduction to VHDL. Lecture, lab. Prerequisite: CET 150.

**CET 354 Microcomputer Architecture and Programming. (4)***fall and spring*

Microcomputer architecture, assembly language programming, I/O considerations, exception and interrupt handling. Introduction to interfacing. Prerequisite: CET 150.

**CET 386 Operating Systems Principles. (3)***spring*

Fundamentals of operating systems, process management, scheduling and synchronization techniques, memory and file management, protection and security issues. Prerequisite: CET 256.

**CET 400 Software Engineering Technology. (3)***spring*

Software life-cycle models; project management; team development environments; software specification, design, implementation techniques and tools, validation, and maintenance; user documentation. Prerequisite: senior standing in Technology.

**CET 401 Digital Signal Processing for Multimedia. (3)***fall*

Application of DSP techniques to multimedia. Digital filter analysis and design. Time and frequency techniques. Computer applications. Cross-listed as EET 401. Credit is allowed for only CET 401 or EET 401. Prerequisites: EET 301; MAT 262.

**CET 425 Server Software Programming. (3)***once a year*

Design and implementation of software servers, threaded socket servers, servers for distributed Web-based applications; security for the Web. Prerequisite: CET 300 or instructor approval.

**CET 426 Software Tools for the Semiconductor Industry. (3)***spring*

Introduction to software tools commonly used in the semiconductor industry, such as SUPREM IV, PSPICE, VIEWLOGIC, and ICED. Cross-listed as UET 426. Credit is allowed for only CET 426 or UET 426. Prerequisite: UET 331.

**CET 433 Database Technology. (3)***fall*

Introduction to database technologies and DBMS, data models, and languages. Prerequisites: CET 230, 300.

**CET 436 Applications of Visual BASIC. (3)***fall*

Applications of Visual BASIC to graphics, graphical user interfaces, error handling, file processing, OO programming, DBMS, networking, and multimedia. Prerequisite: CET 236.

**CET 450 Advanced Internetworking Technologies. (3)***spring*

Effects and benefits, design and functions of internetworking protocols. Prepares students for the Cisco certification examination. Prerequisite: CET 250.

**CET 452 Digital Logic Applications. (4)***spring*

Design of sequential machines using system design techniques and complex MSI/LSI devices with lab. Prerequisite: CET 350.

**CET 454 Microcontrollers. (3)***spring*

Microcontroller input/output ports and advanced features. Microcontrollers as an embedded system and their interfacing considerations. Prerequisites: CET 350, 354.

**CET 456 Assembly Language Applications. (3)***fall*

Programming using BIOS and DOS routines. High-level language interfacing. Disk operations, TSR routines, and device drivers. Prerequisite: CET 354.

**CET 457 Microcomputer Systems Interfacing. (4)***spring*

Applications of microcomputer hardware and software. Special purpose controllers, interface design. Lecture, lab. Prerequisites: CET 354; CSE 183; EET 310.

**CET 458 Digital Computer Networks. (3)***once a year*

Network technology, topologies, protocols, control techniques, reliability, and security. Prerequisite: CET 354.

**CET 473 Digital/Data Communications. (4)***fall*

Signals, distortion, noise, and error detection/correction. Transmission and systems design. Interface techniques and standards. Lecture, lab. Prerequisites: CET 354; EET 372.

**CET 483 UNIX with C Applications. (3)***fall*

Generate user proficiency in the use of the UNIX operating system, its shells, environment, and 4th generation language and tools. Prerequisite: senior standing in the ECET department (or its equivalent).

**CET 484 Internship. (1–12)***not regularly offered*

**NOTE:** For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 78. For graduation requirements, see "University Graduation Requirements," page 74. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 51.

**CET 485 Digital Testing Techniques I. (3)***once a year*

Hardware/software aspects of digital testing technology; systems, board, and logic testing and equipment. Lecture, lab. Cross-listed as UET 485. Credit is allowed for only CET 485 or UET 485. Prerequisites: CET 350; EET 310.

**CET 486 Hardware Description Languages: VHDL. (3)***spring*

Introduction to hardware description languages using VHDL. Techniques for modeling and simulating small digital systems using a VHDL simulator. Prerequisites: CET 350, 483.

**CET 487 Hardware Description Languages: VERILOG. (3)***fall*

Introduction to hardware description languages, digital modeling, and simulation techniques using the VERILOG HDL. Prerequisites: CET 350, 354.

**CET 488 UNIX Systems Administration. (3)***fall*

Generate user proficiency in administration of UNIX operating system, its processes, system calls, kernel, file structure, and interprocess communication tools. Prerequisites: CET 483 (or its equivalent); C or C++ language.

**CET 489 Network Programming Applications. (3)***fall*

Generate user proficiency in writing C programs and scripts to control and administer a UNIX operating system network. Prerequisites: CET 473 and 488 (or their equivalents); C or C++ language.

**CET 490 Reading and Conference. (1–12)***not regularly offered***CET 492 Honors Directed Study. (1–6)***not regularly offered***CET 493 Honors Thesis. (1–6)***not regularly offered***CET 494 Special Topics. (1–4)***not regularly offered*

Possible topics:

(a) Computer Project

**CET 498 Pro-Seminar. (1–7)***not regularly offered***CET 499 Individualized Instruction. (1–3)***not regularly offered***CET 501 Digital Signal Processing Applications. (3)***fall*

Application of DSP techniques to the design and analysis of digital filters. Solution of filtering problems using computer techniques. Cross-listed as EET 501. Credit is allowed for only CET 501 or EET 501. Prerequisite: EET 401 or instructor approval.

**CET 520 Computer Architecture. (3)***fall*

Basics of computer architecture. RTN, RISC, CISC concepts; computer arithmetic; ALUs; memory systems; I/O. Prerequisite: CET 354.

**CET 533 Database Management Systems. (3)***fall*

Systems aspects of relational databases: relational database design, index and access structures, implementation and performance evaluation, query processing and optimization. Prerequisite: CET 433.

**CET 546 Computer Vision. (3)***spring*

Image segmentation and enhancement. Object recognition and modeling. Morphological operation for object recognition and measurement. Prerequisite: CET 300.

**CET 552 Digital Systems Design. (3)***spring*

Digital system design techniques and applications. Prerequisite: CET 452 or instructor approval.

**CET 554 Distributed Computing. (3)***spring*

Topics in distributed systems, including communications, distributed operating systems, fault-tolerance, and performance issues. Prerequisites: CET 354, 386.

**CET 556 Windows Programming. (3)***fall*

Programming techniques in the MS Windows and X Window environments. Prerequisite: CET 256 (or its equivalent).

**CET 557 Microcomputers and Applications. (3)***fall*

Applications of small computer systems, mini- and microcomputer hardware and software. Prerequisites: CET 354; CSE 100 (or 183); EET 310.

**CET 566 Principles and Practices of Operating Systems. (3)***spring*

Principles and practices of operating systems: virtual memory systems, I/O devices and systems, file systems and organization, and other topics. Prerequisite: CET 386.

**CET 576 Embedded Real-Time Programming. (3)***fall*

Topics in real-time embedded operating systems such as synchronization, communications, file systems, and memory sharing. Prerequisites: CET 300, 386.

**CET 580 Practicum. (1–12)***not regularly offered***CET 583 Network Programming. (3)***fall*

Generate user proficiency in writing C programs and scripts to control and administer a UNIX operating system network. Prerequisites: CET 473 and 488 (or their equivalents); C or C++ language.

**CET 584 Internship. (1–12)***not regularly offered***CET 585 Digital Testing Techniques II. (3)***fall*

Testing technology as applied to digital systems, boards, and chips. Lecture, lab. Prerequisite: CET 354.

**CET 586 Digital Modeling Techniques. (3)***spring*

Digital system modeling and simulation using hardware description languages. Prerequisites: CET 350, 354.

**CET 590 Reading and Conference. (1–12)***not regularly offered***CET 591 Seminar. (1–12)***not regularly offered***CET 592 Research. (1–12)***not regularly offered***CET 593 Applied Project. (1–12)***not regularly offered***CET 594 Conference and Workshop. (1–12)***not regularly offered***CET 595 Continuing Registration. (1)***not regularly offered***CET 598 Special Topics. (1–4)***not regularly offered***CET 599 Thesis. (1–12)***not regularly offered***ELECTRONICS ENGINEERING TECHNOLOGY (EET)****EET 191 First-Year Seminar. (1–3)***not regularly offered***EET 208 Electric Circuit Analysis I. (4)***fall and spring*

Electrical models, AC/DC steady-state analysis of first and second order systems. Circuit theorems. Three-phase circuits. Lecture, lab. Pre- or corequisite: MAT 261.

**EET 294 Special Topics. (1–4)***not regularly offered***EET 301 Electric Circuit Analysis II. (4)***fall and spring*

Analysis of continuous-time signals and linear systems of using Laplace and Fourier response of circuits. Lecture, lab. Prerequisite: EET 208. Pre- or corequisite: MAT 262.

**EET 304 Transmission Lines in Computer Engineering. (3)***spring*

Transmission line considerations for computer circuits. Reflection, transients, cross talk, and other topics. High-speed circuit considerations. Prerequisite: EET 301.

**EET 310 Electronic Circuits I. (4)***fall and spring*

Multistage amplifier, analysis, and design using models and computer simulation. Lecture, lab. Prerequisite: EET 208.

**EET 372 Communication Systems. (4)***fall and spring*

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

**EET 394 Special Topics. (1–4)***not regularly offered***EET 396 Professional Orientation. (1)***fall and spring*

Technical, professional, economic, and ethical aspects of electronics/computer engineering technology practice and industrial organization. Lecture, projects. Prerequisite: junior standing.

**EET 401 Digital Signal Processing for Multimedia. (3)***fall*

Application of DSP techniques to multimedia. Digital filter analysis and design. Time and frequency techniques. Computer applications. Cross-listed as CET 401. Credit is allowed for only CET 401 or EET 401. Prerequisites: EET 301; MAT 262.

**EET 406 Control System Technology. (4)***spring*

Control system components, analysis of feedback control systems, stability, performance, and application. Lecture, lab, computer simulations. Prerequisites: EET 301; MAT 262.

**EET 407 Energy Conversion and Applications. (4)***fall*

Electricity, magnetism, mechanics, heat and units, and three-phase circuits. Electrical machines, transformers, generation, transmission, and distribution of electrical energy. Lecture, lab. Prerequisite: EET 208.

**EET 410 Electronic Circuits II. (3)***fall and spring*

Analysis and design of OP-amps, power amplifiers, and digital logic families. Feedback design using frequency response. Computer analysis and design. Prerequisites: EET 301, 310.

**EET 422 Electronic Switching Circuits. (4)***once a year*

Analysis and design of electronic circuits operating in a switching mode. Waveshaping, timing, and logic. Computer simulation. Lecture, lab. Prerequisites: CET 350; EET 301, 310.

**EET 430 Instrumentation Systems. (4)***fall*

Measurement principles and instrumentation, techniques. Signal and error analysis. Lecture, lab. Prerequisites: EET 301, 310.

**EET 460 Power Electronics. (4)***spring*

Analysis of circuits for control and conversion of electrical power and energy. Lecture, lab. Prerequisites: EET 301, 310, 407.

**EET 470 Communication Circuits. (4)***spring*

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

**EET 478 Fiber Optic Communications. (3)***spring*

Fiber optic communication systems analysis and design. Study of fiber optic waveguides, light sources, light detectors, noisy light signal detection. Prerequisites: EET 372; MAT 262.

**EET 482 Industrial Practice: Internship/Co-op. (1–4)***fall, spring, summer*

Specially assigned or approved activities in electronic industries or institutions. Report required. May be repeated for up to a maximum of 10 credits. Prerequisites: Electronics Engineering Technology major; junior or senior standing.

**EET 484 Internship. (1–12)***not regularly offered***EET 490 Electronics Project. (1–4)***fall, spring, summer*

Individual or small group projects in applied electronics, with emphasis on laboratory practice or hardware solutions to practical problems. Prerequisite: instructor approval.

**EET 492 Honors Directed Study. (1–6)***not regularly offered***EET 493 Honors Thesis. (1–6)***not regularly offered***EET 494 Special Topics. (1–4)***fall and spring*

Possible topics:

(a) Data Analysis. (3)

**EET 498 Pro-Seminar. (1–7)***not regularly offered***EET 499 Individualized Instruction. (1–3)***not regularly offered***EET 500 Research/Writing. (2)***fall and spring*

Designed to help master's students develop their projects and write the first three chapters of their projects. Lecture, seminar. Prerequisite: instructor approval.

**EET 501 Digital Signal Processing Applications. (3)***fall*

Application of DSP techniques to the design and analysis of digital filters. Solution of filtering problems using computer techniques. Cross-listed as CET 501. Credit is allowed for only CET 501 or EET 501. Prerequisite: EET 401 or instructor approval.

**EET 506 System Dynamics and Control. (3)***spring*

Time, frequency, and transform domain analysis of physical systems. Transfer function analysis of feedback control systems performance and stability. Compensation. Prerequisite: EET 301 or MAT 262.

**EET 508 Digital Real-Time Control. (3)***once a year*

Sample data control techniques and applications to process control. Prerequisites: CET 354; EET 406.

**EET 510 Linear Integrated Circuits and Applications. (3)***fall*

Analysis, design, and application of linear integrated circuits and systems. Prerequisites: CET 350; EET 301, 310.

**EET 522 Digital Integrated Circuits and Applications. (3)***spring*

Analysis, design, and application of integrated circuits and systems. Prerequisites: CET 350; EET 301, 310.

**EET 530 Electronic Test Systems and Applications. (3)***fall*

Analysis, design, and application of electronic test equipment, test systems, specifications, and documentation. Prerequisites: CET 354; EET 301, 310.

**EET 560 Industrial Electronics and Applications. (3)***spring*

Analysis, design, and application of special electronic devices and systems to industrial control, power, communications, and processes. Prerequisites: CET 350; EET 301, 310, 407.

**EET 574 Microwave Amplifier-Circuits Design. (3)***fall*

Analysis and design of microwave amplifier-circuits using s-parameter theory and computer-aided design. Prerequisites: EET 304, 470.

**EET 578 Digital Filter Hardware Design. (3)***spring*

Hardware design of FIR and IIR filters, including adaptive filters, based on DSP chips. Develop new applications using DSP microprocessor systems. Prerequisites: CET 354; EET 401.

**EET 579 Digital Image Communication. (3)***spring*

Image capture, transform, compression, storage, and transmission. Computer environment (software and hardware) is provided to emphasize the practical aspect. Prerequisite: EET 401 or instructor approval.

**EET 580 Practicum. (1–12)***not regularly offered***EET 584 Internship. (1–12)***not regularly offered***EET 590 Reading and Conference. (1–12)***not regularly offered*

**NOTE:** For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 78. For graduation requirements, see "University Graduation Requirements," page 74. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 51.

**EET 591 Graduate Seminar. (1–12)***not regularly offered***EET 592 Research. (1–12)***not regularly offered***EET 593 Applied Project. (1–12)***not regularly offered***EET 594 Conference and Workshop. (1–12)***not regularly offered***EET 595 Continuing Registration. (1)***not regularly offered***EET 598 Special Topics. (1–4)***not regularly offered***EET 599 Thesis. (1–12)***not regularly offered***MICROELECTRONICS  
ENGINEERING TECHNOLOGY (UET)****UET 191 First-Year Seminar. (1–3)***not regularly offered***UET 194 Special Topics. (1–4)***not regularly offered***UET 294 Special Topics. (1–4)***not regularly offered***UET 331 Electronic Materials. (3)***fall*

Physical, chemical, electromagnetic, and mechanical properties of electronic materials. Solid-state device characteristics and their material properties. Prerequisites: CHM 113; EET 208; PHY 112, 114.

**UET 411 Applied Vacuum Technology. (3)***spring*

Fundamentals, applications, and practical aspects of vacuum systems and their uses in semiconductor fabrication. Prerequisite: UET 331.

**UET 415 Electronic Manufacturing Engineering Principles. (3)***fall and spring*

Electronic equipment design and fabrication principles and practice. Completion of electronics hardware design project and report. Lecture, lab. Fee. Prerequisite: senior standing (113 hours) in Electronics Engineering Technology.

**UET 416 Monolithic Integrated Circuit Devices. (3)***fall*

Physics and electronics of bipolar and MOS devices used in integrated circuits. Prerequisite: UET 331. Corequisite: UET 417.

**UET 417 Monolithic Integrated Circuit Laboratory. (2)***fall*

Laboratory practice in the fabrication of integrated circuits. Lab. Prerequisite: UET 331. Corequisite: UET 416.

**UET 418 Hybrid Integrated Circuit Technology. (4)***spring*

Layout, fabrication, design, and manufacture of thin and thick film hybrid circuits. Lecture, lab. Prerequisites: EET 310; UET 331.

**UET 421 Applied Device Physics. (3)***fall*

Band structures of solids, physics of current carriers in solids, pn junctions, MOS and bipolar transistors. Prerequisite: senior standing in the department.

**UET 424 Integrated Circuit Mask-Making Technology. (3)***fall*

Fundamentals, applications, and techniques for the fabrication of integrated circuit masks. Prerequisite: UET 331.

**UET 426 Software Tools for the Semiconductor Industry. (3)***spring*

Introduction to software tools commonly used in the semiconductor industry, such as SUPREM IV, PSPICE, VIEWLOGIC, and ICED. Cross-listed as CET 426. Credit is allowed for only CET 426 or UET 426. Prerequisite: UET 331.

**UET 432 Semiconductor Packaging and Heat Transfer. (3)***spring*

Packaging theory and techniques; hermetic and plastic assembly; thermal management; electrical characteristics and reliability. Prerequisites: ETC 340 and UET 331 (or their equivalents).

**UET 437 Integrated Circuit Testing. (3)***spring*

Principles, techniques, and strategies employed at wafer level and final product testing, both destructive and nondestructive. Prerequisite: UET 416.

**UET 484 Internship. (1–12)***not regularly offered***UET 485 Digital Testing Techniques I. (3)***once a year*

Hardware/software aspects of digital testing technology; systems, board, and logic testing and equipment. Lecture, lab. Cross-listed as CET 485. Credit is allowed for only CET 485 or UET 485. Prerequisites: CET 350; EET 310.

**UET 492 Honors Directed Study. (1–6)***not regularly offered***UET 493 Honors Thesis. (1–6)***not regularly offered***UET 494 Special Topics. (1–4)***not regularly offered***UET 498 Pro-Seminar. (1–7)***not regularly offered***UET 499 Individualized Instruction. (1–3)***not regularly offered***UET 513 VLSI Circuit Design and Layout. (3)***fall*

Techniques and practice for the design and layout of very large-scale integrated (VLSI) circuits. Emphasis on "system on silicon" using tools for computer-aided design layout. Seminar. Prerequisite: UET 416.

**UET 516 Semiconductor Process Simulation and Integration. (3)***spring*

Modern IC processes and process integration; design of modern IC processes using SUPREM. Lecture, lab. Prerequisite: UET 416.

**UET 518 Hybrid IC Technology and Applications. (3)***spring*

Theory, processing, fabrication, and manufacturing of hybrid microelectronics devices and products. Applications. Prerequisite: UET 331 (or its equivalent) or instructor approval.

**UET 521 Device Physics. (3)***fall*

Band structure of solids, electron hole-pairs, mobility, lifetime, fermi-level, pn junctions, diodes, and bipolar and MOS transistors. Prerequisite: graduate standing in the department.

**UET 532 IC Packaging. (3)***spring*

IC packaging theory and techniques; assembly techniques, material issues; thermal management; electrical performance and reliability. Lecture, lab. Prerequisites: ETC 340 and UET 331 (or their equivalents).

**UET 580 Practicum. (1–12)***not regularly offered***UET 584 Internship. (1–12)***not regularly offered***UET 590 Reading and Conference. (1–4)***not regularly offered***UET 591 Seminar. (1–12)***not regularly offered***UET 592 Research. (1–12)***not regularly offered***UET 593 Applied Project. (1–12)***not regularly offered***UET 594 Conference and Workshop. (1–12)***not regularly offered***UET 595 Continuing Registration. (1)***not regularly offered***UET 598 Special Topics. (1–4)***not regularly offered***UET 599 Thesis. (1–12)***not regularly offered*

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## Department of Information and Management Technology

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*Chair*  
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 Fax 480/727-1684

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### PROFESSORS

DUFF, HILD, SADOWSKI, SCHILDGEN

### ASSOCIATE PROFESSORS

GROSSMAN, HIRATA, HUMBLE, MATSON,  
 OLSON, PETERSON

### ASSISTANT PROFESSOR

KIME

### SENIOR LECTURER

WILSON

### LECTURERS

DOLIN, HARRIS, LESTAR

### PURPOSE

The mission of the department is to prepare graduates who are able to develop and communicate technological solutions to industrial problems, to manage systems operations, to improve and evaluate products, to provide customer support, and to facilitate technology transfer in industry and government. Increased complexity and sophistication have created great demand for those individuals who possess a working knowledge of the technical phases of planning, testing, production, and fabrication of consumer and industrial products and equipment. Technology includes the application of science, systematic methods, procedures, machines, communication protocols, and materials control for the development, improvement, and implementation of state-of-the-art solutions to industrial problems.

### DEGREES

The faculty in the Department of Information and Management Technology offer the B.S. degree in Industrial Technology, with concentrations in the following areas: environmental technology management, industrial technology management, and graphic information technology.

For students holding an A.A.S. degree the department offers the B.A.S. degree in Applied Science, with concentrations in digital media management, digital publishing, emergency management, fire service management, operations management technology, municipal operations management, and technical graphics.

A Master of Science in Technology degree is offered for graduate study. The department offers four concentrations for the graduate degree: environmental technology management, fire service management, graphic information tech-

nology, and management of technology. For more information about the graduate program, see the *Graduate Catalog*.

### INDUSTRIAL TECHNOLOGY—B.S.

The curriculum consists of First-Year Composition, university General Studies, and technical courses. Note that all three General Studies awareness areas are required. Consult with an advisor for an approved list of courses. The technical part of the curriculum includes a required Information and Management core, program concentration course work, and technical electives selected with approval of an advisor.

Information and Management Technology students are required to complete a minimum of 120 semester hours with a 2.00 cumulative GPA, including a minimum of 50 semester hours of upper-division courses to graduate.

#### Information and Management Core\*

ETC 100 Languages of Technology CS .....	4
GIT 233 Digital Publishing .....	3
IMC 331 Quality Assurance .....	3
IMC 346 Management Dynamics .....	3
IMC 396 Professional Orientation.....	1
IMC 470 Project Management .....	3
Total .....	17

\* These courses are for the industrial technology management and graphic information technology concentrations.

#### Environmental Technology Management Concentration

The environmental technology management concentration prepares graduates to manage such challenging problems in industry as regulatory compliance, hazardous materials management, pollution prevention, and international environmental standards for manufacturing. The curriculum is designed to provide a unique blend of critical scientific, technical, and management skills; degree requirements encompass the development of a broad background in the natural sciences and mathematics, social and behavioral sciences, management theory, regulatory issues, and applied sciences. The program is purposely structured to facilitate transfer students who are searching for a degree program that builds upon a strong technical background and focuses on the environmental issues faced by industry.

#### Certificate Program in Hazardous Materials and Waste Management

The Certificate Program in Hazardous Materials and Waste Management is designed to provide current and prospective employees of industry and government with a comprehensive and practical curriculum of study in hazardous materials management. The certificate program features instruction by ASU faculty, attorneys, and professionals who work in the specific area in which they teach. Participation in the certificate program is available in three options: a certificate program for nondegree students, a B.S. degree in Industrial Technology with a Certificate in Hazardous Materials and Waste Management, and a Master of Science in Technology degree with a Certificate in Hazardous Materials and Waste Management. Students must complete seven selected courses (five required and two electives) and earn a grade of "C" or higher to receive the certificate. Except for the introductory course, ETM 501

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Principles of Hazardous Materials and Waste Management, the remainder of the courses may be taken in any sequence.

**Industrial Technology Management Concentration.** The industrial technology management concentration prepares students for supervisory and administrative positions in industry, manufacturing, and public service organizations. Course work includes accounting, data analysis, economics, effective decision making, finance, international business, legal and ethical studies, marketing, operations management, and safety. Emphasis is placed on health and safety within the workplace.

The industrial technology management program may be articulated with a broad range of community college technical courses. Community college specializations in areas such as aeronautics, construction, electronics, fire science, police science, graphic information technology, hazardous materials and waste management, computer graphics, safety and health, human resource management, production management, and manufacturing may form a technical specialty area within the industrial technology management option. Consultation with an advisor is required to coordinate the course selection for transfer to this option.

**Graphic Information Technology Concentration.** The graphic information technology concentration prepares students for technical and management positions in the diverse graphic communication and information technology industries: digital printing and publishing; technical/digital media production; management of graphic information assets; quality assurance of graphic products; planning and evaluation of print, Internet, multimedia, and computer-based communications. This is an intensive 120-semester-hour graphic technology program of study emphasizing theory and hands-on laboratory practice. Students develop skills to plan and execute graphic solutions using visualization and sketching, engineering graphic standards, technical document design, higher-level graphic programming languages, computer drawing and illustration, multimedia and three-dimensional modeling, project management, quality assurance, and e-commerce practices. Graduates are able to present technical solutions using graphics in print and Internet publications, engineering documents, media-rich presentations, interactive training and instruction, models, and animations. Typical career opportunities include graphic operations management, sales and marketing, information technology support in graphics-related industries, graphic systems analysis, digital publishing (both print and online), and computer graphics content planning and creation.

## APPLIED SCIENCE—B.A.S.

The Bachelor of Applied Science degree is a “capstone” degree for the Associate of Applied Science degree. The B.A.S. degree exposes students to advanced concepts and diverse critical thinking skills that prepare them for future career opportunities and professional advancement.

### Admission

Admission to the B.A.S. degree program is restricted to students holding an A.A.S. degree from a regionally accredited U.S. postsecondary educational institution. A GPA of 2.00 or higher is required for all resident applicants and a 2.50 for nonresident applicants.

## Degree Requirements

The B.A.S. degree in the College of Technology and Applied Sciences consists of 60 semester hours of upper-division (300 level and above) courses, with 30 hours in residence.

A.A.S. degree transfer.....	60
Assignable credit.....	6
B.A.S. core.....	15
General Studies .....	19
Technical concentration .....	20
Total .....	120

## General Studies Curriculum

The B.A.S. curriculum builds on the general education content of the A.A.S. degree. Additional General Studies (L, CS and awareness areas) are met with courses in the core or concentration. General Studies courses focus on contextual learning.

L .....	3
MA .....	3
HU .....	3
HU or SB .....	3
SB .....	3
SG .....	4
Total .....	19

## Assignable Credit

Assignable credit allows space in the curriculum for prerequisite courses needed to succeed in the program. The courses are determined by the student and the advisor.

## B.A.S. Core

The area core focuses on management and organization, professional communication, quantitative analysis, and computer competency.

GIT 310 Computer Graphics Programming (C++) CS.....	3
or GIT 494 ST: Computer Systems Applications (3)	
IMC 346 Management Dynamics .....	3
ITM 452 Industrial Human Resource Management.....	3
or IMC 470 Project Management (3)	
MET 401 Quality Assurance .....	3
or STP 420 Introductory Applied Statistics CS (3)	
TWC 400 Technical Communications L .....	3
Total .....	15

## Technical Concentrations

**Operations Management Technology.** The purpose of this technical concentration is to prepare supervisors for management functions in industry, manufacturing, and public service organizations. The B.A.S. degree provides the management and supervision content required for industry and governmental agencies.

**Digital Media Management.** This concentration prepares graduates for technical positions in industries implementing, planning, and producing interactive communications, integrated media, and multimedia for design, training, and marketing. Prospective students with A.A.S degrees in areas such as multimedia, printing and publishing, commercial graphics, desktop publishing, or computer illustration may be interested in pursuing a digital media management concentration.

**Technical Graphics.** This concentration prepares graduates for positions in industries implementing technical and engineering graphics in computer-aided design and computer integrated manufacturing. A.A.S degrees in drafting and design, computer-aided design, computer integrated manufacturing technology, mechanical technology, architectural technology, or construction technology may provide an excellent foundation for a technical graphics concentration.

**Digital Publishing.** This concentration prepares graduates for lead technical and entry-level management positions in the printing and publishing industry. A.A.S degrees in multimedia, printing and publishing, commercial art, desktop publishing, or computer illustration may find that this technical concentration provides excellent opportunities.

**Emergency Management.** The concentration prepares graduates for positions in industry, municipal departments, and government agencies. The curriculum addresses the established Federal Emergency Management Administration (FEMA) guidelines, on-site emergency response contingency planning, first responder scene management, logistical analysis, and communications protocol.

**Fire Service Management.** This concentration prepares graduates for positions in industry, municipal departments, and governmental agencies. The curriculum addresses services delivered by fire departments, fire service personnel development, zoning, planning, inspections, and arson investigations.

**Municipal Operations Management.** This concentration prepares students for supervisory and management functions within municipalities, public service organizations, or businesses that provide services to the public sector. The curriculum addresses quality assurance, ethical issues, leadership practices, operations management, project management, marketing, finance, public sector management, and organizational effectiveness.

#### GRAPHIC INFORMATION TECHNOLOGY (GIT)

##### **GIT 135 Graphic Communications. (3)**

*fall and spring*

Introduction to the technologies involved in the design, image generation, transmission, and industrial production of multiple images for consumer utilization. Lecture, lab, field trips.

##### **GIT 194 Special Topics. (1–4)**

*not regularly offered*

##### **GIT 210 Creative Thinking and Design Visualization. (3)**

*fall and spring*

Fundamental methods, concepts, and techniques of creative thinking, design visualization, and problem solving. Also includes communication, cultural, and societal influences. Lecture, lab. Prerequisite: ETC 100.

##### **GIT 212 Computer-Aided Design and Drafting (CADD). (3)**

*fall and spring*

CADD for product design, representation, and documentation; includes projection theory, descriptive geometry, graphics analysis, drafting standards, and precision dimensioning techniques. Lecture, lab. Prerequisite: ETC 100 (or its equivalent).

*General Studies: CS*

##### **GIT 215 Introduction to Graphics Programming. (3)**

*fall*

Introduction to analyzing, planning, and executing graphic programs using industry-standard programming tools. Lecture, lab. Prerequisite: ETC 100 (or its equivalent).

##### **GIT 233 Digital Publishing. (3)**

*fall and spring*

Introduction to software and hardware used for digital publishing and infographics. Lecture, lab. Pre- or corequisites: GIT 135, 210.

##### **GIT 237 Web Content Design. (3)**

*spring*

Introduction to design principles for visual content on the World Wide Web; raster, vector, fonts, portable documents, color palettes, file formats. Lecture, lab. Prerequisite: GIT 135 (or its equivalent). Pre- or corequisite: GIT 233.

##### **GIT 310 Computer Graphics Programming (C++). (3)**

*fall and spring*

Computer graphics software programming techniques in C++. 2D and 3D graphics: object-oriented programming, transformations, scaling, and database concepts. Lecture, lab. Prerequisite: ETC 100 or GIT 215.

*General Studies: CS*

##### **GIT 312 3D Computer Graphics Modeling and Representation. (3)**

*fall*

3D solid modeling applications: concepts, techniques, data structures, modeling strategies, assemblies, geometric representation. Lecture, lab. Prerequisite: GIT 212.

*General Studies: CS*

##### **GIT 313 Technical Illustration and Photorealistic Rendering. (3)**

*fall*

Computer-generated graphics for technical illustration and design presentation: axonometric and perspective drawing; shading, shadowing, materials and textures; photorealistic rendering for PostScript output. Lecture, lab. Prerequisite: GIT 212.

##### **GIT 314 Multimedia Design, Planning, and Storyboards. (3)**

*spring*

Creative and conceptual process of content selection, planning, designing, flowcharting, storyboarding, proposing, configuring, prototyping, and presenting multimedia projects. Lecture, lab. Prerequisite: GIT 237.

##### **GIT 333 Printing Technology. (3)**

*spring*

Theory and application of sheet and web press technology for offset lithography, flexography, screen process, and digital printing. Lecture, lab. Pre- or corequisite: GIT 135.

##### **GIT 334 Image Capture and Manipulation. (3)**

*fall*

Theory and application of image capture techniques used for all copy formats and conversion processes required for reproduction or dissemination. Lecture, lab. Prerequisite: GIT 233.

##### **GIT 335 Graphic Systems. (3)**

*not regularly offered*

Survey of graphic technology for private/public sectors including hardware, software, storage, networking and internet, telecommunications, and new media technologies. Lecture, lab. Prerequisite: junior standing in Information Technology (graphic information technology concentration).

##### **GIT 337 Web Content Design. (3)**

*fall and spring*

Introduction to design principles for visual content on the World Wide Web; raster, vector, fonts, portable documents, color palettes, file formats. Lecture, lab. Pre- or corequisite: GIT 233.

##### **GIT 352 Technical Presentations. (3)**

*spring*

Technologies for planning, creating, and delivering individual and group presentations. Prerequisites: ENG 102; GIT 233.

##### **GIT 394 Special Topics. (1–4)**

*not regularly offered*

**NOTE:** For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 78. For graduation requirements, see "University Graduation Requirements," page 74. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 51.

**GIT 411 Computer Animation. (3)***fall and spring*

2D and 3D computer animation methods: project planning, scripting, storyboards, advanced modeling, lighting, materials mapping, and motion. Lecture, lab. Prerequisites: GIT 312, 334.

**GIT 412 Multimedia Authoring, Scripting, and Production. (3)***fall and spring*

Production of multimedia projects using industry-standard authoring applications: project management, client considerations, and project documentation; user interface design, interactivity, media, and databases. Lecture, lab. Prerequisites: GIT 314.

**GIT 413 Professional Portfolio Design and Presentation. (3)***spring*

Digital media portfolio design and production: planning, audience analysis, media selection, authoring, media formats, production, copyright considerations, marketing, and delivery. Lecture, lab. Prerequisites: GIT 314, 334.

**GIT 414 Web Site Design and Internet/Web Technologies. (3)***spring*

Web site design, authoring, standards, protocols, tools, and development techniques for commercial client-sided Web-based graphic information systems. Lecture, lab. Prerequisites: GIT 334, 337.

**GIT 415 Computer Graphics: Business Planning and Management. (3)***spring*

Implementation planning: feasibility and application studies; needs assessment and operational analysis techniques; organization, managerial, and technology considerations; business plan development. Lecture, lab, field trips. Prerequisite: senior standing in Information Technology (graphic information technology concentration).

**GIT 417 Advanced Internet Programming. (3)***fall*

Uses industry-standard programming languages and techniques to create interactive graphic information Web sites and applications. Lecture, lab. Prerequisite: GIT 414.

**GIT 432 Graphic Industry Business Practices. (3)***not regularly offered*

Business practices related to press/prepress/Web industries; trade customs, cost analysis, marketing and management approaches. Lecture, lab, field trips. Prerequisite: GIT 414.

**GIT 435 Web Management and E-Commerce. (3)***not regularly offered*

Internet Web site management, security, online databases, and new E-commerce business models. Lecture, lab. Prerequisite: GIT 237. Corequisite: GIT 414.

**GIT 436 Gravure Technology. (3)***spring*

In-depth study of the market profile and production sequences related to the gravure method of printing. Prerequisite: GIT 135.

**GIT 437 Color Reproduction Systems. (3)***fall*

Scientific analysis for the engineering of color reproduction systems and color models used in the graphics industry. Prerequisite: GIT 334.

**GIT 441 Graphic Information Systems. (3)***not regularly offered*

Graphic information systems common to the workplace: graphic user interfaces for online databases, geographic, industrial, architectural, and management applications. Lecture, lab. Prerequisite: senior standing in Information Technology (graphic information technology concentration). Pre- or corequisite: GIT 434.

**GIT 450 Digital Workflow in Graphic Industries. (3)***fall*

Analysis of digital production systems for input, assembly, and output of graphic information to print and Web, including networking and job tracking. Lecture, lab. Prerequisite: GIT 334.

**GIT 494 Special Topics. (1–4)***fall and spring*

Possible topics:

- (a) Computer Systems Applications. (3)

**GIT 510 Computer Graphics Programming: Design, Customization, and Development. (3)***not regularly offered*

Advanced design, development, and documentation of graphic application programs. Lecture, lab.

**GIT 512 Multimedia-Based Education and Training. (3)***fall*

Creative design, planning, development, documentation, and production of technology-based learning and multimedia-based education and training materials and programs. Lecture, lab. Prerequisite: GIT 412.

**GIT 537 Current Issues in Quality Assurance. (3)***not regularly offered*

Directed group study of selected issues relating to quality assurance in the printing, publishing, and information industry.

**GIT 538 Personnel Development for the Graphics Industry. (3)***not regularly offered*

Employee training and development specific to production and management in the graphics industry.

**GIT 590 Reading and Conference. (1–12)***not regularly offered***GIT 598 Special Topics. (1–4)***not regularly offered***ENVIRONMENTAL TECHNOLOGY MANAGEMENT (ETM)****ETM 301 Environmental Management. (3)***fall*

Focuses on knowledge and skills necessary to manage environmental programs. Perspectives include regulatory, individual, corporate, and consulting. Pre- or corequisites: CHM 113; MAT 170.

**ETM 302 Water and Wastewater Treatment Technology. (4)***not regularly offered*

Explores the development of treatment technologies. Addresses regulatory standards. Emphasizes theory and practice of system design, laboratory analysis standards and procedures. Lecture, lab. Pre- or corequisite: ETM 301.

**ETM 303 Environmental Regulations. (3)***fall and spring*

Explores environmental laws, regulations, and directives. Addresses air, land, and water. Prerequisite: ETM 301.

**ETM 360 Introduction to Emergency Management. (3)***fall*

Emergency management theories. Comprehensive emergency management. Mitigation, preparedness, response, and recovery. Post-disasters and policy formation. Current FEMA all-hazards approach.

**ETM 362 Managing Natural and Technological Disasters. (3)***spring*

Federal, state, and local responses to emergencies. Management of mass casualties, evacuation, sheltering, and terrorism; declaration of emergency procedures.

**ETM 363 Computer Applications in Emergency Management. (3)***spring*

Explores specific computer programs which are currently in use for contingency planning, tracking chemical inventories, and response resources. Cross-listed as FSM 363. Credit is allowed for only ETM 363 or FSM 363.

**ETM 364 Toxicology and Biohazards in Emergency Management. (3)***fall*

Introduction to poisons. Dose response routes of exposure and toxicokinetics. Diseases associated with natural disasters. Clinical presentation of treatments.

**ETM 401 Hazardous Waste Management. (3)***fall and spring*

Definition of hazardous waste, RCRA classification, and OSHA criteria. Overview of requirements and methods of waste management. Prerequisite: ETM 301.

**ETM 402 Unit Treatment Technologies. (3)***spring*

Addresses various treatment technologies for contaminated air, water, and soil. Emphasizes design based upon medium, type of contamination, and concentration. Prerequisite: ETM 302.

**ETM 406 Environmental Chemistry. (3)***fall and spring*

Examines reactions, transport, and fates of hazardous chemicals in water, soil, air, and living organisms. Prerequisites: both CHM 113 and 115 or only CHM 114; MAT 170.

**ETM 407 Occupational Hygiene. (3)***spring*

Overview of occupational health hazards, including recognition, evaluation, and control. Includes regulatory status and health standards. Prerequisites: CHM 101 (or 113 or 114); MAT 170.

**ETM 424 Comprehensive Emergency Management. (3)***summer*

Addresses theory and management techniques for emergency preparedness, including mitigation, preparedness, response, and recovery. Pre- or corequisite: ETM 301.

**ETM 426 Environmental Issues. (3)***spring*

Explores the science and policy implications of contemporary problems that threaten the environment. Pre- or corequisites: CHM 113; MAT 170.

**ETM 428 International Environmental Management. (3)***summer*

Emphasis on technological and economic pressures experienced by developing countries. Prerequisite: ETM 301.

**ETM 460 Incident Management Systems and Emergency Operations Center. (3)***fall*

Covers IMS, terminology, players, and management philosophy. EOC setup, activation, operation, and termination. EOC funding and politics. Cross-listed as FSM 460. Credit is allowed for only ETM 460 or FSM 460.

**ETM 461 Contingency Planning. (3)***not regularly offered*

Provides understanding of techniques for in-house or on-site planning as well as community planning.

**ETM 468 Simulation and Exercising. (3)***not regularly offered*

Requirements, planning, conduct, and critique of exercises related to emergency planning. Emphasis on realism using moulage and props.

**ETM 494 Special Topics. (1–4)***spring*

Possible topics:

- (a) Bioremediation. (3)  
Technical-regulatory and policy issues emanating from minetailing and animal waste. Lecture, case studies.

**ETM 501 Principles of Hazardous Materials and Waste Management. (3)***fall*

Foundation for courses in curriculum. Topics include definitions of toxic and hazardous substances and wastes, RCRA classification, and OSHA criteria. Pre- or corequisites: both CHM 113 and 115 or only CHM 114.

**ETM 502 Regulatory Framework for Toxic and Hazardous Substances. (3)***fall*

Examines federal, state, and local regulations for hazardous materials and wastes. Includes history and trends in regulatory development. Prerequisite: ETM 501.

**ETM 503 Principles of Toxicology. (3)***spring*

Interaction of chemicals with life and environment. Mechanisms of toxic action, dose-response relationships, toxicity testing models, predictive toxicology, and epidemiology. Prerequisites: both CHM 113 and 115 or only CHM 114.

**ETM 504 Technology for Storage, Treatment, and Disposal of Hazardous Materials. (3)***fall*

Current and state-of-the-art technologies and future trends for storage, treatment, and disposal of hazardous materials and waste. Prerequisites: both CHM 113 and 115 or only CHM 114; ETM 501.

**ETM 505 Quantitative Analysis and Practical Laboratory Techniques. (3)***fall and spring*

EPA methodologies for sampling and analysis of soils and water. Includes quality assurance and regulatory requirements. Lab is arranged off site. Prerequisites: both CHM 113 and 115 or only CHM 114, 231; MAT 170.

**ETM 506 Chemistry of Hazardous Materials. (3)***fall*

Chemistry and toxicology of hazardous chemicals. Topics include proper handling, storage, transportation, and disposal. Prerequisites: both CHM 113 and 115 or only CHM 114; MAT 170. Corequisite: CHM 231.

**ETM 507 Industrial Hygiene. (3)***not regularly offered*

Emphasis on chemical hazards in industrial settings. Topics include recognizing and measuring hazards, control techniques, and regulatory standards. Prerequisites: both CHM 113 and 115 or only CHM 114; MAT 170.

**ETM 522 Air Pollution and Toxic Chemicals. (3)***fall*

Examines issues in the measurement analysis and control of toxic chemicals in air pollution. Prerequisites: both CHM 113 and 115 or only CHM 114; ETM 501; MAT 170.

**ETM 523 Soils and Groundwater Contamination. (3)***fall*

Theoretical and practical hydrogeology as it applies to cleaning up contamination. Investigative techniques, monitoring, risk assumptions, and assessment methodology. Prerequisites: both CHM 113 and 115 or only CHM 114; ETM 501; MAT 170. Corequisite: CHM 231.

**ETM 524 Emergency Preparedness, Response, and Planning for Hazardous Materials. (3)***summer*

In-house or on-site emergency response contingency planning. Preemergency assessment, resources for cooperation, equipment requirements, and coordination with other agencies. Prerequisites: both CHM 113 and 115 or only CHM 114; ETM 501; MAT 170.

**ETM 525 Risk Assessment for Hazardous Materials. (3)***spring*

Applies the risk assessment process in situations ranging from hazardous facilities regulation to toxic substances in the environment. Prerequisites: both CHM 113 and 115 or only CHM 114; ETM 501; MAT 170.

**ETM 526 Current Environmental Technology Issues. (3)***fall*

In-depth study of current issues in environmental technology facing both the private and public sectors.

**ETM 527 Environmental/Resources Regulations Concepts. (3)***spring*

Develops environmental regulations from common law to statutory requirements. Emphasis on Superfund, hazardous materials, toxics, and liability contracts. Pre- or corequisite: ETM 501.

**ETM 591 Graduate Seminar. (1)***not regularly offered***ETM 592 Research. (1–12)***not regularly offered***ETM 598 Special Topics. (1–4)***spring*

Possible topics:

- (a) Advanced Bioremediation. (3)  
Management and policy issues related to bioremediation of minetailing and animal waste and replacement of chemical control with biological methods. Lecture, case studies.

**FIRE SERVICE ADMINISTRATION (FSA)**

See the *Graduate Catalog* for the FSA courses.

**FIRE SERVICE MANAGEMENT (FSM)****FSM 304 Fire Personnel Management. (3)***fall*

Topics include promotion, personnel development, career and incentive systems, validation of physical requirements, managerial and supervisory procedures.

**NOTE:** For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 78. For graduation requirements, see "University Graduation Requirements," page 74. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 51.

**FSM 305 Quality Emergency Services. (3)***not regularly offered*

Covers quality issues relating to services delivered by progressive fire departments. Covers management of personnel and resources during organizational change.

**FSM 306 Fire Prevention Organization and Management. (3)***not regularly offered*

Examines and evaluates the techniques, procedures, programs, and agencies involved in preventing fires.

**FSM 363 Computer Applications in Emergency Management. (3)***spring*

Explores specific computer programs which are currently in use for contingency planning, tracking chemical inventories, and response resources. Cross-listed as ETM 363. Credit is allowed for only ETM 363 or FSM 363.

**FSM 400 Human Behavior and the Fire Threat. (3)***not regularly offered*

Proper ways of conducting post-fire interviews; emphasizes the psychological effects of communications during emergencies.

**FSM 421 Political and Legal Consideration in Fire Science. (3)***spring*

Study of legal and political considerations that affect the decision making of fire service managers.

**FSM 425 Fire Service Administration. (3)***fall*

Presentation of modern management and planning techniques that apply to organizing a fire department.

**FSM 460 Incident Management Systems and Emergency Operations Center. (3)***fall*

Covers IMS, terminology, players, and management philosophy, EOC setup, activation, operation, and termination. EOC funding and politics. Cross-listed as ETM 460. Credit is allowed for only ETM 460 or FSM 460.

**FSM 494 Special Topics. (1–4)***not regularly offered***FSM 598 Special Topics. (1–4)***not regularly offered***INFORMATION AND MANAGEMENT CORE (IMC)****IMC 233 Desktop Publishing and Infographics. (3)***fall and spring*

Introduction to software and hardware used for desktop publishing and infographics. Lecture, lab.

**IMC 294 Special Topics. (1–4)***not regularly offered***IMC 331 Quality Assurance. (3)***spring*

Instrumentation and methodologies for materials testing and quality control in various manufacturing processes. Lecture, field trips.

**IMC 346 Management Dynamics. (3)***fall and spring*

Management challenges and the leadership skills needed to achieve organizational objectives in the changing industrial and technical environments. Prerequisite: junior standing.

**IMC 396 Professional Orientation. (1)***fall and spring*

Senior advisement, industry presentations, and career counseling.

**IMC 470 Project Management. (3)***spring*

Introduction to techniques for managing small groups within larger organizations, including team building, motivating, planning, tracking activities, and computer tools. Prerequisites: ECN 111; IMC 346; ITM 344.

**IMC 498 Pro-Seminar. (1–7)***not regularly offered***IMC 499 Individualized Instruction. (1–3)***not regularly offered***IMC 584 Internship. (1–3)***fall and spring***IMC 590 Reading and Conference. (1–12)***not regularly offered***IMC 592 Research. (1–12)***fall and spring***IMC 593 Applied Project. (1–12)***fall and spring***IMC 595 Continuing Registration. (1)***not regularly offered***IMC 599 Thesis. (1–12)***fall and spring***INDUSTRIAL TECHNOLOGY MANAGEMENT (ITM)****ITM 343 Occupational Safety and Ergonomics. (3)***fall*

Health and safety movement, accident theories and effects, OSHA standards and liability, safeguarding, hazards, workers' compensation, ergonomics, and safety. Prerequisite: junior standing.

**ITM 344 Industrial Organization. (3)***spring*

Industrial organization concepts. Topics relate to industrial relations, governmental regulations, organizational structure, labor relations, human factors, and current industrial practices. Prerequisite: IMC 346.

**ITM 345 Public Sector Management. (3)***fall and spring*

Management in government and public agencies. Includes mission, planning and organizing to provide services, human resource issues, conflict resolution, coordination. Prerequisite: junior standing.

**ITM 402 Legal Issue for Technologists. (3)***fall*

American legal system and impact on technology management issues: contracts, torts, intellectual property, white collar crime, anti-trust, environmental, and employment.

**ITM 405 Forecasting and Evolution of Technology. (3)***not regularly offered*

History and evolutionary nature of selected technologies, issues in the management of emerging technologies, and methods of technological forecasting. Prerequisite: IMC 346 (or its equivalent).

**ITM 430 Ethical Issues in Technology. (3)***spring*

Topics in social responsibility for industrial technology and engineering. Prerequisite: IMC 346.

**ITM 440 Introduction to International Business. (3)***spring*

International business principles and operations, including partnerships, trade agreements, currency issues, international sales, and cultural differences between countries. Prerequisite: IMC 346.

*General Studies: G***ITM 445 Industrial Internship. (1–10)***fall, spring, summer*

Work experience assignment in industry commensurate with student's program. Specialized instruction by industry with university supervision. Pass/fail. Prerequisites: advisor approval; junior standing; 2.50 GPA.

**ITM 451 Industrial Distribution and Materials Management. (3)***not regularly offered*

Surveys topics in industrial distribution including, but not limited to, materials handling, purchasing, receiving, warehousing, traffic, inventory control, and shipping. Prerequisite: IMC 346 or ITM 343.

**ITM 452 Industrial Human Resource Management. (3)***fall*

Concepts and practices of human resource management in a global industrial environment. Prerequisite: IMC 346.

**ITM 453 Safety Management. (3)***not regularly offered*

Development and management of safety programs, education and training, and relationships within an organization. Prerequisite: ITM 343 or instructor approval.

**ITM 455 Industrial Marketing Concepts. (3)***not regularly offered*

Customer and sales strategies for industrial organizations, including current practice and future planning. Prerequisites: ECN 111; IMC 346; junior standing.

**ITM 456 Introduction to Organized Labor. (3)***spring*

Introduction to labor relations, unions, federations, collective bargaining, grievances, and labor legislation. Prerequisites: IMC 346; ITM 344.

**ITM 461 Operations Management. (3)***fall*

Introduction to supervisory principles as applied to production of goods and services. Prerequisites: IMC 346; ITM 344.

**ITM 480 Organizational Effectiveness. (3)***spring*

Human aspects of supervisory behavior in the industrial setting and how they influence efficiency, morale, and organizational practices. Prerequisite: IMC 346.

**ITM 494 Special Topics. (1–4)***not regularly offered***ITM 501 Managerial Economics. (3)***not regularly offered*

Basic managerial economic tools and techniques applied to unique concerns of scientifically intensive firms operating in rapidly evolving industrial sectors.

**ITM 502 Financial Management. (3)***not regularly offered*

Examines corporate financial and managerial accounting systems, budgeting, and financial policy, using microcomputers to analyze, forecast, and report information.

**ITM 503 Marketing Management. (3)***not regularly offered*

Modern methods and industrial case studies of planning, pricing, promoting, and distributing goods and services in the global marketplace. Prerequisites: ITM 480 (or its equivalent); instructor approval.

**ITM 504 Law and Ethics for Technical Professionals. (3)***not regularly offered*

Analyzes legal and ethical framework for making managerial decisions in the corporate environment of engineering- and technology-related industries.

**ITM 520 Strategic Management of Technology. (3)***not regularly offered*

Analyzes entrepreneurial dynamics and technology development, methods of research and development management, new technology implementation, and start-up organization. Prerequisites: ITM 480 (or its equivalent); instructor approval.

**ITM 540 International Management. (3)***not regularly offered*

Practices and procedures for effective management of multinational business organizations, including partnerships, joint ownerships, and global subsidiaries.

**ITM 548 Statistical Methods for Research. (3)***not regularly offered*

Multivariate statistical techniques to analyze research data. Uses statistical software and applications. Prerequisite: STP 420 (or its equivalent).

**ITM 549 Research Techniques and Applications. (3)***fall and spring*

Selection of research problems, analysis of literature, individual investigations, preparing reports, and proposal writing. Prerequisite: STP 420 (or its equivalent).

**ITM 550 Industrial Training and Development. (3)***not regularly offered*

Training techniques and learning processes. Planning, developing, evaluating, and managing industrial and governmental programs. Prerequisite: ITM 480.

**ITM 552 Global Management Philosophies. (3)***not regularly offered*

Analyzes and compares significant supervision philosophies developed in various industrial nations and their potential application in the United States.

**ITM 560 Managerial Decision Making. (3)***fall*

Analyzes common decision-making bias and techniques to overcome them. Uses both subjective quantitative decision tools and computerized decision aids.

**ITM 570 Advanced Project Management. (3)***spring*

Planning, organizing, coordinating, and controlling staff and project groups to accomplish the project objective.

**ITM 593 Applied Project. (1–12)***not regularly offered***ITM 598 Special Topics. (1–4)***not regularly offered*

Possible topics:

- (a) Quantitative Research Analysis

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## Department of Manufacturing and Aeronautical Engineering Technology

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*Chair*

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**PROFESSOR**

COLLINS

**ASSOCIATE PROFESSORS**

DANIELSON, NAM, PALMGREN, RAJADAS,

ROGERS, SCHMIDT

**ASSISTANT PROFESSOR**

POST

**PURPOSE**

The mission of the Department of Manufacturing and Aeronautical Engineering Technology is to emphasize applied engineering practice in the manufacturing and aerospace fields through four-year degree programs in Manufacturing Engineering Technology and Aeronautical Engineering Technology. This is accomplished by the application of math and science principles to the solution of technical problems in a lecture/laboratory environment. The goal of the Manufacturing Engineering Technology program is to prepare students for employment in areas such as materials, mechanics, design, manufacturing processes, automation, and quality control. The department actively supports the student chapter of the Society of Manufacturing Engineers. The purpose of the Aeronautical Engineering Technology program is to prepare students for employment in areas such as aircraft and aerospace vehicle design, and manufacturing, applied thermodynamics, fluid mechanics and aerodynamics, propulsion, and wind tunnel testing. For more information, access [www.east.asu.edu/ctas/maet](http://www.east.asu.edu/ctas/maet) on the Web.

**ACCREDITATION**

The B.S. degree in Manufacturing Engineering Technology and the B.S. degree in Aeronautical Engineering Technology are accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc. (See "Accreditation," page 633, for more information.)

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**NOTE:** For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 78. For graduation requirements, see "University Graduation Requirements," page 74. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 51.

## DEGREES

The Department of Manufacturing and Aeronautical Engineering Technology offers the B.S. degree in Manufacturing Engineering Technology and the B.S. degree in Aeronautical Engineering Technology.

For students holding an A.A.S. degree, the department offers the B.A.S. degree with a concentration in production technology.

A Master of Science in Technology degree is offered for graduate study. See the *Graduate Catalog* for more information.

### B.S. Degree Requirements

All degree requirements for the program are shown on curriculum check sheets. Requirements include First-Year Composition, University General Studies (see “General Studies,” page 78), and the Engineering Technology Core. Note that all three General Studies awareness areas are required. Consult your advisor for an approved list of courses. To graduate, students are required to complete a minimum of 128 semester hours with a 2.00 cumulative GPA, including at least 50 semester hours of upper-division courses.

### Manufacturing Engineering Technology—B.S.

The B.S. degree in Manufacturing Engineering Technology requires 128 semester hours as specified below:

Engineering technology core .....	14
First-Year Composition .....	6
General Studies/department requirements .....	45
Manufacturing Engineering Technology major .....	52
Selected concentration .....	11
<b>Total .....</b>	<b>128</b>

The following courses constitute the Manufacturing Engineering Technology major and are required of all manufacturing engineering technology students. Refer to the specific concentrations for additional requirements.

#### Manufacturing Engineering Technology Major

EET 406 Control System Technology .....	4
MET 231 Manufacturing Processes .....	3
MET 300 Applied Material Science .....	4
MET 302 Welding Survey .....	3
MET 313 Applied Engineering Mechanics: Materials .....	4
MET 331 Design for Manufacturing I .....	3
MET 341 Manufacturing Analysis .....	3
MET 344 Casting and Forming Processes .....	3
MET 345 Advanced Manufacturing Processes .....	3
MET 396 Manufacturing Professional Orientation .....	1
MET 401 Quality Assurance .....	3
MET 416 Applied Computer-Integrated Manufacturing CS .....	3
MET 443 N/C Computer Programming .....	3
MET 444 Production Tooling .....	3
MET 451 Introduction to Automation .....	3
MET 460 Manufacturing Capstone Project I .....	3
MET 461 Manufacturing Capstone Project II .....	3
<b>Total .....</b>	<b>52</b>

A student participating in the Manufacturing Engineering Technology program may select from two concentrations: manufacturing engineering technology or mechanical engineering technology.

### Manufacturing Engineering Technology Concentration.

This concentration is designed to prepare technologists with both conceptual and practical applications of processes, materials, and products related to manufacturing industries. Accordingly, this concentration is intended to prepare students to meet the responsibilities in planning the processes of production, developing the tools and machines, and integrating facilities for production or manufacturing.

Students may select course work that focuses on the implementation of design and manufacturing strategies that favorably impact the environment. Concepts like design for recyclability, manufacturing material reuse, and air quality control during manufacturing are addressed. Required courses follow:

MET 438 Design for Manufacturing II .....	4
MET 442 Specialized Production Processes .....	3
Technical electives .....	4
<b>Total .....</b>	<b>11</b>

**Mechanical Engineering Technology Concentration.** The primary objective of the mechanical engineering technology concentration is to prepare students for entry-level work in mechanical design and testing, either in engineering or manufacturing departments in product-oriented industries.

Major emphasis is placed on reducing the amount of time required by industry to make the graduate productive in any area of work. Students obtain a well-rounded academic background with an emphasis in mechanics and thermal sciences. Required courses follow:

AET 415 Gas Dynamics and Propulsion .....	3
MET 434 Applied Fluid Mechanics .....	3
MET 438 Design for Manufacturing II .....	4
Approved technical elective .....	1
<b>Total .....</b>	<b>11</b>

### Aeronautical Engineering Technology—B.S.

The B.S. degree in Aeronautical Engineering Technology requires 128 semester hours as specified below:

Aeronautical Engineering Technology major .....	63
Engineering technology core .....	14
First-Year Composition .....	6
General Studies/department requirements .....	45
<b>Total .....</b>	<b>128</b>

The following courses constitute the Aeronautical Engineering Technology major and are required of all Aeronautical Engineering Technology students.

#### Aeronautical Engineering Technology Major

AET 150 Introduction to Aeronautical Engineering Technology .....	1
AET 210 Measurements and Testing .....	3
AET 215 Mechanics of Aerospace Systems .....	3
AET 300 Aircraft Design I .....	3
AET 312 Applied Engineering Mechanics: Dynamics .....	3
AET 396 Aerospace Professional Orientation .....	1
AET 415 Gas Dynamics and Propulsion .....	3
AET 417 Aerospace Structures .....	3
AET 420 Applied Aerodynamics and Wind Tunnel Testing .....	4
AET 432 Applied Heat Transfer .....	3
AET 487 Aircraft Design II .....	3
EET 406 Control System Technology .....	4
MET 231 Manufacturing Processes .....	3
MET 300 Applied Material Science .....	4

MET 313 Applied Engineering Mechanics: Materials.....	4
MET 331 Design for Manufacturing I .....	3
MET 432 Thermodynamics II.....	3
MET 434 Applied Fluid Mechanics.....	3
Programming Language course .....	3
Technical elective.....	6
Total .....	63

**APPLIED SCIENCE—B.A.S.**

The Bachelor of Applied Science degree is a “capstone” degree for the Associate of Applied Science degree. The B.A.S. degree exposes students to advanced concepts and diverse critical thinking skills that prepare them for future career opportunities and professional advancement.

**Admission**

Admission to the B.A.S. degree program is restricted to students holding an A.A.S. degree from a regionally accredited U.S. postsecondary educational institution. A GPA of 2.00 or higher is required for all resident applicants and a 2.50 for nonresident applicants.

**Degree Requirements**

The B.A.S. degree in the College of Technology and Applied Sciences consists of 60 semester hours of upper-division (300 level and above) courses, with 30 hours in residence. A total of 120 semester hours is required for graduation.

A.A.S. degree transfer.....	60
Assignable credit.....	6
B.A.S. core.....	15
General Studies .....	19
Technical concentration .....	20
Total .....	120

**General Studies Curriculum**

The B.A.S. curriculum builds on the general education content of the A.A.S. degree. Additional General Studies (L, CS and awareness areas) are met with courses in the core or concentration. General Studies courses focus on contextual learning.

L.....	3
MA.....	3
HU.....	3
HU or SB.....	3
SB.....	3
SG.....	4
Total .....	19

**Assignable Credit**

Assignable credit allows space in the curriculum for prerequisite courses needed to succeed in the program. The courses are determined by the student and the advisor.

**B.A.S. Core**

The area core focuses on management and organization, professional communication, quantitative analysis, and computer competency.

IMC 470 Project Management .....	3
ITM 344 Industrial Organization .....	3

MET 401 Quality Assurance .....	3
MET 416 Applied Computer-Integrated Manufacturing CS.....	3
TWC 400 Technical Communications L .....	3
Total .....	15

**Technical Concentration**

**Production Technology.** This concentration prepares supervisors and other personnel for technical and management positions in the manufacturing industry. The students increase their knowledge of manufacturing and gain insight into other areas, such as management, that support their professional growth.

**AERONAUTICAL ENGINEERING TECHNOLOGY (AET)**

**AET Note 1.** Flight instruction costs are not included in university tuition and fees.

**AET 150 Introduction to Aeronautical Engineering Technology. (1) fall**

Introduction to the fields of aeronautical engineering and engineering technology.

**AET 191 First-Year Seminar. (1–3) not regularly offered**

**AET 194 Special Topics. (1–4) not regularly offered**

**AET 210 Measurements and Testing. (3) fall**

Measurement systems, components, system response, and the characteristics of experimental data. Lecture, lab. Prerequisites: MET 230; PHY 112, 114.

**AET 215 Mechanics of Aerospace Systems. (3) spring**

Basic physics of flight. Principles and design of aircraft systems and powerplants.

**AET 294 Special Topics. (1–4) not regularly offered**

**AET 300 Aircraft Design I. (3) fall**

Basic applied aerodynamics, propeller performance, and airplane performance analysis. Fee. Prerequisites: AET 210 and 215 (or AMT 280 and 287); ETC 100; MAT 260; PHY 112, 114.

**AET 310 Instrumentation. (3) fall**

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

**AET 312 Applied Engineering Mechanics: Dynamics. (3) fall**

Masses; motion kinematics; dynamics of machinery. Prerequisites: ETC 211; MAT 261.

**AET 394 Special Topics. (1–4) not regularly offered**

**AET 396 Aerospace Professional Orientation. (1) fall**

Career focus for Aeronautical Engineering Technology students. Familiarization with the aerospace industry. Prerequisite: junior standing.

**AET 409 Nondestructive Testing and Quality Assurance. (1) not regularly offered**

Purpose of inspection and quality assurance. Theory and application of nondestructive inspection methods. Application of pertinent standards, specifications, and codes. Lecture, lab. Cross-listed as AMT 409. Credit is allowed for only AET 409 or AMT 409. See AET Note 1. Prerequisite: AMT 280 or MET 230.

**NOTE:** For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see “General Studies,” page 78. For graduation requirements, see “University Graduation Requirements,” page 74. For an explanation of additional omnibus courses offered but not listed in this catalog, see “Classification of Courses,” page 51.

**AET 415 Gas Dynamics and Propulsion. (3)***spring*

Introduction to compressible flow, internal and external flow, and aerothermodynamic analysis of propulsion systems. Prerequisite: MET 434.

**AET 417 Aerospace Structures. (3)***fall*

Analysis and design of aircraft and aerospace structures. Shear flow. Semimonocoque structures. Effects of dynamic loading. Prerequisites: AET 300, 312; MET 313.

**AET 420 Applied Aerodynamics and Wind Tunnel Testing. (3)***fall*

Introduction to viscous and inviscid flow and their relationship to aircraft lift and drag. Wind tunnel design and testing. Lecture, lab. Prerequisites: AET 300; MET 434.

**AET 432 Applied Heat Transfer. (3)***fall*

Steady-state and transient conduction, heat transfer by convection and radiation. Applications of heat transfer. Prerequisite: MET 434 or instructor approval.

**AET 484 Internship. (1–12)***not regularly offered***AET 487 Aircraft Design II. (3)***spring*

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

**AET 490 Advanced Applied Aerodynamics. (3)***not regularly offered*

Study of fluid motion and aerodynamics. Essentials of incompressible aerodynamics and computational fluid dynamics. Elements of laminar and turbulent flows. Prerequisites: AET 312; ETC 100; MAT 262.

**AET 492 Honors Directed Study. (1–6)***not regularly offered***AET 493 Honors Thesis. (1–6)***not regularly offered***AET 494 Special Topics. (1–4)***not regularly offered***AET 498 Pro-Seminar. (1–7)***not regularly offered***AET 499 Individualized Instruction. (1–3)***not regularly offered***AET 500 Research Methods. (1–12)***not regularly offered***AET 524 Application of Heat Transfer. (3)***fall*

Energy conservation, steady-state and transient conduction, convection transfer, free and forced convection Reynolds analogy, blackbody and environmental radiation. Prerequisite: MET 434 or instructor approval.

**AET 525 Advanced Propulsion. (3)***spring*

Mechanics and thermodynamics of propulsion systems. Solid, liquid propellant rocket design performance. Electrical nuclear propulsion systems. Space missions. Prerequisites: both AET 415 and 420 (or MET 434) or only instructor approval.

**AET 560 Numerical Methods in Engineering Technology. (3)***not regularly offered*

Analyzing problems in physical sciences, modeling of physical problems, perturbation techniques, curvefitting, data analysis, numerical solutions, ordinary and partial differential equations.

**AET 580 Practicum. (1–12)***not regularly offered***AET 583 Field Work. (1–12)***not regularly offered***AET 584 Internship. (1–12)***not regularly offered***AET 590 Reading and Conference. (1–12)***not regularly offered***AET 591 Seminar. (1–12)***not regularly offered***AET 592 Research. (1–12)***not regularly offered***AET 593 Applied Project. (1–12)***not regularly offered***AET 594 Conference and Workshop. (1–12)***not regularly offered***AET 595 Continuing Registration. (1)***not regularly offered***AET 598 Special Topics. (1–4)***not regularly offered***AET 599 Thesis. (1–12)***not regularly offered***MANUFACTURING ENGINEERING TECHNOLOGY (MET)****MET 191 First-Year Seminar. (1–3)***not regularly offered***MET 194 Special Topics. (1–4)***not regularly offered***MET 230 Engineering Materials and Processing. (3)***fall, spring, summer*

Materials, their structures, properties, fabrication characteristics, and applications. Material forming, joining, and finishing processes. Automation and quality control.

**MET 231 Manufacturing Processes. (3)***fall*

Design documentation and material processes on plastics, ferrous and nonferrous materials, emphasizing orthographic projection, geometric dimensioning and tolerances. Lecture, lab. Prerequisite: MAT 117 or 170.

**MET 294 Special Topics. (1–4)***not regularly offered***MET 300 Applied Material Science. (4)***fall*

Principles of materials science emphasizing concepts relevant to manufacturing and use. Discusses metals, polymers, ceramics, and composites. 3 hours lecture, 1 hour lab. Prerequisite: MET 231 or instructor approval.

**MET 302 Welding Survey. (3)***fall*

Theory and application of industrial welding processes; introductory welding metallurgy and weldment design; SMAW, GTAW, GMAW, oxy-acetylene, and brazing experiences. Lecture, lab. Prerequisite: junior or senior standing.

**MET 313 Applied Engineering Mechanics: Materials. (4)***fall, spring, summer*

Stress, strain, relations between stress and strain, shear, moments, deflections, and combined stresses. 3 hours lecture, 1 hour lab. Prerequisite: ETC 211.

**MET 331 Design for Manufacturing I. (3)***spring*

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

**MET 341 Manufacturing Analysis. (3)***spring*

Organization and functional industrial requirements. Manufacturing economics and group technology. Writing assembly and production plans. Analysis on industrial specifications. Prerequisite: MET 231 or 343.

**MET 343 Material Processes. (4)***spring*

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

**MET 344 Casting and Forming Processes. (3)***spring*

Analyzes various forming processes to determine load requirements necessary for a particular metal-forming operation. Information used to select equipment and design tooling. Metal casting processes and design of castings. Introduction to powder metallurgy. Prerequisites: both MET 300 and 313 or only instructor approval.

**MET 345 Advanced Manufacturing Processes. (3)***spring*

Material removal processes emphasizing advanced turning, milling, and machinability studies using cutting tools. CNC programming for machining and turning centers. Lecture, lab. Prerequisite: MET 231.

**MET 346 Numerical Control: Point-to-Point and Continuous Path Programming. (3)***not regularly offered*

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

**MET 394 Special Topics. (1–4)***not regularly offered***MET 396 Manufacturing Professional Orientation. (1)***fall*

Career focus for Manufacturing Engineering Technology students. Familiarization with the manufacturing industry. Prerequisite: junior standing.

**MET 401 Quality Assurance. (3)***spring*

Introduction to statistical quality control methods design of experiments, sampling, gage requirements, specifications, quality assurance tools emphasizing CNC-CMM programming. Lecture, lab. Prerequisite: junior standing.

**MET 409 Applied Engineering Economics. (3)***spring*

Fundamentals of engineering economics in a practical, industry-based approach. Includes effects of depreciation, taxes, inflation, and replacement analysis. Lecture, computer lab experiences.

**MET 415 Manufacturing Simulation. (3)***spring*

Computer simulation of manufacturing operations. Discrete event simulation models range from individual processes to whole factories. Lecture, computer lab experiences. Prerequisite: MET 345.

**MET 416 Applied Computer-Integrated Manufacturing. (3)***fall*

Techniques and practices of computer-integrated manufacturing, with emphasis on computer-aided design and computer-aided manufacturing. Prerequisite: MET 345.

*General Studies: CS***MET 432 Thermodynamics. (3)***spring*

Thermodynamics of mixtures. Combustion process. Applies thermodynamics to power and refrigeration cycles. Prerequisite: ETC 340.

**MET 433 Thermal Power Systems. (4)***not regularly offered*

Analyzes gas power, vapor power, and refrigeration cycles. Components of air conditioning systems. Direct energy conversion. Psychrometry. Analyzes internal combustion engines and fluid machines. Lecture, lab. Prerequisite: MET 432 or instructor approval.

**MET 434 Applied Fluid Mechanics. (3)***spring*

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

**MET 435 Alternate Energy Sources. (3)***not regularly offered*

Alternate energy systems, energy use and its impact on the environment, and demonstrating practical alternative energy sources to fossil fuels. Prerequisite: instructor approval.

**MET 436 Turbomachinery Design. (3)***not regularly offered*

Applies thermodynamics and fluid mechanics to the analysis of machinery design and power cycle performance predictions. Prerequisites: ETC 340; MET 434.

**MET 438 Design for Manufacturing II. (4)***fall*

Applies mechanics in design of machine elements and structures. Uses experimental stress analysis in design evaluation. Lecture, lab. Prerequisite: AET 312 or MET 331 or instructor approval.

**MET 442 Specialized Production Processes. (3)***fall*

Nontraditional manufacturing processes, emphasizing EDM, ECM, ECG, CM, PM, HERF, EBW, and LBW. Prerequisite: MET 231.

**MET 443 CNC Computer Programming. (3)***fall*

Theory and application of N/C languages using CAM software and CNC machine tools. Lecture, lab. Prerequisite: MET 345 or instructor approval.

**MET 444 Production Tooling. (3)***fall*

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

**MET 448 Expert Systems in Manufacturing. (3)***not regularly offered*

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

**MET 451 Introduction to Automation. (3)***spring*

Introduction to automation. Topics include assembly techniques, fixed and flexible automation systems, robots, material-handling systems, sensors, and controls. Lecture, lab. Prerequisite: MET 346.

**MET 452 Implementation of Robots in Manufacturing. (3)***not regularly offered*

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

**MET 453 Robotic Applications. (3)***spring*

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

**MET 460 Manufacturing Capstone Project I. (3)***fall*

Small-group projects designing, evaluating, and analyzing components, assemblies, and systems. Develop products/manufacturing techniques demonstrating state-of-the-art technology. Lecture, lab. Prerequisites: MET 331, 341, 346; senior standing.

**MET 461 Manufacturing Capstone Project II. (3)***spring*

Small-group projects applying manufacturing techniques, with emphasis on demonstrating state-of-the-art technology. Lecture, lab. Prerequisite: MET 460 or instructor approval.

**MET 484 Internship. (1–12)***not regularly offered***MET 492 Honors Directed Study. (1–6)***not regularly offered***MET 493 Honors Thesis. (1–6)***not regularly offered***MET 494 Special Topics. (1–4)***fall and spring*

Possible topics:

- (a) Consumer Manufacturing. (1–3)
- (b) Manufacturing Process Simulation. (1–3)
- (c) Packaging Design. (1–3)

**MET 498 Pro-Seminar. (1–7)***not regularly offered***MET 499 Individualized Instruction. (1–3)***not regularly offered***MET 500 Research Methods. (1–12)***not regularly offered***MET 501 Statistical Quality Control Applications. (3)***spring*

SPC problem-solving techniques for implementation in industrial setting; design and analysis of experiments. Prerequisite: instructor approval.

**MET 502 Specialized Production Processes. (3)***fall*

Specialized production processes including lasers, electronic beam, abrasive and water jet, and chemical and thermal processes. Prerequisite: instructor approval.

**NOTE:** For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 78. For graduation requirements, see "University Graduation Requirements," page 74. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 51.

**MET 504 Applications of Production Tooling. (3)***fall*

Design and fabrication of fixtures, jigs, templates, and specialized industrial tooling for manufacturing. Lecture, lab. Prerequisite: instructor approval.

**MET 507 Manufacturing Enterprise. (3)***fall and spring*

Organization and project management of cellular manufacturing methods, including IIT and lean manufacturing. Prerequisite: instructor approval.

**MET 509 Applied Engineering Economics. (3)***spring*

Fundamentals of engineering economics in a practical, industry-based approach. Includes effects of depreciation, taxes, inflation, and replacement analysis. Lecture, computer lab experiences.

**MET 512 Introduction to Robotics. (3)***not regularly offered*

Introduction to industrial robots. Topics include: robot workspace, trajectory generation, robot actuators and sensors, design of end effectors, and economic justification. Application case studies.

Prerequisite: instructor approval.

**MET 513 Advanced Automation. (3)***fall*

Analysis and design of hard and flexible automation systems. Particular attention to material-handling technology. Prerequisite: instructor approval.

**MET 514 CNC Computer Programming. (3)***spring*

Theory and application of N/C languages using CAM software and CNC machine tools. Lecture, lab. Prerequisite: instructor approval.

**MET 515 Manufacturing Simulation. (3)***spring*

Computer simulation of manufacturing operations. Discrete event simulation models range from individual processes to whole factories. Lecture, computer lab experiences.

**MET 517 Applied Computer-Integrated Manufacturing. (3)***fall*

Techniques and practices of computer-integrated manufacturing, with emphasis on computer-aided design and computer-aided manufacturing. Prerequisite: MET 345 or instructor approval.

**MET 560 Fundamentals of Security Engineering. (3)***fall*

Definitions of threats, fundamentals of design of physical protection systems, computer modeling and analysis of security systems.

**MET 571 Waste Minimization and Waste Prevention. (3)***spring*

Life cycle analysis, selection of environmentally compatible materials, design of waste minimization equipment and operation, economics of waste minimization and prevention. Prerequisite: ETC 340 or instructor approval.

**MET 580 Practicum. (1–12)***not regularly offered***MET 584 Internship. (1–12)***not regularly offered***MET 590 Reading and Conference. (1–12)***not regularly offered***MET 591 Seminar. (1–12)***not regularly offered***MET 592 Research. (1–12)***not regularly offered***MET 593 Applied Project. (1–12)***not regularly offered***MET 594 Conference and Workshop. (1–12)***not regularly offered***MET 595 Continuing Registration. (1)***not regularly offered***MET 598 Special Topics. (1–4)***not regularly offered***MET 599 Thesis. (1–12)***not regularly offered***SECURITY ENGINEERING TECHNOLOGY (SET)**

See the *Graduate Catalog* for the SET courses.



Preflight instruction

Dave Tevis photo