ASU East

Charles E. Backus, Ph.D., Provost

www.east.asu.edu

The burgeoning ASU East campus offers a variety of programs, from agriculture to aeronautical engineering technology.

Tim Trumble photo

Arizona State University East was established in 1996 at the former Williams Air Force Base, 23 miles southeast of ASU Main. There, ASU East and its educational partners have created the Williams Campus—a residential academic community focused on meeting the needs of students, business, industry, and the larger community. The 600-acre Williams Campus offers a small college environment, with access to the amenities of a major metropolitan area and the resources of a major research university.

ASU East offers degree programs that help students develop knowledge and skills they need for success in their professional, civic, and personal lives in the 21st century. Fourteen baccalaureate degree programs, four master's degree programs, and one certificate program can be completed at ASU East, with additional programs in the planning stages. (See the "ASU East Baccalaureate Degrees and Majors" table, page 561.) The College of Technology and Applied Sciences offers a master's degree and a range of bachelor's programs in high demand areas of technology, the only programs of their kind in Arizona. The unique bachelor's and master's degrees in Agribusiness offered by the faculty in the Morrison School of Agribusiness and Resource Management lead to careers in one of the fastest growing sectors of global business. The Environmental Resources degrees offered through the Morrison School provide opportunities to study wilderness areas and urban habitats and how people's activities affect the regenerative ability of natural resources. East College offers a range of supporting courses for all ASU East programs and bachelor's degrees with majors in Business Administration, Applied Psychology, Family Resources and Human Development, Elementary Education, and Interdisciplinary Studies. Students who are uncertain of their major may start college at ASU East as East College/No Preference majors.

Although it is a young campus, ASU East has already developed significant student-centered innovations in higher education that have earned national recognition.

ASU East assumed leadership in Arizona in developing and offering the Bachelor of Applied Science (B.A.S.) degree, a program designed specifically as a career progression degree for students holding the Associate of Applied Science (A.A.S.) degree. The B.A.S. emphasizes management, leadership, and communication skills, along with additional technical course work.

ASU East has also developed an innovative academic partnership with Chandler-Gilbert Community College (CGCC). This partnership combines the strengths of the two institutions to provide ASU students with high quality education in a cost-effective way. CGCC provides lower-division general education and major prerequisite courses that are directly equivalent to ASU courses and transfer automatically. ASU East provides both lower- and upper-division courses in the major and upper-division general studies and general interest courses. Through the partnership, students can get at the Williams Campus all the courses needed to graduate in four years with an ASU baccalaureate degree, generally at some savings in tuition.

New facilities, new programs, and new opportunities are constantly emerging at ASU East. The campus is easily accessible via major interstate routes. See the map on page 601. For the latest information, call 480/727-EAST (3278) or check the Web site at www.east.asu.edu.

Accreditation

The North Central Association of Colleges and Schools accreditation of ASU Main includes ASU East. In addition, ASU East 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. (TAC of ABET). For more 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

ACADEMIC ORGANIZATION AND ADMINISTRATION

The chief operating and academic officer of ASU East is the provost. There are two colleges and one school at ASU East administered by deans. These academic units develop and implement the teaching, research, and service programs of the institution. Additional support for the academic mission of the campus is provided by Library Services and Information Technology, each administered by a director. See "ASU East Faculty and Academic Professionals," page 603, and "Academic Organization," page 8.

ADMISSION

Nondegree Students. Nondegree students may take courses at ASU East according to the special provisions under "Admission of Undergraduate Nondegree Applicants," page 68.

Degree-Seeking Students. Degree-seeking students must meet the university admissions standards set by the Arizona Board of Regents (ABOR). Any student admitted to ASU may take courses at ASU East. To be admitted to an ASU East degree program, the student must meet undergraduate admissions requirements and the specific admission requirements of the ASU East program. A student who is admitted to an ASU East degree program is defined as an ASU East student.

For more admissions information and applications to ASU East degree programs, call 480/727-EAST (3278) or visit or write

UNDERGRADUATE ADMISSIONS
ARIZONA STATE UNIVERSITY
PO BOX 870112
TEMPE AZ 85287-0112

Transfer Among ASU Campuses

Degree-seeking students currently enrolled at either ASU Main or ASU West who want to relocate to an ASU East degree program should contact the OASIS at ASU East, the Office of the Registrar at ASU Main, or the Admissions and Records Office at ASU West for appropriate procedures. All credit earned at any ASU campus automatically transfers to ASU East. Students should consult with their ASU East major advisor to determine how this credit applies to their major and graduation requirements. Students should be aware that certain requirements (e.g., the minimum number

ASU East Baccalaureate Degrees and Majors

Major	Concentration	Degree	Administered By
Aeronautical Engineering Technology*	—	B.S.	Department of Manufacturing and Aeronautical Engineering Technology
Aeronautical Management Technology*	Airway science flight management, airway science management	B.S.	Department of Aeronautical Management Technology
Agribusiness	Agribusiness finance, food and agribusiness marketing, food science, general agribusiness, golf facilities management, international agribusiness, management of agribusiness, preveterinary medicine, professional golf management, resource management	B.S.	Morrison School of Agribusiness and Resource Management
Applied Psychology	—	B.S.	East College
Applied Science	Aviation maintenance management technology, aviation management technology, computer systems administration, consumer products technology, digital media management, digital publishing, emergency management, fire service management, food retailing, instrumentation, microcomputer systems, municipal operations management, operations management, production technology, resource team specialist, semiconductor technology, software technology applications, technical graphics	B.A.S.	Bachelor of Applied Science Advisory Committee
Business Administration	—	B.S.	East College
Computer Engineering Technology*	Computer engineering technology, software engineering technology, software technology	B.S.	Department of Electronics and Computer Engineering Technology
Electronics Engineering Technology*	Electronic systems, microelectronics, telecommunications	B.S.	Department of Electronics and Computer Engineering Technology
Elementary Education	—	B.A.E.	East College
Environmental Resources	Ecology, watershed ecology, wildlife habitat management	B.S.	Morrison School of Agribusiness and Resource Management
Family Resources and Human Development	Family resources and human development in business, human nutrition—dietetics	B.S.	East College
Industrial Technology	Environmental technology management, industrial technology management, information technology	B.S.	Department of Information and Management Technology
Interdisciplinary Studies	—	B.I.S.	East College
Manufacturing Engineering Technology*	Manufacturing engineering technology, mechanical engineering technology	B.S.	Department of Manufacturing and Aeronautical Engineering Technology
Multimedia and Technical Communication	—	B.S.	East College

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

Academic Advising

College or School	Location	Telephone	Days	Hours[1]
College of Technology and Applied Sciences	CNTR 10	480/727-1252	Mon.–Fri.	8 A.M.–5 P.M.
East College	CNTR 92	480/727-1515	Mon.–Fri.	8 A.M.–5 P.M.
Morrison School of Agribusiness and Resource Management	CNTR 20	480/727-1585	Mon.–Fri.	8 A.M.–5 P.M.
University Honors College	IRISH A121[2]	480/965-2359	Mon.–Fri.	8 A.M.–5 P.M.

[1] Walk-ins are welcome; appointments are recommended.

[2] The University Honors College is located at ASU Main.

of upper-division semester hours to graduate) may differ among campuses.

TRANSFER CREDIT

Courses taken from Chandler-Gilbert Community College through the Partnership in Baccalaureate Education are automatically transferred to ASU East each semester. These courses and courses taken at other Arizona public community colleges transfer according to equivalencies established in the current Arizona Higher Education Course Equivalence Guide. (Transfer guides are available at www.asu.edu/provost/articulation.) The acceptability and applicability of courses transferred from other universities and community colleges is determined by ASU Main Undergraduate Admissions in consultation with the faculty or academic advisor of the student's choice of major.

JOINT ADMISSION CONTINUOUS ENROLLMENT (JAC)

JAC 001 Joint Admission Continuous Enrollment. (0–12) F, S, SS
For use by ASU East to track undergraduate students admitted to East Campus degree programs who are concurrently enrolled or solely enrolled in courses offered by Chandler-Gilbert Community College.

ADVISING

Students are encouraged to take advantage of the skill and knowledge of the advising professionals available to them in the academic units and to seek academic advising early.

For more information or to schedule an advising session, contact an academic advisor (see the "Academic Advising" table on this page).

DEGREE PROGRAMS

See the "ASU East Baccalaureate Degrees and Majors" table, page 561. For graduate degrees, see the "ASU East Graduate Degrees and Majors" table, page 563.

CAMPUS AND STUDENT SERVICES

ASU East is a student-centered campus that offers many of the features of a small college in a rural area while providing access to the resources of a major research university and the amenities of a large metropolitan area. The campus includes excellent educational facilities: modern classrooms and laboratories, a 21st-century electronic library, and state-of-the-art computer equipment. Other amenities include a learning center, child care services, campus union, bookstore, copy center, and free parking. A shuttle service provides transportation between ASU East, Mesa Community College, and ASU Main. An additional shuttle is available for transportation from ASU Main to ASU West.

Enrollment Services—OASIS

The OASIS provides one-stop services for admission, financial aid, business services, and registration. Conveniently located in the Academic Center Building, students find personnel ready to assist them with registration processes, tuition payment, financial assistance information, student employment, ASU Sun Cards (photo IDs), and parking information.

Student Support Services

Staff provide new student advising orientation programs, workshops, academic advising for undeclared majors, support for clubs and organizations, international and multicultural students, students with disabilities, and tutoring services and referrals. Staff also provide career advising and assessment, career planning workshops, career exploration software programs, and internship information.

Williams Campus Housing and Residential Life

Campus housing is located in several academic villages designed to support and promote student academic success. Family resident assistants live and work in the homes and resident assistants live and work in the residence halls. There are many opportunities for students to be involved in leadership positions in residential life programs.

Residence Halls. Residence halls offer 160 large private rooms, which feature a private bath and a shared kitchenette that includes a microwave and a refrigerator. Students may elect to share a room with another student if they prefer.

Homes. More than 600 homes with two to five bedrooms are located on campus. Homes include all appliances, carports, and storage. Single and married students, as well as faculty and staff living with their families make their home at the Williams Campus. For more information, call 480/727-1700.

Library Services

Strong resources and personal service define the ASU East Library. As a primarily electronic research library, it is designed to take maximum advantage of new technology. Electronic indexes, catalogs, and journals support study and research in many fields, with an emphasis on the majors offered at ASU East. While the library acquires materials in all formats, by intention it prefers electronic text. Thousands of periodicals are available digitally in all subjects, while those that remain in print form can be obtained by the library quickly. Documents in electronic form can be delivered directly to students' desks by e-mail or fax. Most publications not available on campus may be obtained overnight. While most come from the other campuses of ASU, the

ASU East Graduate Degrees and Majors

Major	Concentration	Degree	Administered By
Agribusiness	Agribusiness management and marketing, food quality assurance	M.S.	Morrison School of Agribusiness and Resource Management
Environmental Resources	GIS/remote sensing, natural resource management, and range ecology	M.S.	Morrison School of Agribusiness and Resource Management
Family Resources and Human Development	Human nutrition	M.S.	East College
Technology	Aeronautical engineering technology, aviation human factors, aviation management technology, computer systems engineering technology, electronic systems, engineering technology, environmental technology management, information technology, instrumentation and measurement technology, management of technology, manufacturing engineering technology, mechanical engineering technology, microelectronics engineering technology, security engineering technology	M.S.Tech.	College of Technology and Applied Sciences

library can obtain publications from anywhere in the world. The library's Web address is eastlib.east.asu.edu.

Computing Services

With more than 75 workstations, the Computing Commons at ASU East provides general computing access through the campus network to the Internet and ASU Main computer services, including e-mail and general purpose computing. The IT East department provides specialized software and systems to meet the particular needs of the ASU East programs. In addition, IT East provides computer classrooms and audiovisual material to support the campus academic programs. IT East has a staff of support personnel to aid the campus community's computing needs, including Web development.

Williams Campus Union

The Campus Union is the center of the campus community, serving students, faculty, staff, and guests. Union facilities include meeting and study rooms, a ballroom, TV lounge, coffee bar, and a game room. Programs and services such as movie nights, ice cream socials, dances, and holiday parties complement the educational mission of the Williams Campus and enhance the quality of campus life. The union is staffed primarily by students, providing them the opportunity to develop leadership skills and a customer service orientation. For more information, call 480/727-1098.

Learning Center

In the Learning Center, undergraduate and graduate students can study, conduct research and access writing assistance, subject-area tutoring, and computer-assisted instruction. Staff members also provide workshops and in-class presentations on writing, presentation, and study skills. Located in the Academic Center Building, the Learning Center offers a convenient and quiet study location for individual students and study groups. Leisure reading is encouraged by offering recycled paperback books and magazines to borrow and comfortable furnishings in which to relax. All Learning Center services are free to enrolled students. For more information or to schedule a tutoring appointment, call 480/727-1452.

Recreational Facilities and Services

The Williams Campus Fitness Center is equipped with state-of-the-art weight training and cardiovascular machines, racquetball courts, and a gymnasium. Trained exercise professionals are on hand daily to provide personal training assistance. A variety of health, fitness, and sports classes are also offered at the Fitness Center. For students who prefer outdoor sports activities, the campus has basketball and tennis courts, soccer/football fields, baseball fields, a running track, and swimming pool. For more information, call 480/988-8400.

Student Health Services

Health services for ASU East students are provided by the Veteran's Administration Medical Center located at the Williams Campus. Services include primary assessment and treatment of health problems and injuries, physical examinations and immunizations, women's health care, diagnostic tests, laboratory tests/X-rays, and a pharmacy. Health education and counseling, smoking cessation counseling, and wellness and health assessments are also available. Student registration fees cover the cost of office visits for full-time ASU East students. Part-time students pay a nominal fee. Some office procedures and laboratory tests require additional charges. Health insurance is not required to use the health services; however, it is strongly advised for all students and is required for international students. For more information, call 602/222-6568.

NOTE: For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 87. For graduation requirements, see "University Graduation Requirements," page 83. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 60.

Morrison School of Agribusiness and Resource Management

Raymond A. Marquardt
Dean
(CNTR 20) 480/727-1585
www.east.asu.edu/msabr

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

ASSOCIATE PROFESSOR
GREEN, MILLER, RACCACH, RICHARDS, WHYSONG

ASSISTANT PROFESSORS
BURKINK, MANFREDO, PATTERSON, SCHMITZ, STANTON

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 emerging countries related to food and fiber products. Population increases worldwide have led forecasters to predict that more than 11 billion food and fiber consumers will be part of the global agribusiness system by the year 2020. 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.

For students interested in natural resource management, the school offers degree programs 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.

CENTER FOR AGRIBUSINESS POLICY STUDIES

The Center for Agribusiness Policy Studies (CAPS) carries out research and development relating to agribusiness, rural development, multiple use of scarce resources, and public policy. CAPS addresses regional, national, and international development in the context of global and competitive markets for agricultural products and inputs. For more information, contact the director at 480/727-1249.

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, crop insurance and risk management, and the use of neural network models in forecasting. For more information, contact the director at 480/727-1124.

DEGREES

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 facilities management, international agribusiness, management of agribusiness, professional golf management, resource management, 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 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 62. 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 87), 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 567.

B.S. Agribusiness Prerequisite Courses

Students who select the concentrations in agribusiness finance, food and agribusiness marketing, food science, general agribusiness, golf 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 *SQ*....4
CHM	101	Introductory Chemistry *SQ**....4
ECN	111	Macroeconomic Principles *SB*....3
ECN	112	Microeconomic Principles *SB*....3
ENG	301	Writing for the Professions *L*....3
MAT	210	Brief Calculus *MA*....3
Total		26

* Not required for professional golf management and golf facilities management concentrations.

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	310	Agribusiness Management I....3
AGB	320	Agribusiness Marketing I*....3
AGB	332	Agribusiness Finance I....3
AGB	333	Agribusiness Finance II....3
AGB	360	Agribusiness Statistics *CS*....3
AGB	364	Agribusiness Technologies I*....3
AGB	365	Agribusiness Technologies II....3
AGB	380	Applied Microeconomics....3
AGB	410	Agribusiness Management II....3
AGB	414	Agribusiness Analysis *L*....3
AGB	420	Food Marketing....3
Core total		36

* Not required for professional golf management or golf 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.

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 433	Intermediate Agribusiness Financial Markets....3
AGB 434	Agricultural Risk Management and Insurance....3
AGB electives	9
Agribusiness core	36
Agribusiness prerequisite courses	26
Total	80

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 411	Agricultural Cooperatives....3
AGB 480	Agribusiness Policy and Government Regulations....3
AGB electives	9
Agribusiness core	36
Agribusiness prerequisite courses	26
Total	80

Food and Agribusiness Marketing Concentration. Students in the food and agribusiness marketing concentration develop critical skills relevant to firms involved in food manufacturing, and distribution and retailing, in addition to input suppliers, commodity associations, and primary producers. To this end, food and agribusiness marketing stu-

NOTE: For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 87. For graduation requirements, see "University Graduation Requirements," page 83. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 60.

dents 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
AGB 422 Consumer Behavior	3
AGB 429 Marketing Research	3
AGB electives	9
Agribusiness core	36
Agribusiness prerequisite courses	26
Total	80

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	3
MIC 205 Microbiology *SG*	3
MIC 206 Microbiology Laboratory *SG*	1
AGB upper-division electives	6
Agribusiness core	36
Agribusiness prerequisite courses	26
Total	81

General Agribusiness Concentration. The general agribusiness concentration offers students a chance to build a broad perspective in the field of agribusiness. In an age of specialization, there remains a growing need for generalists. These individuals have mastered finance, marketing, management, and other technologies such as computers and statistics and are capable of demonstrating this mastery.

General Agribusiness

AGB 334 Agricultural Commodities	3
AGB 410 Agribusiness Management II	3
AGB electives	12
Agribusiness core	36
Agribusiness prerequisite courses	26
Total	80

International Agribusiness Concentration. A student studying international agribusiness is typically preparing for a career with

1. a U.S.-based international agribusiness firm;
2. a U.S. agribusiness firm affected significantly by trade;
3. programs of agribusiness for or in developing countries; or
4. government agencies oriented toward international issues.

This concentration requires a mastery of subjects in international trade, agricultural development, international policy, and global marketing practices and institutions.

International Agribusiness

AGB 450 International Agricultural Development *G*	3
AGB 452 International Agricultural Policy	3
AGB 454 International Trade	3
AGB electives	9
Agribusiness core	36
Agribusiness prerequisite courses	26
Total	80

Professional Golf Management Concentration. The professional golf management (PGM) concentration provides qualified students with the unique combination of knowledge and skills required to pursue management opportunities in the golf industry. This program, accredited by the Professional Golfer's Association of America, is specifically designed for the student who aspires to become a qualified golf professional; thus the student must meet a playing ability test (see "PGM Admission," on this page). PGM students must complete the agribusiness core, which helps them develop the critical business skills needed to manage complex organizations.

In addition, the PGM concentration requires a minimum of 14 semester hours of golf-related courses in the following areas: golf course operations, turf grass management, club fitting and repair, pro-shop merchandising, golf course mechanics, golf course shop management, and movement analysis. The concentration also requires the student to complete nine semester hours of internship experience at golf facilities, providing the student with valuable hands-on experience. All golf-related courses and internships are selected with the assistance of a PGM program coordinator.

PGM Admission. To be admitted into the PGM program, students must meet a playing ability test. Contact the PGM program coordinator at 480/727-1017 for more information.

Professional Golf Management

Agribusiness core	30
Agribusiness prerequisite courses	22
Professional golf management courses	14
Professional golf management internship	9
Total	75

Golf Facilities Management Concentration. The golf facilities management concentration is designed to prepare students to pursue careers as golf course superintendents. Through the agribusiness core, students develop the critical business skills needed to manage complex organizations. In addition, the golf facilities management concentration requires a minimum of 22 semester hours of golf facilities management courses in the following areas: operations, plants, landscaping, soils, irrigation and water management, fertilizers, pest control, turf grass management, mechanics, and shop management. The golf facilities management concentration also requires the student to complete six semester hours of internship experience at golf facilities, providing valuable hands-on experience. Contact an academic advisor for more information.

Golf Facilities Management

Agribusiness core	30
Agribusiness prerequisite courses	22
Golf facilities management courses	22
Internship	6
Total	80

Prerequisite Courses for Preveterinary Medicine and Resource Management. Students who select the preveterinary medicine and resource management concentrations must take the following courses, some of which can also be used to meet the General Studies requirement.

ACC 230 Uses of Accounting Information I....3
ACC 240 Uses of Accounting Information II....3
BIO 181 General Biology *SQ*....4
BIO 182 General Biology *SG*....4
CHM 113 General Chemistry *SQ*....4
CHM 115 General Chemistry with Qualitative Analysis *SQ*....5
Choose between the course combinations below....4–8
CHM 231 Elementary Organic Chemistry *SQ* (3)
CHM 235 Elementary Organic Chemistry Laboratory *SQ* (1)
—or—
CHM 331 General Organic Chemistry (3)
CHM 332 General Organic Chemistry (3)
CHM 335 General Organic Chemistry Laboratory (1)
CHM 336 General Organic Chemistry Laboratory (1)
ECN 111 Macroeconomic Principles *SB*....3
ECN 112 Microeconomic Principles *SB*....3
ENG 301 Writing for the Professions *L*....3
MAT 210 Brief Calculus *MA*....3
MIC 205 Microbiology *SG*....3
MIC 206 Microbiology Laboratory *SG*....1

Total....43–51

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....36
Preveterinary medicine prerequisites....43–51

Total....79–87

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 concentration 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 *SB*....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 87), 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 *SQ*....4
BIO 182 General Biology *SG*....4
CHM 101 Introductory Chemistry *SQ*....4
CHM 231 Elementary Organic Chemistry *SQ*....3

NOTE: For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see “General Studies,” page 87. For graduation requirements, see “University Graduation Requirements,” page 83. For an explanation of additional omnibus courses offered but not listed in this catalog, see “Classification of Courses,” page 60.

CHM	235	Elementary Organic Chemistry Laboratory *SQ*	1
ERS	130	Introduction to Environmental Science *SQ*	4
ERS	207	Plant Taxonomy	4
ERS	225	Soils	3
ERS	226	Soils Laboratory	1
ERS	246	Environmental Conservation and Ecology *G*	3
ERS	301	Ecology	3
ERS	307	Plant Identification	4
ERS	311	Forest and Range and Ecosystems	4
ERS	350	Environmental Statistics *CS*	3
ERS	365	Watershed Management	3
ERS	402	Vegetation Measurement	4
ERS	460	Applied Systems Ecology	3
ERS	480	Ecosystem Management and Planning *L*	3
ERS	485	GIS in Natural Resources	3
ERS	490	Recent Advances in Environmental Resources	1
MAT	210	Brief Calculus *MA*	3
			—
Core total			65

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 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	420	Ecological Restoration	3
ERS	425	Soil Classification and Management	3
ERS	433	Riparian Ecosystem Management	3
ERS	434	Wetland Ecosystems and Soils	3
ETM	301	Environmental Management	3
GLG	101	Introduction to Geology I (Physical) *SQ*	3
GLG	103	Introduction to Geology I—Laboratory *SQ*	1
GPH	111	Introduction to Physical Geography *SQ*	3
GPH	210	Society and Environment *G*	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 *G*	3
GPH	381	Geography of Natural Resources *G*	3
GPH	418	Landforms of the Western United States *L*	3
GPH	481	Environmental Geography	3

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	333	Water Resources Management	3
ERS	364	Surface Water Hydrology	3
ERS	425	Soil Classification and Management	3
ERS	465	Surface Water Quality	3
ETM	302	Water and Wastewater Treatment Technology	3
GLG	101	Introduction to Geology I (Physical) *SQ*	3
GLG	103	Introduction to Geology I—Laboratory *SQ*	1
GPH	212	Introduction to Meteorology I *SG*	3
GPH	214	Introduction to Meteorology Laboratory I *SG*	1

Group B: Focus Areas and Tools of Watershed Ecology

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

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 *L*	4
BIO	471	Ornithology	3
BIO	472	Mammalogy	4
BIO	474	Herpetology	3

Group B: Focus Areas and Tools of Wildlife Habitat Management

ERS	353	Wildlife Nutrition	3
ERS	420	Ecological Restoration	3
ERS	433	Riparian Ecosystem Management	3
ERS	434	Wetland Ecosystems and Soils	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 *SQ*	4
BIO	182	General Biology *SG*	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.

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

NOTE: For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 87. For graduation requirements, see "University Graduation Requirements," page 83. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 60.

AGB	458	Bioremediation....3
AGB	484	Internship....1
ETM	301	Environmental Management....3
ETM	303	Environmental Regulations....3
Total		19

AGRIBUSINESS (AGB)

AGB 100 Introduction to Agribusiness. (3) F
Overview of agribusiness industries and career opportunities.

AGB 105 Global Resources. (3) F, S
Effect of quality, quantity, and cost of national food supplies on technology, marketing, and world agricultural policies.

AGB 171 Animal Science. (3) S
Comparative growth, development, and propagation of domestic animals.

AGB 210 Livestock Management. (3) F, S
Methods of managing livestock enterprises, economics, loss prevention, and marketing.

AGB 211 Crop Management. (3) F, S
Crop production, management principles, and their application to crop growth and development.

AGB 250 World Food Dynamics. (3) S
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) S
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) F
Identification and analysis of methods, problems, and future of international agribusiness operations. Emphasizes special problems associated with international agribusiness systems. *General Studies: G.*

AGB 271 Veterinary Medicine Today. (3) S
Introduction to the role of the veterinarian as related to the fields of food supply and veterinary medicine.

AGB 310 Agribusiness Management I. (3) F
Principles of management, including planning, organizing, integrating, measuring, and developing people in agribusiness organizations.

AGB 311 Establishing an Agribusiness. (3) F
Opportunities and problems associated with new firm development in agribusiness. Business plan will be written and presented orally.

AGB 320 Agribusiness Marketing I. (3) F, S
Examines the food marketing system with an emphasis on the marketing institutions, arrangements, and methods for basic commodities. Prerequisites: ACC 230, 240; AGB 360; ECN 111, 112.

AGB 321 Agribusiness Marketing II. (3) F, S
Examines marketing strategy, focusing on the marketing mix (product, price, promotion, place) in a dynamic socioeconomic environment. Prerequisites: ACC 230, 240; AGB 360; ECN 111, 112.

AGB 330 Agribusiness Accounting. (3) F
Introduction to managerial accounting for agribusiness using computerized accounting systems.

AGB 332 Agribusiness Finance I. (3) F, S
Agribusiness investment management and financial institutions that serve agriculture. Prerequisites: ACC 230, 240.

AGB 333 Agribusiness Finance II. (3) S
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* equivalent; introductory accounting.

AGB 334 Agricultural Commodities. (3) F
Trading on futures markets. Emphasis on the hedging practices with grains and meats. Prerequisite: AGB 320.

AGB 340 Food Processing. (3) F
An introduction to processed food quality assurance, statistical sampling, and inspection procedures. Prerequisite: AGB 364.

AGB 341 Food Analysis. (3) N
Processing control and scientific instrumentation used in food quality assurance laboratories. Prerequisites: AGB 364; CHM 101.

AGB 351 Management Science. (3) F
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) F, S
Innovative developments in precision farming, irrigation, soils, tillage methods, machinery, and biotechnology in crop production. Prerequisite: AGB 211.

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

AGB 364 Agribusiness Technologies I. (3) F
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) F
Biotechnology and other methods used in the production, processing, and distribution of food. Prerequisite: BIO 100.

AGB 370 Wildlife and Domestic Animal Nutrition. (3) S
Survey of nutritional needs of domestic and wild animals. Prerequisites: AGB 210, 211; General Studies SQ course.

AGB 371 Animal Genetics. (3) F
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) F, S
Emphasis on application of the theory of the firm, theory of exchange, and consumer theory.

AGB 410 Agribusiness Management II. (3) S
Principles of human resource management in agribusiness firms. Prerequisite: AGB 310.

AGB 411 Agricultural Cooperatives. (3) S
Organization, operation, and management of agricultural cooperatives.

AGB 414 Agribusiness Analysis. (3) F, S
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) S
Food processing, packaging, distribution, market research, new food research and development, and social implications. Prerequisite: AGB 320.

AGB 422 Consumer Behavior. (3) F
Application of behavioral concepts in analyzing consumer food purchases and their implications for marketing strategies. Prerequisite: completion of Agribusiness core or equivalent.

AGB 424 Sales and Merchandising in Agribusiness. (3) SS
The principles and techniques of selling and merchandising in the agricultural and food industries.

AGB 425 Agricultural Marketing Channels. (3) F
Operational stages of agricultural commodities in normal distribution systems and implementation of marketing strategies. Prerequisite: AGB 320.

AGB 429 Marketing Research. (3) F
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 equivalent.

AGB 433 Intermediate Agribusiness Financial Markets. (3) S
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 equivalent.

AGB 434 Agricultural Risk Management and Insurance. (3) F
Strategies to manage agricultural price and business risk: derivatives, insurance, self-insurance, and public policy. Prerequisite: completion of Agribusiness core or equivalent.

AGB 440 Food Safety. (3) S
Control, prevention, and prediction of microbial and chemical foodborne diseases. Prerequisite: AGB 442 or instructor approval.

AGB 441 Food Chemistry. (4) N
The biochemical and chemical interactions that occur in raw and processed foods. Lecture, lab. Prerequisites: CHM 115, 231.

AGB 442 Food and Industrial Microbiology. (3) N
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. (4) N
Management, manipulation, and metabolic activities of industrial microbial cultures and their processes. Lecture, lab. Prerequisite: AGB 442 or instructor approval.

AGB 445 Food Retailing. (3) F
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) S
Transition of developing countries from subsistence to modern agriculture. Emphasis is placed on implications for U.S. agribusiness working abroad. *General Studies: G*.

AGB 452 International Agricultural Policy. (3) F
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) S
International practices in trading of agribusiness, technology, and resource products and services.

AGB 455 Resource Management. (3) S
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) F
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) F
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) S
Technical-regulatory and policy issues emanating from minetailing and animal waste. Lecture, case studies.

AGB 460 Agribusiness Management Systems. (4) S
The development and use of decision support systems for agribusiness management and marketing. Lecture, lab.

AGB 470 Comparative Nutrition. (3) N
Effects of nutrition on animal systems and metabolic functions. Prerequisite: CHM 231.

AGB 471 Diseases of Domestic Animals. (3) S
Control and prevention of infectious and noninfectious diseases of domestic animals. Prerequisite: AGB 442 or microbiology course with lecture and lab.

AGB 473 Animal Physiology I. (3) N
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) F, S
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) S
The development and implementation of government food, drug, pesticide, and farm policies and regulations that affect the management of agribusiness.

AGB 484 Internships. (2) F, S

AGB 490 Recent Advances in Agribusiness. (1) F, S
Reports and discussions of current topics and problems associated with agribusiness. May be repeated for credit.

AGB 501 Master's Thesis Preparation. (1) F, S
Step-by-step guidelines to major elements of a master's thesis along with practical guidelines for conduction research.

AGB 510 Advanced Agribusiness Management I. (3) F
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) S
Analysis of organization behavior, change, and resource requirements within agribusiness systems. Prerequisite: AGB 310.

AGB 512 Food Industry Management. (3) S
Operations and management of food-processing factories, food distribution centers, and retail food-handling firms.

AGB 513 Advanced Cooperatives. (3) F
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) S
Vertical integration and differentiation in food and agricultural industries. Prerequisite: AGB 510 or 528.

AGB 515 Agribusiness Coordination. (3) S
Organizational alternatives for agribusiness with emphasis on cooperatives and trading companies. Prerequisite: AGB 510 or 528.

AGB 528 Advanced Agribusiness Marketing. (3) F
Theory and analysis of marketing farm commodities, risks, and the effect of future trading on cash prices.

AGB 529 Advanced Agribusiness Marketing Channels. (3) S
Analysis of agribusiness market channel systems. Formulation of marketing strategies.

AGB 532 Advanced Agribusiness Finance. (3) F
Financial management of agribusiness firms; agribusiness financial analysis, investment analysis, agricultural risk management, and introduction to agricultural financial intermediaries. Prerequisites: computer literacy and 1 finance course *or* instructor approval.

AGB 535 Commodity Analysis. (3) F
Analysis of commodity markets.

AGB 540 Advanced Food Science. (3) N
Chemical and physical nature of processed foods. Emphasis on food product development.

AGB 550 International Agricultural Development. (3) F
Transition of developing countries from subsistence to modern agriculture. Emphasis is placed on implications for U.S. agribusiness working abroad.

AGB 551 Agribusiness in Developing Countries. (3) S
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) F
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) F
Advanced international practices in trading of agribusiness, technology, and resource products and services.

AGB 557 Resource Policy and Sustainability. (3) F
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) S
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) N
Development and use of decision support systems for agribusiness management decision making. Prerequisite: AGB 510.

AGB 561 Agribusiness Research Methods. (3) F
The use of model building, hypothesis testing, and empirical analysis in solving agribusiness problems.

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

NOTE: For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 87. For graduation requirements, see "University Graduation Requirements," page 83. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 60.

AGB 580 Advanced Agribusiness Policy. (3) F
Policy-making history, structure, and process.

AGB 581 Advanced Agribusiness Policy. (3) N
Policy-making history, structure, and process.

AGB 587 Resource Policy and Sustainability. (3) F
Considers the evolution of policy design, focusing on how resource and environmental concerns have affected agricultural development and trade policies.

ENVIRONMENTAL RESOURCES (ERS)

ERS 130 Introduction to Environmental Science. (4) F
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 207 Plant Taxonomy. (4) S
Introduction to identification of vascular plants. Survey of plant families. 2 hours lecture, 2 hours lab. Prerequisite: BIO 182.

ERS 225 Soils. (3) F
Fundamental properties of soils and their relation to plant growth and the nutrition of man and animals. Relation of soils to environmental quality. Prerequisite: CHM 101 or 113 or equivalent.

ERS 226 Soils Laboratory. (1) F
Selected exercises to broaden the background and understanding of basic soil principles. Lab. Corequisite: ERS 225.

ERS 246 Environmental Conservation and Ecology. (3) S
Principles of environmental conservation from global, historical, and ecological perspectives. Consideration of development/sustainability issues. *General Studies: G.*

ERS 301 Ecology. (3) F
Introduction to basic principles of ecology including ecosystem structure and function, population dynamics, and community ecology. Prerequisite: BIO 182.

ERS 307 Plant Identification. (4) F
Identification of key plants of western rangelands and forests. Laboratory emphasis on grass identification. Lecture, lab. Prerequisite: ERS 207 or PLB 310 or equivalent.

ERS 311 Forest and Rangeland Ecosystems. (4) N
Ecology of forest and rangeland ecosystems; emphasis on vegetation community structure and dynamics and impacts of management practices. 3 hours lecture, 1 hour lab. Prerequisites: ERS 225, 301, 350.

ERS 333 Water Resources Management. (3) N
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) F
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) N
Principles of nutrient metabolism in wildlife species, with emphasis on understanding the interaction of wildlife with their environment. Prerequisites: BIO 181 and 182 and CHM 101 *or* instructor approval.

ERS 360 Range Ecosystem Management. (3) F
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 equivalent); ERS 246.

ERS 364 Surface Water Hydrology. (3) F 2000
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) N
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) S
Vegetation sampling and inventory as related to animal-habitat relations. Lecture, lab, 1 weekend field trip. Prerequisites: ERS 301 and 307 and 350 and program major *or* instructor approval.

ERS 415 Wildlife Life Histories. (4) S
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 *and* ERS 360.

ERS 420 Ecological Restoration. (3) S
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) N
Principles of soil genesis, morphology, and classification. Management and conservation practices will be presented. Prerequisite: ERS 225.

ERS 433 Riparian Ecosystem Management. (3) N
Examination of 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) N
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) N
Soils viewed in an ecosystem context, soil-plant relationships, nutrient budgets, and abiotic factors that influence soil processes. Prerequisites: BIO 320 and ERS 225 and 226 *or* instructor approval.

ERS 449 Landscape Ecology. (3) N
Causes and ecological consequences of spatial and temporal patterns in the environment. Prerequisite: ERS 301.

ERS 460 Applied Systems Ecology. (3) N
The 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 equivalent; 1 course in ecology.

ERS 465 Surface Water Quality. (3) S 2001
Examination of 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) N
Integration of 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) S
Principles and techniques of applied ecology for the management and wildlife populations. Lecture, lab. Prerequisites: ERS 311 and 474 *or* equivalent.

ERS 477 Environmental Risk Assessment and Management. (3) N
Survey of methods related to identification, evaluation, comparison, and management of environmental risks. Prerequisite: senior standing.

ERS 480 Ecosystem Management and Planning. (3) S
Planning for management and conservation of wildland ecosystems. Ecological, economic, and social constraints on long-term sustainable resource development. Computer tools for resource planning. Lecture, 1 weekend field trip. Prerequisites: ERS 402 or equivalent; senior standing. *General Studies: L.*

ERS 485 GIS in Natural Resources. (3) F
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 equivalent.

ERS 486 Remote Sensing in Environmental Resources. (4) S
Principles and application of remote sensing technologies in natural resource management. Integration of computerized data from aerial photography and LanSat imagery in resource management. Lecture, lab. Prerequisite: ERS 485 or equivalent.

ERS 489 Undergraduate Research. (1–3) F, S
Undergraduate research under the supervision of an environmental resources faculty member. Prerequisite: junior or senior status.

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

ERS 533 Riparian Ecology. (3) N
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) N
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) F
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) S
Advanced statistical procedures for environmental resources. Techniques for analyzing research data that do not meet assumptions. Studio. Prerequisite: ERS 350 or equivalent.

ERS 553 Advanced Animal Nutrition. (4) N
Metabolic and physiological interactions of nutrients in wild and domesticated animals consuming natural feeds. Lecture, lab.

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

ERS 561 Spatial Statistics and GIS. (3) F
Dependent spatial data, analysis and description, semivariograms, variograms, kriging, and GIS analysis. Lecture, lab. Prerequisites: ERS 350 and 485 *or* equivalents.

ERS 585 Spatial Modeling with GIS. (3) F
GIS technology for spatial modeling of natural resources. Practical application of GIS technology for problem solving. Lecture, lab. Prerequisite: ERS 485 or equivalent *or* instructor approval.

ERS 591 Environmental Resources Seminar. (1–12) N

East College

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PROFESSORS
BALCAZAR, BERGERON, JOHNSTON, MAID, MANORE, SCHVANEVELDT, VAUGHAN

ASSOCIATE PROFESSORS
BARCHILON, MONTE

ASSISTANT PROFESSOR
HAMPL

SENIOR LECTURER
MARTIN

LECTURER
WENHART

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. All credit earned at ASU East automatically transfers to ASU Main or ASU West.

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 87. 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 or the Partnership can declare "East College/No Preference" as an interim major while completing the General Studies requirement and searching for an ASU major that serves their personal and career objectives. East College provides advising for No Preference majors.

Degree Programs. East College also offers five bachelor's degree programs, each of which requires 120 semester hours to graduate:

1. the B.S. degree in Applied Psychology;
2. the B.S. degree in Business Administration;
3. the B.A.E. degree in Elementary Education;
4. the B.S. degree in Family Resources and Human Development with concentrations in family resources and human development in business and human nutrition—dietetics; and
5. the B.I.S. (Bachelor of Interdisciplinary Studies).

APPLIED PSYCHOLOGY—B.S.

This program offers a traditional psychology core curriculum leading to applied courses in the areas of human factors and organizational psychology. The program serves students who wish to pursue these special applications of psychological concepts either as preparation for careers in business and industry or for graduate study. New students, continuing ASU students in good standing, or transfer students eligible for admission to ASU may declare Applied Psychology as their major at ASU East. To graduate with a B.S. degree in Applied Psychology, a student must complete a minimum of 120 hours, including university graduation

NOTE: For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 87. For graduation requirements, see "University Graduation Requirements," page 83. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 60.

requirements and the following major requirements: 31 semester hours in psychology (19-hour core and a 12-hour concentration) and 18 hours of related course work. Because the program is new and the curriculum is under development, interested students should contact an East College advisor to determine their current status and work out a provisional plan for completing the degree program. For the latest information about program requirements and courses, access www.east.asu.edu/ecollege on the Web or contact an East College advisor at 480/727-1042.

BUSINESS ADMINISTRATION—B.S.

The B.S. degree in Business Administration is a *general* business program, offering 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 152). The major requires an additional 33 hours, including a 15-hour core, seven hours of professional proficiency courses, and 11 hours of general 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, and program requirements and courses, access www.east.asu.edu/ecollege on the Web or call an East College advisor at 480/727-1042.

ELEMENTARY EDUCATION—B.A.E.

Students who wish to prepare for certification in Elementary Education can complete the B.A.E. degree in Elementary Education in East College. It is a "cohort" program. Groups of students move through the entire professional curriculum together. Methods courses are taught on site in the schools, and students do field work in the schools every semester leading up to their student teaching experience. Admissions and major requirements for the program at ASU East are identical to admissions and major requirements for the program at ASU Main. See "College of Education," page 174, for details. For the latest information about application, admissions, program requirements, and courses in the East College program, access www.east.asu.edu/ecollege on the Web, or call the East College advisor at 480/727-1042.

Course Listings

Bilingual Education (BLE)
BLE 498 Pro-Seminar 1–7

Curriculum and Instruction (DCI)
DCI 396 Field Experience I 0

Elementary Education (EED)
EED 420 Science Methods, Management, and Assessment in the Elementary School 3
EED 433 Language Arts Methods, Management, and Assessment in the Elementary School 3
EED 444 Organizing the Classroom Culture 1
EED 455 Social Studies Methods, Management, and Assessment in the Elementary School 3
EED 478 Student Teaching in the Elementary School 3–15
EED 480 Mathematics Methods, Management, and Assessment in the Elementary School 3
EED 496 Field Experience 0
EED 578 Student Teaching in the Elementary School 9–15

Educational Psychology (EDP)
EDP 310 Educational Psychology *SB* 1–10

Educational Media and Computers (EMC)
EMC 300 Computers in Education 1

Reading Education (RDG)
RDG 414 Teaching Reading/Decoding 3
RDG 481 Reading Practicum 3

Special Education (SPE)
SPE 311 Orientation to Education of Exceptional Children *SB* 3
SPE 394 Special Topics 3

Educational Policy Studies (SPF)
SPF 301 Culture and Schooling *L* 3
SPF 401 Theory and Practice in Education 1–2

Theatre Performance and Production (THP)
THP 311 Improvisation with Youth 3

FAMILY RESOURCES AND HUMAN DEVELOPMENT—B.S.

Options are available under concentrations under the major in Family Resources and Human Development, as shown in the "Concentrations and Options" table below.

Concentrations and Options

Concentration	Option
Family resources and human development in business	Food service management
Human nutrition—dietetics	General dietetics, human nutrition

Family Resources and Human Development in Business Concentration

Food Service Management Option. The food service management option consists of the following required course:

FON 100 Introductory Nutrition 3
FON 142 Applied Food Principles 3
FON 344 Nutrition Services Management *L* 3
FON 442 Experimental Foods 3
FON 445 Quantity Food Production 3
MGT 301 Management and Organization Behavior 3
or MGT 394 Special Topics (3)
MKT 300 Principles of Marketing 3
or MKT 394 Special Topics (3)
Two AGB or business courses 6
Total 27

The students work with their advisor to select an additional 15 hours of course work to complete the major.

In addition, the following related courses are required:

CHM	101	Introductory Chemistry *SQ* 4
CHM	231	Elementary Organic Chemistry *SQ*[1] 3
CHM	235	Elementary Organic Chemistry Laboratory *SQ*[1] 1
MIC	205	Microbiology *SG*[2] 3
MIC	206	Microbiology Laboratory *SG*[2] 1
Total		 12

[1] Both CHM 231 and 235 must be taken to secure SQ credit.

[2] Both MIC 205 and 206 must be taken to secure SG credit.

Human Nutrition—Dietetics Concentration

General Dietetics Option. The American Dietetic Association (ADA) has approved the general dietetics option in the human nutrition—dietetics concentration as a Didactic Program in Dietetics (DPD). Graduates of a DPD program may apply for dietetic internships or preprofessional practice programs to establish eligibility to write the Dietetic Registration examination.

The following FON courses are required of all students in the general dietetics option:

FON	142	Applied Food Principles 3
FON	241	Human Nutrition 3
FON	341	Introduction to Planning Therapeutic Diets 3
FON	344	Nutrition Services Management *L* 3
FON	440	Advanced Human Nutrition I 3
FON	441	Advanced Human Nutrition II 3
FON	444	Diet Therapy 3
FON	445	Quantity Food Production 3
FON	446	Human Nutrition Assessment Lecture/Laboratory 3
FON	448	Community Nutrition *L* 3
FON	494	ST: Nutrition and Health Promotion 3
Total		 33

In addition to the required FON courses, the following related courses are required by the program to comply with ADA standards:

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*[1] 3
CHM	235	Elementary Organic Chemistry Laboratory *SQ*[3] 1
ENG	301	Writing for the Professions *L* 3
MIC	205	Microbiology *SG*[2] 3
Statistics course		 3
Total		 33

[1] Both CHM 231 and 235 must be taken to secure SQ credit.

[2] Both MIC 205 and 206 must be taken to secure SG credit.

Additional supporting courses in social sciences required by the American Dietetic Association for completion of DPD requirements must be selected in consultation with an advisor.

Human Nutrition Option. This option is not an ADA approved curriculum. The following FON courses are required:

FON	142	Applied Food Principles 3
FON	241	Human Nutrition 3
FON	440	Advanced Human Nutrition I 3
FON	441	Advanced Human Nutrition II 3
FON	444	Diet Therapy 3
FON	446	Human Nutrition Assessment Lecture/Laboratory 3
Total		 18

An additional 15 hours of FON or closely related courses must be taken to complete this option. Students will select courses in consultation with an advisor.

In addition to FON courses, the following related courses are required in the option:

BCH	361	Principles of Biochemistry 3
BIO	201	Human Anatomy and Physiology I *SG* 4
BIO	202	Human Anatomy and Physiology II 4
CHM	113	General Chemistry *SQ* 4
CHM	231	Elementary Organic Chemistry *SQ** 3
Total		 18

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

MINOR

The faculty of nutrition also offer a minor in Family Resources and Human Development with two emphases, each requiring 18 hours: (1) foods and nutrition in business; and (2) nutrition. At least 12 of the 18 hours must be in upper-division courses.

Foods and Nutrition in Business. The foods and nutrition in business emphasis requires that students take the following courses:

FON	100	Introductory Nutrition ..... 3 or FON 241 Human Nutrition (3)
FON	142	Applied Food Principles 3
FON	344	Nutrition Services Management *L* 3
FON	394	ST: Computers in Nutrition and Foods 3
FON	442	Experimental Foods 3
FON	445	Quantity Food Production 3
Total		 18

Nutrition. The nutrition emphasis requires the following courses:

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

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

FON	446	Human Nutrition Assessment Lecture/Laboratory 3
FON	448	Community Nutrition *L* 3

NOTE: For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 87. For graduation requirements, see "University Graduation Requirements," page 83. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 60.

FON 450 Nutrition in the Life Cycle 3
FON 531 Recent Developments in Nutrition 3
FON 532 Current Research in Nutrition 3

GRADUATE PROGRAMS

The faculty of nutrition offer programs leading to the M.S. degree. See the *Graduate Catalog* for requirements.

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 on 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 an information age that requires lifelong learning. Self-assessment, active engagement in learning, and appraisal of opportunities to support academic and career goals are key elements in the core courses. The concentrations are based on approved academic minors, certificate programs, or special coherent clusters of course work. The student should be able to integrate these into a meaningful program.

The combination of areas of concentration gives students great 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 480/727-1042 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 (usually 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 *L* 3
BIS 302 Interdisciplinary Principles 3
BIS 401 Applied Interdisciplinary Studies 3
BIS 402 Senior Seminar *L* 3
Total 12

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 at least one course completed in each with a grade of "C" or higher.

Approved Concentrations

Each concentration generally 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. As this program is new to ASU East, students should check for new information about concentrations on the Web at www.east.asu.edu/ecollege or contact an East College advisor at 480/727-1042. Other concentrations may be formed from existing minors and certificates, with the approval of an advisor. See the "ASU Minors" table, page 111, and the "ASU Certificates" table, page 113, for more information.

OTHER NEW PROGRAMS

East College has been authorized to plan a B.S. degree in Multimedia Writing and Technical Communication and a B.S. degree in Human Health. These programs are under development, and the latest information about them is available on the East College Web site, www.east.asu.edu/ecollege.

APPLIED SCIENCE CORE (ASC)

ASC 301 Contextual Uses of Algebra in Technology. (1) F, S
Using 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) F, S
Using 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) F, S
Using trigonometry to solve real-world technological problems using currently available computer software. Prerequisite: B.A.S. major.

ASC 315 Numeracy in Technology. (3) F, S
Contextual uses of mathematics in applied sciences. Emphasis on using mathematical methodologies to solve technology-related problems. Prerequisite: B.A.S. major.

ASC 325 Physical Sciences in Technology. (4) F, S
Physical systems and their interrelationships on technology systems. Real-world applications of physical systems. Lecture, lab. Prerequisite: B.A.S. major.

BACHELOR OF INTERDISCIPLINARY STUDIES (BIS)

BIS 301 Foundations of Interdisciplinary Studies. (3) F, S, SS
Introduces concepts and methods of interdisciplinary study by critically examining anticipated 21st-century workplace and civic trends. Lecture, seminar, discussion. Prerequisites: B.I.S. major; 2.00 GPA. *General Studies: L.*

BIS 302 Interdisciplinary Principles. (3) F, S, SS
Demonstrates interdisciplinary principles as applied to progressively more complex problems. Students choose among course topics that address both their concentrations. Lecture, seminar, discussion. Prerequisite: BIS 301.

BIS 401 Applied Interdisciplinary Studies. (3) F, S, SS
Applies interdisciplinary problem-solving skills in internships, service-learning, or research; may involve individual or group projects combining both concentrations. Prerequisite: BIS 301.

BIS 402 Senior Seminar. (3) F, S, SS
Capstone course will help students integrate their classroom and experiential learning. Lecture, seminar, discussion. Prerequisites: BIS 301, 302, 401. *General Studies: L.*

FOOD AND NUTRITION (FON)

FON 100 Introductory Nutrition. (3) F, S, SS
Basic concepts of human nutrition. Alternative diets and how food choices affect personal health. Prerequisite: nonmajor.

FON 142 Applied Food Principles. (3) F, S
Applied scientific principles of food preparation and production. 2 hours lecture, 3 hours lab.

FON 241 Human Nutrition. (3) F, S, SS
Principles of human nutrition relative to health. Emphasis on nutrients and the factors affecting their utilization in the human body. Prerequisite: CHM 101 or equivalent.

FON 341 Introduction to Planning Therapeutic Diets. (3) S
Cultural, health, and economic aspects of diet planning. Computer and manual assessment of food composition. Review of common therapeutic diets. Prerequisites: FON 142 and 241 (or equivalent).

FON 344 Nutrition Services Management. (3) S
Organization, administration, and management of food and nutrition services in hospitals and other institutions. Field trips may be included. *General Studies: L.*

FON 394 Special Topics. (3) N
(a) Computers in Nutrition and Foods

FON 440 Advanced Human Nutrition I. (3) F
Metabolic reactions and interrelationships of vitamins, minerals, and water. CHM 332 recommended. Prerequisites: BCH 361; BIO 202; FON 241 (or equivalent).

FON 441 Advanced Human Nutrition II. (3) S
Metabolic reactions and interrelationships of carbohydrate, lipid, and protein. CHM 331 and 332 recommended. Prerequisites: BCH 361; BIO 202; FON 241 (or equivalent).

FON 442 Experimental Foods. (3) F
Food product development techniques, food evaluation and testing, and investigation of current research into food composition. 2 hours lecture, 3 hours lab. Prerequisites: CHM 231; FON 142.

FON 444 Diet Therapy. (3) S
Principles of nutritional support for prevention and treatment of disease. Prerequisites: BIO 202; FON 241 (or equivalent).

FON 445 Quantity Food Production. (3) S
Standard methods of food preparation in quantity; operation of institutional equipment and menu planning for institutions. Experience in quantity food service. 1 hour lecture, 6 hours lab. May require field trips. Prerequisites: FON 241 (or equivalent) and 344 *or* instructor approval.

FON 446 Human Nutrition Assessment Lecture/Laboratory. (3) S
Clinical and biochemical evaluation of nutritional status. 2 hours lecture, 3 hours lab. Prerequisites: BCH 367; FON 440 (or 441).

FON 448 Community Nutrition. (3) F
Food-related behaviors; community organization and delivery of nutrition services; program design, implementation, and evaluation strategies; nutritional assessment of population groups. PGS 101 and SOC 101 are recommended. Prerequisite: FON 241 or equivalent. *General Studies: L.*

FON 450 Nutrition in the Life Cycle. (3) F
Emphasis on nutritional needs and problems during pregnancy, lactation, infancy, and childhood. Prerequisite: FON 241 or equivalent.

FON 494 Special Topics. (3) N
(a) Nutrition and Health Promotion

FON 531 Recent Developments in Nutrition. (3) N
Survey of research. Prerequisites: 1 course each in advanced nutrition and biochemistry.

FON 532 Current Research in Nutrition. (3) S
Vitamins and minerals. Prerequisites: 1 course each in advanced nutrition and biochemistry.

FON 540 Advanced Micronutrient Metabolism. (3) F
The metabolism of vitamins and minerals, primarily as applied to humans, with research literature emphasized. Prerequisites: 1 course each in basic nutrition and biochemistry.

FON 541 Advanced Macronutrient Metabolism. (3) S
The metabolism of protein, fat, and carbohydrate, primarily as applied to humans, with research literature emphasized. Prerequisites: 1 course each in basic nutrition and biochemistry.

FON 542 Experimental Foods. (3) F
Food product development techniques, food evaluation and testing, and investigation of current research into food composition. 2 hours lecture, 3 hours lab. Prerequisites: CHM 231; FON 142.

FON 544 Therapeutic Nutrition. (3) S
Current theories of the nutritional prevention or treatment of various diseases. Prerequisites: 1 course each in basic nutrition and physiology.

FON 545 Recent Developments in Institutional Feeding. (3) S
Current practices in institutional feeding, including supervised practicum with local quantity food operation. 1 hour lecture, 6 hours lab. Prerequisites: FON 142 and 344 *or* instructor approval.

FON 548 Nutrition Program Development. (3) F
The planning, development, implementation, and evaluation of community nutrition programs, including the process of grant applications. Prerequisites: 1 course each in basic nutrition and sociology.

FON 550 Advanced Maternal and Child Nutrition. (3) F
Metabolic characteristics and nutritional needs of the pregnant woman, lactating woman, infant, and child are reviewed in-depth. Prerequisites: 1 course each in basic nutrition, physiology, and biochemistry.

FON 551 Advanced Geriatric Nutrition. (3) S
Metabolic characteristics and nutritional requirements of the elderly are reviewed in depth. Prerequisites: 1 course each in basic nutrition and physiology and biochemistry *or* instructor approval.

FON 580 Dietetics Practicum. (3–9) F, S, SS
Structured practical experience in the Preprofessional Practice Program (AP4), supervised by practitioners with whom the student works closely. Practicum. Prerequisite: acceptance into the AP4 program.

FON 598 Special Topics. (1–4) N
(a) Research Methods in Nutrition

TECHNICAL WRITING AND COMMUNICATION (TWC)

TWC 200 Impact of Communications Technology on Society. (3) F, S
Organizational issues and development of technical communication. Activities include research, evaluations, and presentation of oral arguments in support of positions. Prerequisite: ENG 102. *General Studies: L.*

TWC 351 Technical Writing and Editing. (3) F, S
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) F, S, SS
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; L course; senior standing as a CTAS major. *General Studies: L.*

NOTE: For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see “General Studies,” page 87. For graduation requirements, see “University Graduation Requirements,” page 83. For an explanation of additional omnibus courses offered but not listed in this catalog, see “Classification of Courses,” page 60.

College of Technology and Applied Sciences

Albert L. McHenry
Dean
(CNTR 10) 480/727-1874
www.asu.edu/east/tech

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

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

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 62. High school precalculus, physics, and chemistry are recommended. Transfer applicants must meet the university requirements for transfer students as specified under "Transfer Credit," page 65, with the exception that Arizona resident transfer students must have a 2.25 GPA.

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 65. 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 65. 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.

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.

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 83, 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.

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 of Technology and Applied Sciences 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.

NOTE: For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 87. For graduation requirements, see "University Graduation Requirements," page 83. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 60.

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 77, 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 of Technology and Applied Sciences 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.

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. A description and the opportunities offered by the University Honors College can be found under "Craig and Barbara Barrett Honors College," page 323.

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 programs are required to 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) F, S
Introduction to computer-aided design, programming, modeling, and technical documentation. Lecture, lab. *General Studies: CS.*

ETC 201 Applied Electrical Science. (4) F, S, SS
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) F, S
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) F, S
Thermodynamic systems and processes, first and second laws of thermodynamics, properties of pure substances, and applications to heat engines and special systems. Fundamentals of conduction, radiation, and convection. Prerequisites: MAT 261; PHY 112, 114.

Department of Aeronautical Management Technology

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PROFESSOR
GESELL

ASSOCIATE PROFESSORS
JACKSON, McCURRY, TURNEY

ASSISTANT PROFESSORS
KARP, PEARSON

LECTURERS
BORRMANN, 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. 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 the approval of the Federal Aviation Administration as Airway Science programs. The concentrations are described separately on the following pages.

All degree requirements are shown on curriculum check sheets for the concentrations that are available through the department. Requirements include First-Year Composition, university General Studies (see "General Studies," page 87), 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. Type rating in the Boeing 737 airliner is an available option.

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. The airway science flight management concentration is approved by the Federal Aviation Administration as an airway science program.

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 $35,000 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.

Course Requirements

In addition to the required courses for First-Year Composition, university General Studies (see "General Studies," page 87), 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

NOTE: For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 87. For graduation requirements, see "University Graduation Requirements," page 83. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 60.

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 *MA*....3
Total		13

Second Semester

AMT	100	Flight Safety I....1
AMT	214	Commercial/Instrument Ground School I....3
ENG	102	First-Year Composition....3
ETC	100	Languages of Technology *CS*....4
MAT	260	Technical Calculus I *MA*....3
PHY	111	General Physics *SQ**....3
PHY	113	General Physics Laboratory *SQ**....1
Total		18

* 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.

Course Requirements

In addition to the required courses for First-Year Composition, university General Studies (see "General Studies," page 87), 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 *MA*....3
Total		13

Second Semester

ENG	102	First-Year Composition....3
ETC	100	Languages of Technology *CS*....4
MAT	260	Technical Calculus I *MA*....3
PHY	111	General Physics *SQ**....3
PHY	113	General Physics Laboratory *SQ**....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 or specialization. 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 is focused on management and organization, professional communication, quantitative analysis, and computer competency.

CGC	494	ST: Computer Systems Applications	3
IMC	346	Management Dynamics or ITM 344 Industrial Organization (3) or ITM 452 Industrial Human Resource Management (3)	3
IMC	470	Project Management	3
STP	420	Introductory Applied Statistics *CS*	3
TWC	400	Technical Communications *L*	3
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 competitions.

AERONAUTICAL MANAGEMENT TECHNOLOGY (AMT)

Flight instruction costs are not included in university tuition and fees.

AMT 100 Flight Safety I. (1) F, S, SS
Supervised private pilot flight training and flight safety briefings. Continuous enrollment until completion of the FAA Private Pilot Certificate. Lecture, lab. Corequisite: AMT 182 or 220 or equivalent.

AMT 101 Introduction to Aeronautical Management Technology. (1) F, S
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) F, S
Ground school preparation for Private Pilot Certificate. Aerodynamics, navigation, performance, and regulations. Lecture, lab. Corequisite: AMT 220.

AMT 200 Flight Safety II. (2) F, S, SS
Supervised commercial instrument flight training and safety briefings. Continuous enrollment required until completion of FAA Commercial Pilot Certificate with Instrument Rating. Lecture, lab. Prerequisites: AMT 100; Private Pilot Certificate. Pre- or corequisite: AMT 214 or 322.

AMT 201 Air Traffic Control. (3) F
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) S
Ground school leading to FAA Instrument Pilot Rating/Commercial Pilot Certificate (part 1 of 2). 10 hours ground trainer included. Lecture, lab. Pre- or corequisites: AMT 182, 220.

AMT 220 Aviation Meteorology. (3) F, S
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) F
Basic aerodynamics, aerospace vehicle structures, materials, and systems. Inspection requirements and methods. Lecture, lab. Prerequisites: PHY 111, 113.

AMT 287 Aircraft Powerplants. (4) S
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) F, S, SS
Supervised instructor flight training and safety briefings. Continuous enrollment required until completion of FAA Flight Instructor Certificate with Instrument Instructor Rating. Lecture, lab. Prerequisite: AMT 200. Pre- or corequisite: AMT 385.

AMT 308 Air Transportation. (3) F
Study of the historical and international development of air transportation and its social, political, and economic impact upon global interrelationships. Prerequisite: junior standing. *General Studies: G.*

AMT 322 Commercial/Instrument Ground School II. (3) F
Ground school leading to FAA Instrument Pilot Rating/Commercial Pilot Certificate (part 2 of 2). 10 hours ground trainer included. Lecture, lab. Prerequisite: Private Pilot Certificate. Pre- or corequisite: AMT 214.

AMT 360 Introduction to Helicopter Technology. (3) N
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) F
Air freight operations in National Aviation System; ramp operations, loading, weight and balance, and administration of airside and groundside operations. Prerequisite: junior standing.

AMT 382 Air Navigation. (3) S
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) S
Ground school in preparation for the FAA Flight Instructor Certificate. Lecture, lab. Pre- or corequisite: AMT 300.

AMT 387 Multiengine Pilot Ground School. (1) S
Ground school preparation for the FAA Multiengine Rating. Lecture, lab. Pre- or corequisite: AMT 200 or instructor approval.

AMT 391 Multiengine Instructor Ground School. (2) N
Ground school preparation for the FAA Multiengine Flight Instructor Rating. Lecture, lab. Prerequisites: AMT 300, 387, 400.

AMT 392 Flight Instructor Instrument Ground School. (2) F
Ground school preparation for the FAA Instrument Flight Instructor Rating. Prerequisite: AMT 300.

AMT 395 Multiengine Land, Airplane Flight Instructor Rating. (1) N
Normal and emergency flight operations. Instruction techniques and procedures for light multiengine land, airplane. CFIAME Rating required for course completion. Lecture, lab. Prerequisite: AMT 391.

AMT 396 Aviation Professional. (1) F
Career focus for management and flight students, including internships, résumé writing, interviews, and employment search in aviation industry. Prerequisite: junior standing.

NOTE: For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 87. For graduation requirements, see "University Graduation Requirements," page 83. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 60.

AMT 400 Flight Safety IV. (1) F, S, SS
Multiengine and crew training and safety briefings. Continuous enrollment required until completion of rating and multicrew training. Lecture, lab. Prerequisite: AMT 300. Pre- or corequisite: AMT 387.

AMT 408 National Aviation Policy. (3) F
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) N
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. Prerequisite: AMT 280 or MET 230.

AMT 410 Aviation Safety and Human Factors. (3) F
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 L1 requirement.

AMT 412 Air Transportation Research. (1) F
Survey of practical research methodology in use in the air transportation industry. Topics include planning and design considerations.

AMT 419 Aviation Logistical Management. (3) S
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) F
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) S
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) F
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) F, S, SS
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) S
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) S
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 496 Airline Aircraft Systems Capstone. (3) S
Commercial airline aircraft systems and flight procedures. Includes theoretical education for large, commercial passenger aircraft. Lecture, lab. Prerequisite: senior standing.

AMT 521 Air Transportation Regulation. (3) N
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 equivalent.

AMT 523 Aviation Systems Management. (3) N
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 equivalent.

AMT 525 Airport Planning and Design. (3) N
Students complete various phases of airport master planning process. Provide guidance for logical and timely development of airports. Project work groups assigned. Prerequisite: AMT 444 or 489 or equivalent.

AMT 527 Airline Management Strategies. (3) N
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 equivalent.

AMT 528 International Aviation. (3) N
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 equivalent.

AMT 529 Fixed-Base Operations Management. (3) N
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 equivalent.

AMT 541 Aviation Physiology. (3) N
Survey of human physiology and human performance principles related to modern aircraft and aircraft systems operating in multiple environments. Prerequisite: AMT 410 or equivalent.

AMT 543 Ergonomics in High-Technology Environments. (3) N
Examination of ergonomic design principles regarding man-machine interface requirements of high-technology workstations. Emphasis on computer workstation design issues. Prerequisite: AMT 410 or equivalent.

AMT 545 Human Factors in Aviation. (3) N
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 equivalent.

AMT 546 Crew Resource Management /Line-Oriented Flight Training. (3) N
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 equivalent.

AMT 547 Modern Human Factors Design Issues. (3) N
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 equivalent.

AMT 549 Human Factors Research. (3) N
Aviation human factors research principles applied and tested in operational settings. Group projects assigned in conjunction with industry partners. Prerequisite: AMT 410 or equivalent.

Department of Electronics and Computer Engineering Technology

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PROFESSORS
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ASSOCIATE PROFESSORS
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LIPARI, PETERSON, SUNDARARAJAN

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 com-

puter industries with responsibilities such as designing, installing and operating technical systems, configuring hardware and software systems 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).

Electronics Engineering Technology—B.S.

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.

Three concentrations are available in electronics engineering technology: 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 87) 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 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

NOTE: For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 87. For graduation requirements, see "University Graduation Requirements," page 83. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 60.

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*[1]	3
PHY 113 General Physics Laboratory *SQ*[1]	1
Total	14

Second Semester

ENG 102 First-Year Composition	3
ETC 100 Languages of Technology *CS*	4
MAT 260 Technical Calculus I *MA*	3
PHY 112 General Physics *SQ*[2]	3
PHY 114 General Physics Laboratory *SQ*[2]	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 *SQ*	4
ECN 111 Macroeconomic Principles *SB*	3
EET 208 Electric Circuit Analysis I	4
MAT 261 Technical Calculus II *MA*	3
Total	17

Second Semester

EET 301 Electric Circuit Analysis II	4
ETC 211 Applied Engineering Mechanics: Statics	3
MAT 262 Technical Calculus III *MA*	3
L1 course	3
HU, SB, or awareness area course	3
Total	16

[1] Both PHY 111 and 113 must be taken to secure SQ credit.

[2] 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 engineering technology, software engineering technology, and software technology.

The *computer engineering technology* concentration is designed to provide students with an opportunity to develop a broad-based knowledge and skills in digital systems, interfacing techniques and computer hardware applications.

The *software engineering technology* concentration is intended to prepare students for the application, interconnection and use of computer hardware systems and the implementation of hardware/software solutions.

The *software technology* concentration prepares students for careers in software applications using object-oriented programming techniques and languages to design programs and to modify and adapt programs for existing systems.

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 *CS*	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 *CS*	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 Engineering 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 *SQ*	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

Software Engineering 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 *SQ*	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	Systems 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 *MA*	3
PHY	111	General Physics *SQ*[1]	3
PHY	113	General Physics Lab *SQ*[1]	1
Total			13

Second Semester

CET	200	Object-Oriented Software Development II	3
ENG	102	First-Year Composition	3
ETC	100	Languages of Technology *CS*	4
MAT	260	Technical Calculus I *MA*	3
PHY	112	General Physics *SQ*[2]	3
PHY	114	General Physics Lab *SQ*[2]	1
Total			17

Second Year

First Semester

CET	150	Digital Systems *CS*	4
CET	230	Applied Data Structures	3
CET	256	C Programming for Engineering Technology	3
CHM	113	General Chemistry *SQ*	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 *SB*	3
EET	208	Electric Circuit Analysis I	4
MAT	243	Discrete Mathematical Structures or MAT 262 Technical Calculus III *MA* (3)	3
Total			17

[1] Both PHY 111 and 113 must be taken to secure SQ credit.

[2] 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 specialization. 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
CGC	352	Technical Presentations and Visual Literacy	3
EET	494	ST: Data Analysis	3
IMC	346	Management Dynamics	3
TWC	400	Technical Communication *L*	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

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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 Object-Oriented Software Development I. (3) F
Basic concepts of OO analysis, design, and programming using JAVA. Studies main features of software development in an OO framework. Prerequisite: freshman standing.

CET 150 Digital Systems I. (4) F, S
Number systems, Boolean algebra, combinational logic, K-maps, flip-flops, sequential circuits, state machines, and minimization techniques. *General Studies: CS.*

CET 200 Object-Oriented Software Development II. (3) F
Continuation of CET 100. Object modeling, task scripts, and use cases; the dynamic model, interaction diagrams, and other OO concepts. Prerequisite: CET 100.

CET 230 Applied Data Structures. (3) F
Introduction to data structures: strings, stacks, queues, binary trees, recursion, searching, and sorting. Prerequisite: CET 100.

CET 236 Introduction to Visual BASIC. (3) F
Introduction to BASIC and programming in the Visual BASIC environment. Prerequisite: CET 100.

CET 256 C Programming for Engineering Technology. (3) F, S, SS
Applied and practical problem solving using the C programming language. Prerequisite: ETC 100.

CET 300 Object-Oriented Software Development III. (3) F
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) F
Concepts and semantical and syntactical construction of modern programming languages. Prerequisite: CET 200.

CET 350 Digital Systems II. (4) F
Analysis and design of synchronous and asynchronous state machines. Introduction to VHDL. Lecture, lab. Prerequisite: CET 150.

CET 354 Microcomputer Architecture and Programming. (4) F, S
Microcomputer architecture, assembly language programming, I/O considerations, exception and interrupt handling. Introduction to interfacing. Prerequisite: CET 150.

CET 386 Operating Systems Principles. (3) S
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) S
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 425 Systems Programming. (3) F
Design and implementation of systems programs, including text editors, file utilities, monitors, assemblers, relocating linking loaders, I/O handlers, and schedulers. Prerequisite: CET 300.

CET 426 Software Tools for the Semiconductor Industry. (3) S
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) F
Introduction to database technologies and DBMS, data models, and languages. Prerequisites: CET 230, 300.

CET 436 Applications of Visual Basic. (3) F
Applications of visual basic to graphics, graphical user interfaces, error handling, file processing, OO programming, DBMS, networking, and multimedia. Prerequisite: CET 236.

CET 452 Digital Logic Applications. (4) S
Design of sequential machines using system design techniques and complex MSI/LSI devices with lab. Prerequisite: CET 350.

CET 454 Microcontrollers. (3) S
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) F
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) S
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) A
Network technology, topologies, protocols, control techniques, reliability, and security. Prerequisite: CET 354.

CET 473 Digital/Data Communications. (4) F
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) F
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 equivalent.

CET 485 Digital Testing Techniques I. (3) A
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) S
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) F
Introduction to hardware description languages, digital modeling, and simulation techniques using the VERILOG HDL. Prerequisites: CET 350, 354.

CET 488 UNIX Systems Administration. (3) F
Generate user proficiency in administration of UNIX operating system, its processes, system calls, kernel, file structure, and interprocess communication tools. Prerequisites: CET 483 (or equivalent); C or C++ language.

CET 489 Network Programming. (3) F
Generate user proficiency in writing C programs and scripts to control and administer a UNIX operating system network. Prerequisites: CET 473 and 488 *or* equivalents; C or C++ language.

CET 494 Special Topics. (1–4) N
(a) Computer Project

CET 520 Computer Architecture. (3) F
The basics of computer architecture. RTN, RISC, CISC concepts; computer arithmetic; ALUs; memory systems; I/O. Prerequisite: CET 354.

CET 533 Database Management Systems. (3) F
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) S
Image segmentation and enhancement. Object recognition and modeling. Morphological operation for object recognition and measurement. Prerequisite: CET 300.

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

CET 554 Distributed Computing. (3) S
Topics in distributed systems, including communications, distributed operating systems, fault-tolerance, and performance issues. Prerequisites: CET 354, 386.

CET 556 Windows Programming. (3) F
Programming techniques in the MS Windows and X Window environments. Prerequisite: CET 256 or equivalent.

CET 557 Microcomputers and Applications. (3) F
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) S
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) F
Topics in real-time embedded operating systems such as synchronization, communications, file systems, and memory sharing. Prerequisites: CET 300, 386.

CET 583 Network Programming. (3) F
Generate user proficiency in writing C programs and scripts to control and administer a UNIX operating system network. Prerequisites: CET 473 and 488 *or* equivalents; C or C++ language.

CET 585 Digital Testing Techniques II. (3) F
Testing technology as applied to digital systems, boards, and chips. Lecture, lab. Prerequisite: CET 354.

CET 586 Digital Modeling Techniques. (3) S
Digital system modeling and simulation using hardware description languages. Prerequisites: CET 350, 354.

ELECTRONICS ENGINEERING TECHNOLOGY (EET)

EET 208 Electric Circuit Analysis I. (4) F, S
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 301 Electric Circuit Analysis II. (4) F, S
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 Microwave Technology. (4) A
Theory and applications of waveguides, transmission lines, impedance measurements and matching, microwave components, antennas, and fiber optics. Lecture, lab. Prerequisite: EET 301.

EET 310 Electronic Circuits I. (4) F, S
Multistage amplifier, analysis, and design using models and computer simulation. Lecture, lab. Prerequisite: EET 208.

EET 372 Communication Systems. (4) F, S
Systems analysis and design of AM, FM, PCM, and SSB communication systems. Noise and distortion performance of communication systems. Lecture, lab. Pre- or corequisites: EET 301, 310.

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

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

EET 406 Control System Technology. (4) S
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) F
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) F, S
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) A
Analysis and design of electronic circuits operating in a switching mode. Waveshaping, timing, and logic. Computer simulation. Lecture, lab. Prerequisites: CET 350; EET 301, 310.

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

EET 460 Power Electronics. (4) S
Analysis of circuits for control and conversion of electrical power and energy. Lecture, lab. Prerequisites: EET 301, 310, 407.

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

EET 478 Fiber Optic Communications. (3) S
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) F, S, SS
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 490 Electronics Project. (1–4) F, S, SS
Individual or small group projects in applied electronics, with emphasis on laboratory practice or hardware solutions to practical problems. Prerequisite: instructor approval.

EET 494 Special Topics. (3) F, S
(a) Data Analysis

EET 500 Research/Writing. (2) F, S
Designed to help master's students develop their projects and write the first three chapters of their projects. Lecture, seminar. Prerequisite: instructor approval.

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

EET 508 Digital Real-Time Control. (3) A
Sample data control techniques and applications to process control. Prerequisites: CET 354; EET 406.

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

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

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

EET 560 Industrial Electronics and Applications. (3) S
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) F
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) S
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) S
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 591 Graduate Seminar. (1) N

EET 593 Applied Project. (3) N

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MICROELECTRONICS ENGINEERING TECHNOLOGY (UET)

UET 331 Electronic Materials. (3) F
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) S
Fundamentals, applications, and practical aspects of vacuum systems and their uses in semiconductor fabrication. Prerequisite: UET 331.

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

UET 416 Monolithic Integrated Circuit Devices. (3) F
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) F
Laboratory practice in the fabrication of integrated circuits. Lab. Prerequisite: UET 331. Corequisite: UET 416.

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

UET 421 Applied Device Physics. (3) F
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) F
Fundamentals, applications, and techniques for the fabrication of integrated circuit masks. Prerequisite: UET 331.

UET 426 Software Tools for the Semiconductor Industry. (3) S
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) S
Packaging theory and techniques; hermetic and plastic assembly; thermal management; electrical characteristics and reliability. Prerequisites: ETC 340 and UET 331 *or* equivalents.

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

UET 485 Digital Testing Techniques I. (3) A
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 513 VLSI Circuit Design and Layout. (3) F
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) S
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) S
Theory, processing, fabrication, and manufacturing of hybrid microelectronics devices and products. Applications. Prerequisite: UET 331 or equivalent or instructor approval.

UET 521 Device Physics. (3) F
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) S
IC packaging theory and techniques; assembly techniques, material issues; thermal management; electrical performance and reliability. Lecture, lab. Prerequisites: ETC 340 and UET 331 *or* equivalents.

Department of Information and Management Technology

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PROFESSORS
DANEKE, DUFF, HILD, SADOWSKI, SCHILDGEN

ASSOCIATE PROFESSORS
GROSSMAN, HIRATA, HUMBLE, MATSON, OLSON, PETERSON

SENIOR LECTURER
WILSON

LECTURER
DOLIN

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 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 three concentrations for the graduate degree: environmental technology management, information technology, 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

your 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
IMC	233	Desktop Publishing and Infographics	3
IMC	331	Quality Assurance	3
IMC	346	Management Dynamics	3
IMC	396	Professional Orientation	1
IMC	470	Project Management	3
Total			17

Environmental Technology Management Concentration. The environmental technology management concentration provides graduates entering the field of industrial and hazardous waste management with the abilities and skills required to address environmental challenges. Graduates are prepared to conduct site assessments, select technologies for soil and ground water remediation, and design solutions to environmental problems for industries, regulatory agencies, and consulting firms.

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 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 communications, hazardous materials and waste management, computer graphics, safety and health, human resource management, mortuary science, 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.

Information Technology Concentration. The information technology concentration prepares students for positions in the communication and information technology industry. Students are prepared in technical/digital media production; information management; printing and publishing; operations management; quality assurance; customer service and marketing; digital imaging; computer graphics; 3D modeling, technical graphics and illustration, rendering and animation/special effects; Internet/Intranet operations; and computer-based training. Graduates understand seamless communications from traditional print to digital/multimedia, Web design and development, database management, and corporate communications. The information technology concentration has two areas of study: graphic communications, and interactive computer graphics.

Graphic Communications Area of Study. The purpose of the graphic communications area of study is to prepare students for a wide variety of professional positions in the printing and graphic communications industry. This area of study offers a blend of technological and managerial knowledge and skills. The program has been specifically designed to produce graduates with a complete understanding of graphic image processing, image presentation, and the use of electronic image manipulation and storage techniques. Graduates have the skills to address the requirements of the print and image manipulation environments. They also are prepared to exploit opportunities and competitive challenges taking place in the digital information industry. Each graduate is also prepared to manage the turbulent economic and human relations concerns associated with modern business. Each student is exposed to practical and effective problem-solving techniques currently used in industry. As a prerequisite for graduation, students are expected to acquire job-related industry experience. Typical career paths may include operations management, sales and marketing, and technology.

Interactive Computer Graphics Area of Study. The purpose of the interactive computer graphics area of study is to prepare students for entry into the diverse field of computer graphics. The area of study is focused on computer applications as a foundation in technological processing and dissemination of information. Modern information management includes discipline-specific applications of graphic analysis, communication, databases, design, documentation, image generation, modeling, programming, visualization, and multimedia presentation. Graduates are qualified computer graphics technologists who have acquired extensive knowledge and technical competency, thereby preparing them to advance into professional positions in the industry. The courses are industry responsive and evolve at the fast

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pace of the technology. Typical career paths may include animation and multimedia creation; applications management and supervision; information process design (specialty areas such as electronics, advertising/graphics design, process simulation, rendering and illustration, and computer-aided design and drafting); graphics systems and database analysis; technical graphics and publication; and testing and implementation.

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 specialization. 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.

CGC	310	Computer Graphics Programming (C++) *CS*	3
		or CGC 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.

COMPUTER GRAPHIC COMMUNICATIONS (CGC)

CGC 135 Graphic Communications. (3) F, S
Introduction to the technologies involved in the design, image generation, transmission, and industrial production of multiple images for consumer utilization. Lecture, lab, field trips.

CGC 210 Creative Thinking and Design Visualization. (3) F
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.

CGC 212 Computer-Aided Design and Drafting (CADD). (3) S
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 instructor approval. *General Studies: CS.*

CGC 215 Introduction to Graphics Programming. (3) F
Introduction to analyzing, planning, and executing graphic programs using industry-standard programming tools. Lecture, lab. Prerequisite: ETC 100.

CGC 237 Design for Digital Imaging. (3) S
Introduction to design principles, typography, and document development of graphic images for printing, CD-ROM databases, and World Wide Web applications. Lecture, lab. Prerequisite: CGC 135 or equivalent.

CGC 310 Computer Graphics Programming (C++). (3) F, S
Computer graphics software programming techniques and Windows applications in C++. 2D and 3D graphics: object-oriented programming, transformations, scaling, and database concepts. Lecture, lab. Prerequisite: ETC 100 or equivalent C language programming course or instructor approval. *General Studies: CS.*

CGC 311 Communication and Media Ethics, Law, and Copyright. (3) F
Study and analysis of copyright and intellectual property laws, regulations, and ethical standards, including ownership, piracy, security, and distribution issues. Lecture, lab. Prerequisite: TWC 200.

CGC 312 3D Computer Graphics Modeling and Representation. (3) F
3D solid modeling applications: concepts, techniques, database structures, modeling strategies, assemblies, mass-properties analysis, kinematics, data file exchange specifications, and representation. Lecture, lab. Prerequisite: CGC 212 or instructor approval. *General Studies: CS.*

CGC 313 Technical Illustration and Photorealistic Rendering. (3) F
Computer-generated graphics for technical illustration and design presentation: axonometric and perspective drawing; shading, shadowing, texture mapping; and photorealistic rendering. Lecture, lab. Prerequisite: CGC 312 or instructor approval.

CGC 314 Multimedia Design, Planning, and Storyboards. (3) S
Studying the creative and conceptual process of content selection, planning, designing, flowcharting, storyboarding, proposing, configuring, prototyping, and presenting multimedia projects. Lecture, lab. Prerequisites: CGC 210 and 237 and 311 *or* instructor approval.

CGC 332 Image Assembly and Plate Preparation. (3) F
Imposition of film or digital images for reproduction using various image carriers direct-to-press technology. Lecture, lab, field trips. Prerequisite: CGC 135.

CGC 333 Printing Technology. (3) S
Theory and application of sheet and web press technology for offset-lithography, flexography, screen process, and digitial printing. Lecture, lab. Prerequisite: CGC 135 or instructor approval.

CGC 334 Image Capture and Conversion. (3) F
Theory and application of image capture techniques used for all copy formats and conversion processes required for reproduction or dissemination. Lecture, lab. Prerequisite: CGC 135.

CGC 352 Technical Presentations and Visual Literacy. (3) S
Planning, technology, and delivery of individual and group presentations for impromptu, informative, and persuasive applications. Prerequisite: ENG 102.

CGC 410 Graphics User Interfaces and Database Programming (C++). (3) F, S
GUI design and programming: Window standards, protocols, tools and files; use of project managers, database components, visual libraries and OOPS. Lecture, lab. Prerequisites: CGC 310 (or equivalent C++ language programming course) and 314 *or* instructor approval.

CGC 411 Computer Animation and Special Effects (F/X). (3) F
2D and 3D computer animation principles and methods: project planning, scripting; character generation; storyboards; and modeling, lighting, rendering, special effects, and plug-in techniques. Lecture, lab. Prerequisites: CGC 313 and 314 *or* instructor approval.

CGC 412 Multimedia Authoring, Scripting, and Production. (3) F
Production of multimedia projects using authoring software applications, including project management, client considerations, interactive navigation, cross-platforming, testing, and documentation issues. Lecture, lab. Prerequisites: CGC 314 and 352 and 411 *or* instructor approval.

CGC 413 Professional Portfolio Design and Presentation. (3) S
Digital media portfolio: planning, targeted audience(s), design appearance, authoring, packaged media formats, media presentation formats, production, marketing, and copyright considerations. Lecture, lab, field trips. Prerequisites: CGC 411 and 412 *or* instructor approval.

CGC 414 Web Site Design and Internet/Web Technologies. (3) S
Web site design, authoring, standards, protocols, tools, and development techniques; HTML, CGI and Perl coding; Web servers, browsers, interfaces and URLs. Lecture, lab. Prerequisites: CGC 311 and 314 *or* instructor approval.

CGC 415 Computer Graphics: Business Planning and Management Issues. (3) S
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: CGC 412 or instructor approval.

CGC 417 JavaScript, VBScript, HTML, and ActiveX Programming. (3) S
Use of JavaScript, VBScript, HTML, and ActiveX software programs and standards to create customized, interactive, Internet/Web site applications. Lecture, lab. Prerequisites: CGC 410 and 412 and 414 *or* instructor approval.

CGC 433 Graphic Production Processes. (3) N
Systematic production planning experience involving a mock enterprise and defined management responsibilities. Lecture, lab. Prerequisites: CGC 333, 334.

CGC 435 Web Management and E-Commerce. (3) N
Internet Web site management, security, online databases, and new E-commerce business models. Lecture, lab. Prerequisite: CGC 237. Corequisite: CGC 414.

CGC 436 Gravure Technology. (3) S
In-depth study of the market profile and production sequences related to the gravure method of printing. Prerequisite: CGC 135 or instructor approval.

CGC 437 Color Reproduction Systems. (3) F
Scientific analysis for the engineering of color reproduction systems and color models used in the graphics industry. Prerequisite: CGC 334 or instructor approval.

CGC 441 Graphic Information Systems. (3) N
Graphical information systems common to the workplace. Includes graphic user interfaces for online databases, geographic, and management information systems. Lecture, lab. Prerequisites: ETC 100; IMC 233.

CGC 494 Special Topics. (3), F, S
(a) Computer Systems Applications

CGC 510 Computer Graphics Programming: Design, Customization, and Development. (3) N
Advanced design, development, and documentation of Windows application programs, including GUIs, OOP, RAD, API, DLLs, and GDI in C++ and Java. Lecture, lab. Prerequisites: CGC 310 and 410 (or equivalent GUI/OOP course) *or* instructor approval.

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CGC 511 Procedural and Physically Based Character Animation. (3) N
Creative and aesthetic design, storyboarding, planning, development, and documentation of constraint-based, procedural, and interactive character, avatar-actor, and product animations/simulations. Lecture, lab. Prerequisites: CGC 411 and 510 (or equivalents) *or* instructor approval.

CGC 512 Multimedia-Based Education and Training. (3) F, SS
Creative design, planning, development, documentation, and production of technology-based learning and multimedia-based education and training materials and programs. Lecture, lab. Prerequisites: CGC 412 and 413 (or equivalents) *or* instructor approval.

CGC 514 Interactive Virtual Reality Environments and Technologies. (3) N
Research and development of passive, exploratory, and interactive VR environments in education and training, infotainment, Internet/Web, and VRML programming and simulation arenas. Lecture, lab, field trips. Prerequisites: CGC 510 and 511 (or equivalents) *or* instructor approval.

CGC 537 Current Issues in Quality Assurance. (3) N
Directed group study of selected issues relating to quality assurance in the printing, publishing, and information industry.

CGC 538 Personnel Development for the Graphics Industry. (3) N
Employee training and development specific to production and management in the graphics industry.

ENVIRONMENTAL TECHNOLOGY MANAGEMENT (ETM)

ETM 301 Environmental Management. (3) F
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) N
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) F, S
Exploration of environmental laws, regulations, and directives. Air, land, and water are addressed. Prerequisite: ETM 301.

ETM 360 Introduction to Emergency Management. (3) F
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) S
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) S
Specific computer programs will be explored 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) F
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) F, S
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) S
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) F, S
Examines reactions, transport, and fates of hazardous chemicals in water, soil, air, and living organisms. Prerequisites: CHM 113 and 115 *or* CHM 114; MAT 170.

ETM 407 Occupational Hygiene. (3) S
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) SS
Addresses theory and management techniques for emergency preparedness, including mitigation, preparedness, response, and recovery. Pre- or corequisite: ETM 301.

ETM 426 Environmental Issues. (3) S
Exploration of 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) SS
Emphasis on technological and economic pressures experienced by developing countries. Prerequisite: ETM 301.

ETM 460 Incident Management Systems and Emergency Operations Center. (3) F
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) N
Provides student with an understanding of techniques for in-house or on-site planning as well as community planning.

ETM 468 Simulation and Exercising. (3) N
Requirements, planning, conduct, and critique of exercises related to emergency planning. Emphasis on realism using moulage and props.

ETM 494 Special Topics. (3) S
(a) Bioremediation
Technical-regulatory and policy issues emanating from minetailing and animal waste. Lecture, case studies.

ETM 501 Principles of Hazardous Materials and Waste Management. (3) F
Foundation for courses in curriculum. Topics include definitions of toxic and hazardous substances and wastes, RCRA classification, and OSHA criteria. Pre- or corequisites: CHM 113 and 115 *or* CHM 114.

ETM 502 Regulatory Framework for Toxic and Hazardous Substances. (3) F
Examination of 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) S
Interaction of chemicals with life and environment. Mechanisms of toxic action, dose-response relationships, toxicity testing models, predictive toxicology, and epidemiology. Prerequisites: CHM 113 and 115 *or* CHM 114.

ETM 504 Technology for Storage, Treatment, and Disposal of Hazardous Materials. (3) F
Current and state-of-the-art technologies and future trends for storage, treatment, and disposal of hazardous materials and waste. Prerequisites: CHM 113 and 115 *or* CHM 114; ETM 501.

ETM 505 Quantitative Analysis and Practical Laboratory Techniques. (3) F, S
EPA methodologies for sampling and analysis of soils and water. Includes quality assurance and regulatory requirements. Lab will be arranged off site. Prerequisites: CHM 113 and 115 (or CHM 114), 231; MAT 170.

ETM 506 Chemistry of Hazardous Materials. (3) F
Chemistry and toxicology of hazardous chemicals. Topics include proper handling, storage, transportation, and disposal. Prerequisites: CHM 113 and 115 (or CHM 114); MAT 170. Corequisite: CHM 231.

ETM 507 Industrial Hygiene. (3) N
Emphasis on chemical hazards in industrial settings. Topics include recognizing and measuring hazards, control techniques, and regulatory standards. Prerequisites: CHM 113 and 115 (or CHM 114); MAT 170.

ETM 522 Air Pollution and Toxic Chemicals. (3) F
Examines issues in the measurement analysis and control of toxic chemicals in air pollution. Prerequisites: CHM 113 and 115 (or CHM 114); ETM 501; MAT 170.

ETM 523 Soils and Groundwater Contamination. (3) F
Theoretical and practical hydrogeology as it applies to cleaning up contamination. Investigative techniques, monitoring, risk assumptions, and assessment methodology. Prerequisites: CHM 113 and 115 (or CHM 114); ETM 501; MAT 170. Corequisite: CHM 231.

ETM 524 Emergency Preparedness, Response, and Planning for Hazardous Materials. (3) SS
In-house or on-site emergency response contingency planning. Preemergency assessment, resources for cooperation, equipment requirements, and coordination with other agencies. Prerequisites: CHM 113 and 115 (or CHM 114); ETM 501; MAT 170.

ETM 525 Risk Assessment for Hazardous Materials. (3) S
Application of the risk assessment process in situations ranging from hazardous facilities regulation to toxic substances in the environment. Prerequisites: CHM 113 and 115 (or CHM 114); ETM 501; MAT 170.

ETM 526 Current Environmental Technology Issues. (3) F
In-depth study of current issues in environmental technology facing both the private and public sectors.

ETM 527 Environmental/Resources Regulations Concepts. (3) S
Development of 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) N

ETM 592 Research. (1–12) N

ETM 598 Special Topics. (3) S
(a) Advanced Bioremediation
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 MANAGEMENT (FSM)

FSM 304 Fire Personnel Management. (3) F
Topics include promotion, personnel development, career and incentive systems, validation of physical requirements, managerial and supervisory procedures.

FSM 305 Quality Emergency Services. (3) N
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) N
Examination and evaluation of the techniques, procedures, programs, and agencies involved in preventing fires.

FSM 363 Computer Applications in Emergency Management. (3) S
Specific computer programs will be explored 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) N
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) S
Study of legal and political considerations that affect the decision making of fire service managers.

FSM 425 Fire Service Administration. (3) F
Presentation of modern management and planning techniques that apply to organizing a fire department.

FSM 460 Incident Management Systems and Emergency Operations Center. (3) F
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.

INFORMATION AND MANAGEMENT CORE (IMC)

IMC 233 Desktop Publishing and Infographics. (3) F, S
Introduction to software and hardware used for desktop publishing and infographics. Lecture, lab.

IMC 331 Quality Assurance. (3) S
Instrumentation and methodologies for materials testing and quality control in various manufacturing processes. Lecture, field trips.

IMC 346 Management Dynamics. (3) F, S
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) F, S
Senior advisement, industry presentations, and career counseling.

IMC 470 Project Management. (3) S
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 584 Internship. (1–12) F, S

IMC 592 Research. (1–12) F, S

IMC 593 Applied Project. (1–12) F, S

IMC 599 Thesis. (1–12) F, S

INDUSTRIAL TECHNOLOGY MANAGEMENT (ITM)

ITM 343 Occupational Safety and Ergonomics. (3) F
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) S
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) F, S
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 Industrial Laws, Contracts, and Regulations. (3) F
Review of city, state, county, and federal laws that affect industrial and construction operations, materials, supplies, and acquisition procedures. Prerequisite: IMC 346.

ITM 430 Ethical Issues in Technology. (3) S
Topics in social responsibility for industrial technology and engineering. Prerequisite: IMC 346.

ITM 440 Introduction to International Business. (3) S
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) F, S, SS
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 Materials Control. (3) N
Activities of material handling, including purchasing, receiving, warehousing, traffic, plant layout, inventory, and production control and shipping relating to technical procedures. Prerequisites: IMC 346; ITM 343.

ITM 452 Industrial Human Resource Management. (3) F
Concepts and practices of human resource management in a global industrial environment. Prerequisite: IMC 346.

ITM 453 Safety Management. (3) N
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) N
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) S
Introduction to labor relations, unions, federations, collective bargaining, grievances, and labor legislation. Prerequisites: IMC 346; ITM 344.

ITM 461 Operations Management. (3) F
Introduction to supervisory principles as applied to production of goods and services. Prerequisites: IMC 346; ITM 344.

NOTE: For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 87. For graduation requirements, see "University Graduation Requirements," page 83. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 60.

ITM 480 Organizational Effectiveness. (3) S
Human aspects of supervisory behavior in the industrial setting and how they influence efficiency, morale, and organizational practices. Prerequisite: IMC 346.

ITM 501 Managerial Economics. (3) N
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) N
Examination of corporate financial and managerial accounting systems, budgeting, and financial policy, using microcomputers to analyze, forecast, and report information.

ITM 503 Marketing Management. (3) N
Modern methods and industrial case studies of planning, pricing, promoting and distributing, goods and services in the global marketplace. Prerequisites: ITM 480 (or equivalent); instructor approval.

ITM 504 Law and Ethics for Technical Professionals. (3) N
Analysis of 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) N
Analysis of entrepreneurial dynamics and technology development, methods of research and development management, new technology implementation, and start-up organization. Prerequisites: ITM 480 (or equivalent); instructor approval.

ITM 540 International Management. (3) N
Practices and procedures for effective management of multinational business organizations, including partnerships, joint ownerships, and global subsidiaries.

ITM 549 Research Techniques and Applications. (3) F, S
Selection of research problems, analysis of literature, individual investigations, preparing reports, and proposal writing. Prerequisite: STP 420 or equivalent.

ITM 550 Industrial Training and Development. (3) N
Training techniques and learning processes. Planning, developing, evaluating, and managing industrial and governmental programs. Prerequisite: ITM 480.

ITM 552 Global Management Philosophies. (3) N
Analysis and comparison of significant supervision philosophies developed in various industrial nations and their potential application in the United States.

ITM 560 Managerial Decision Making. (3) F
Analysis of 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) S
Planning, organizing, coordinating, and controlling staff and project groups to accomplish the project objective.

ITM 593 Applied Project. (1–12) N

ITM 598 Special Topics. (1–4) N
(a) Quantitative Research Analysis

Department of Manufacturing and Aeronautical Engineering Technology

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PROFESSORS
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ASSISTANT PROFESSOR
RAJADAS

LECTURER
OKONKWO

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 intense 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 to is prepare students for employment in areas such as aircraft and aerospace vehicle design, aerospace manufacturing, applied thermodynamics, fluid mechanics and aerodynamics, propulsion, and wind tunnel testing.

ACCREDITATION

The B.S. degree in Manufacturing Engineering Technology and the B.S. degree Aeronautical Engineering Technology are accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc. (See “Accreditation,” page 578, for more information.)

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 87), 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
Total	128

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
Total		52

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 metalworking industries. Accordingly, this concentration is intended to prepare students to meet the responsibilities in planning the processes of production, developing the tools and machines, and integrating the facilities of production or manufacturing.

Students may select course work that focuses on the implementation of design and manufacturing strategies that favorably impact the environment before manufacturing and during manufacturing. Students address design, materials, and manufacturing problems with a focus on 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
Total		11

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
Total		11

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
Total	128

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	230	Engineering Materials and Processing 3
MET	300	Applied Material Science 4

NOTE: For the General Studies requirement, courses, and codes (such as L, SQ, C, and H), see "General Studies," page 87. For graduation requirements, see "University Graduation Requirements," page 83. For an explanation of additional omnibus courses offered but not listed in this catalog, see "Classification of Courses," page 60.

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
One CET course in a programming language....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 specialization. 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 150 Introduction to Aeronautical Engineering Technology. (1) F
Introduction to the fields of aeronautical engineering and engineering technology.

AET 210 Measurements and Testing. (3) F
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) S
Basic physics of flight. Principles and design of aircraft systems and powerplants. Lecture, lab. Prerequisite: AET 210.

AET 300 Aircraft Design I. (3) F, S
Basic applied aerodynamics, propeller performance, and airplane performance analysis. Prerequisites: AET 210 and 215 (or AMT 280 and 287); ETC 100; MAT 260; PHY 112, 114.

AET 310 Instrumentation. (3) F
Measurement systems, components, system response, and the characteristics of experimental data. Methods of collecting and analyzing data. Lecture, lab. Prerequisites: ETC 201; MAT 261. Pre- or corequisite: MET 313.

AET 312 Applied Engineering Mechanics: Dynamics. (3) F, S
Masses; motion kinematics; dynamics of machinery. Prerequisites: ETC 211; MAT 261.

AET 396 Aerospace Professional Orientation. (1) F
Career focus for Aeronautical Engineering Technology students. Familiarization with the aerospace industry. Prerequisite: junior standing.

AET 409 Nondestructive Testing and Quality Assurance. (1) N
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. Prerequisite: AMT 280 or MET 230.

AET 415 Gas Dynamics and Propulsion. (3) S
Introduction to compressible flow, internal and external flow, and aerothermodynamic analysis of propulsion systems. Prerequisites: ETC 340; MAT 262.

AET 417 Aerospace Structures. (3) F
Analysis and design of aircraft and aerospace structures. Shear flow. Semimonocoque structures. Effects of dynamic loading. Prerequisites: AET 300, 312, 420; MAT 262; MET 313.

AET 420 Applied Aerodynamics and Wind Tunnel Testing. (4) F
Introduction to viscous and inviscid flow and their relationship to aircraft lift and drag. Wind tunnel design and testing. Lecture, lab. Prerequisites: AET 300; MAT 262.

AET 432 Applied Heat Transfer. (3) F
Steady-state and transient conduction, heat transfer by convection and radiation. Applications of heat transfer. Prerequisite: MET 434 or instructor approval.

AET 487 Aircraft Design II. (3) S
Basic aerodynamics and airplane performance analysis methods applied to practical design project. Prerequisite: AET 300.

AET 490 Advanced Applied Aerodynamics. (3) N
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 524 Application of Heat Transfer. (3) F
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) S
Mechanics and thermodynamics of propulsion systems. Solid, liquid propellant rocket design performance. Electrical nuclear propulsion systems. Space missions. Prerequisites: AET 420 (or MET 434) and 415 *or* instructor approval.

AET 560 Numerical Methods in Engineering Technology. (3) N
Analyzing problems in physical sciences, modeling of physical problems, perturbation techniques, curvefitting, data analysis, numerical solutions, ordinary and partial differential equations.

MANUFACTURING ENGINEERING TECHNOLOGY (MET)

MET 230 Engineering Materials and Processing. (3) F, S, SS
Materials, their structures, properties, fabrication characteristics, and applications. Material forming, joining, and finishing processes. Automation and quality control.

MET 231 Manufacturing Processes. (3) F
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 300 Applied Material Science. (4) F
Principles of materials science emphasizing concepts relevant to manufacturing and use. Discuss metals, polymers, ceramics, and composites. 3 hours lecture, 1 hour lab. Prerequisite: MET 231 or instructor approval.

MET 302 Welding Survey. (3) F
Theory and application of industrial welding processes; introductory welding metallurgy and weldment design; SMAW, GTAW, GMAW, Oxyacetylene, and brazing experiences. Lecture, lab. Prerequisite: upper-class standing.

MET 313 Applied Engineering Mechanics: Materials. (4) F, S, SS
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) S
Introduction to design of machines and structures, with emphasis on layout design drawing. Basics of gears, cams, fasteners, springs, bearing linkages, cylindrical fits, flat pattern development, and surface finish requirements emphasized. Prerequisite: MET 313.

MET 341 Manufacturing Analysis. (3) F
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) S
Industrial processing as applied to low, medium, and high volume manufacturing. Basic and secondary processing, fastening and joining, coating, and quality control. Lecture, lab.

MET 344 Casting and Forming Processes. (3) S
Analysis of various forming processes to determine load requirements necessary for a particular metal forming operation. This information is used to select equipment and design tooling. Metal casting processes and design of castings. Introduction to powder metallurgy. Prerequisites: MET 300 and 313 *or* instructor approval.

MET 345 Advanced Manufacturing Processes. (3) S
Material removal processes emphasizing advanced turning, milling, and machinability studies using cutting tools. CNC programming for machining and turning centers. Lecture, lab. Prerequisites: MET 231; 343.

MET 346 Numerical Control Point to Point and Continuous Path Programming. (3) N
Methods of programming, set up, and operation of numerical control machines, emphasizing lathe and mill systems. Lecture, lab. Prerequisite: MET 231.

MET 396 Manufacturing Professional Orientation. (1) F
Career focus for Manufacturing Engineering Technology students. Familiarization with the manufacturing industry. Prerequisite: junior standing.

MET 401 Quality Assurance. (3) F
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 416 Applied Computer-Integrated Manufacturing. (3) F
Techniques and practices of computer-integrated manufacturing, with an emphasis on computer-aided design and computer-aided manufacturing. Prerequisite: MET 346 or instructor approval. *General Studies: CS.*

MET 432 Thermodynamics II. (3) S
Thermodynamics of mixtures. Combustion process. Applications of thermodynamics to power and refrigeration cycles. Prerequisite: ETC 340.

MET 433 Thermal Power Systems. (4) N
Analysis of gas power, vapor power, and refrigeration cycles. Components of air conditioning systems. Direct energy conversion. Psychrometry. Analysis of internal combustion engines and fluid machines. Lecture, lab. Prerequisite: MET 432 or instructor approval.

MET 434 Applied Fluid Mechanics. (3) N
Fluid statics. Basic fluid flow equations. Viscous flow in pipes and channels. Compressible flow. Applications to fluid measurement and flow in conduits. Prerequisite: ETC 340.

MET 435 Alternate Energy Sources. (3) F
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) N
The application of thermodynamics and fluid mechanics to the analysis of machinery design and power cycle performance predictions. Prerequisite: MET 432 or instructor approval.

MET 438 Design for Manufacturing II. (4) F
Application of mechanics in design of machine elements and structures. Use of experimental stress analysis in design evaluation. Lecture, lab. Prerequisite: AET 312 or MET 331 or instructor approval.

MET 442 Specialized Production Processes. (3) F
Nontraditional manufacturing processes, emphasizing EDM, ECM, ECG, CM, PM, HERF, EBW, and LBW. Prerequisite: MET 231.

MET 443 N/C Computer Programming. (3) F
Theory and application of computer-aided N/C languages with programming emphasis with APT and suitable postprocessors. Lecture, lab. Prerequisite: MET 346 or instructor approval.

MET 444 Production Tooling. (3) F
Fabrication and design of jigs, fixtures, and special industrial tooling related to manufacturing methods. Lecture, lab. Prerequisite: MET 345.

MET 448 Expert Systems in Manufacturing. (3) F
Introduction to expert systems through conceptual analysis, with an emphasis on manufacturing applications. Prerequisite: MET 231.

MET 451 Introduction to Automation. (3) F
Introduction to automation. Topics included are 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) N
Robotic workcell design, including end effectors, parts presenters, and optimum material flow. Prerequisite: MET 451 or instructor approval.

MET 453 Robotic Applications. (3) S
Lab course utilizing robots and other automated manufacturing equipment to produce a part. Students are required to program robots, as well as interface the robots with other equipment. Prerequisite: instructor approval.

MET 460 Manufacturing Capstone Project I. (3) F
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.

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MET 461 Manufacturing Capstone Project II. (3) S
Small-group projects applying manufacturing techniques, with an emphasis on demonstrating state-of-the-art technology. Lecture, lab. Prerequisite: MET 460 or instructor approval.

MET 494 Special Topics. (1–3) F, S
Topics such as the following are offered:
(a) Consumer Manufacturing
(b) Manufacturing Process Simulation
(c) Packaging Design

MET 501 Statistical Quality Control Applications. (3) S
SPC problem-solving techniques for implementation in industrial setting, design and analysis of experiments. Prerequisite: instructor approval.

MET 502 Specialized Production Processes. (3) F
Specialized production processes including lasers, electronic beam, abrasive and water jet, and chemical and thermal processes. Prerequisite: instructor approval.

MET 504 Applications of Production Tooling. (3) F
Design and fabrication of fixtures, jigs, templates, and specialized industrial tooling for manufacturing. Lecture, lab. Prerequisite: instructor approval.

MET 507 Manufacturing Enterprise. (3) F, S
Organization and project management of cellular manufacturing methods, including IIT and lean manufacturing. Prerequisite: instructor approval.

MET 512 Introduction to Robotics. (3) N
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) F
Analysis and design of hard and flexible automation systems. Particular attention to material handling technology. Prerequisite: instructor approval.

MET 514 N/C Computer Programming. (3) S
Point-to-point and continuous path control system programming emphasizing metal removal procedures and processes. Lecture, lab. Prerequisite: instructor approval.

MET 517 Applied Computer-Integrated Manufacturing. (3) F
Techniques and practices of computer-integrated manufacturing, with an emphasis on computer-aided design and computer-aided manufacturing. Prerequisite: MET 346 or instructor approval.

MET 560 Fundamentals of Security Engineering. (3) F
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) S
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 592 Research. (1–12) N

MET 593 Applied Project. (1–12) N

The vertical diffusion furnace was the first piece of equipment to be delivered and installed in the Teaching Factory, located in the Technology Center at ASU East.

Tim Trumble photo