# ASU East Full-page Photo

ASU East Student Union fountain.

Dave Tevis photo

# ASU East

**Charles E. Backus, Ph.D.**
*Provost*

Arizona State University's third campus, ASU East, opened at the Williams Campus in the fall of 1996, serving more than 1,000 students in degree programs offered by the College of Technology and Applied Sciences and School of Agribusiness and Resource Management. These unique "get down to business" programs are offered at no other Arizona campus, and they are tailored to help students develop knowledge and skills specifically needed in the businesses and industries of the 21st century. In 1997, East College was created to provide support courses for existing programs and to generate new degree programs at ASU East.

Students admitted to ASU East programs can take courses at ASU Main and ASU West. They can also take advantage of an exciting educational innovation at the Williams Campus. ASU East has joined with Chandler-Gilbert Community College (CGCC) in the New Partnership in Baccalaureate Education that allows students to graduate in four years with an ASU baccalaureate degree earned entirely at the Williams Campus.

Benefits of the partnership include:

1. CGCC provides lower-division general education, general interest, and major prerequisite courses, which transfer automatically to ASU East each semester as direct equivalents of ASU courses;
2. ASU East provides both lower- and upper-division courses in the major and upper-division general interest courses;
3. all students in the partnership have the status and all the privileges of ASU students. A no-cost/no-credit course, JAC 001, is used to maintain ASU status for ASU East students enrolled solely in CGCC courses;
4. ASU East students never pay more than ASU tuition and may pay less, depending on the combination of ASU and CGCC classes they are taking;
5. ASU East students can participate in an innovative first-year curriculum combining introductory courses in the major with required general studies courses in an efficient, integrated "block schedule";
6. ASU East and CGCC have a single registration form, a unified payment system, and financial aid agreement; and
7. ASU East and CGCC together provide advising, tutoring, library services, and a computing center as well as residence life, shared student life activities and recreation.

The New Partnership in Baccalaureate Education combines the proven strengths of ASU East and Chandler-Gilbert Community College into a powerful student-centered educational experience.

ASU East, a residential campus, is transforming the facilities inherited from Williams Air Force Base into an academic village. The campus includes excellent educational facilities: modern classrooms and laboratories, a 21st century electronic library, and state-of-the-art computer equipment. ASU East offers unique residential opportunities. Faculty, staff, and students live, teach, work, and learn together in a growing, diverse academic community offering a choice of traditional residence halls or two- to five-bedroom homes. ASU students may live on East, Main, or off campus while attending classes at any of the campuses. Other amenities include a dining hall, bookstore, campus union, free parking, and abundant recreational facilities.

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. A shuttle service provides transportation between ASU East and ASU Main. An additional shuttle is available for transportation from ASU Main to ASU West. The 600-acre ASU East campus is easily accessible via major interstate routes. Please see map on page 459.

For more information, call 602/727–EAST (3278) or check the Web site, 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).

### 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 "Administrative and Academic Personnel," (ASU East) page 461 and "Academic Organization," page 9.

## ADMISSION

**Nondegree Students**. Nondegree students may take courses at ASU East according to the special provisions on page 62.

**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 602/727–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 Registrar's Office 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 will apply to their major and graduation requirements. Students should be aware that certain requirements (e.g., the minimum number of upper-division semester hours to graduate) may differ among campuses.

### Transfer Credit

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

## 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

**Bachelor of Applied Science.** ASU East offers the B.A.S. degree for students who have completed an A.A.S. degree. For further information contact Dale Palmgren at 602/727–1874.

**Bachelor of Science, Master of Science, Master of Technology.** Refer to the "ASU East Degrees, Majors, and Concentrations" table, page 437.

### 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.

**Academic Advising**

| College or School | Location | Telephone | Days | Hours |
|---|---|---|---|---|
| College of Technology and Applied Sciences | CNTR 10 | 602/727–1252 | Mon.–Fri. | 8:00–5:00 Appointments are recommended. |
| East College | CNTR 30 | 602/727–1041 | Mon.–Fri. | 8:00–5:00 Appointments are recommended. |
| School of Agribusiness and Resource Management | CNTR 20 | 602/727–1585 | Mon.–Fri. | 8:00–5:00 Appointments are recommended. |
| University Honors College | MCL 112* | 602/965–2359 | Mon.–Fri. | 8:00–5:00 Appointments are recommended. |

* The University Honors College is located at ASU Main.

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

# East College

**David E. Schwalm, Ph.D.**
***Dean***
**(CNTR 30) 602/727–1028**
**www.asu.edu/east/ecollege/eastcoll.html**

## 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 agribusiness and technology programs;
2. to coordinate the New Partnership in Baccalaureate Education with Chandler-Gilbert Community College to provide lower-division General Studies and major prerequisite courses for ASU East students;
3. to offer an academic home for students who choose the unique social and academic environment of ASU East but do not wish to declare a major immediately; and
4. to be the home for all new degree programs developed at ASU East outside of agribusiness and technology. The first new programs should be available in the fall of 1998.

Through the New Partnership in Baccalaureate Education, ASU East students take First-Year Composition courses and lower-division courses that meet ASU General Studies requirements in mathematics, science, social and behavioral sciences, arts and humanities, and literacy, along with the awareness areas: historical awareness, global awareness, and cultural diversity. These courses are available in an innovative integrated first-year curriculum designed to foster student academic success. Students can take major prerequisite courses, introductory foreign language courses, and other lower-division courses of general interest through the partnership. East College also offers popular upper-division courses in anthropology, art, communication, economics, English, history, mathematics, music, philosophy, political science, psychology, religious studies, sociology, and women's studies.

## ASU East Degrees, Majors, and Concentrations

| Major | Degree | Administered by |
|---|---|---|
| **Baccalaureate Degrees** | | |
| Aeronautical Engineering Technology | B.S. | Department of Manufacturing and Aeronautical Engineering Technology |
| Aeronautical Management Technology*<br>Options: airway science flight management, airway science management | B.S. | Department of Aeronautical Management Technology |
| Agribusiness<br>Concentrations: general agribusiness, preveterinary medicine | B.S. | School of Agribusiness and Resource Management |
| Applied Science | B.A.S. | Bachelor of Applied Science Advisory Committee |
| Electronics Engineering Technology*<br>Options: computer systems, electronic systems, microelectronics, telecommunications | B.S. | Department of Electronics and Computer Engineering Technology |
| Industrial Technology*<br>Options: environmental technology management, industrial technology management, information technology | B.S. | Department of Information and Management Technology |
| Manufacturing Engineering Technology*<br>Emphases: manufacturing engineering technology, mechanical engineering technology | B.S. | Department of Manufacturing and Aeronautical Engineering Technology |
| **Graduate Degrees** | | |
| Agribusiness<br>Concentrations: agribusiness management and marketing, food quality assurance | M.S. | School of Agribusiness and Resource Management |
| Technology<br>Concentrations: aeronautical engineering technology, aeronautical management technology, electronics and computer engineering technology, graphic communications technology, industrial management and supervision, manufacturing engineering technology, mechanical engineering technology, welding engineering technology | M.Tech. | College of Technology and Applied Sciences |

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

# College of Technology and Applied Sciences

**Albert L. McHenry, Ph.D.**
***Dean***
**(CNTR 10) 602/727–1874**
**www.asu.edu/east/tech**

## PURPOSE

The College of Technology and Applied Sciences (CTAS) helps students develop knowledge and skill in technological fields which qualify them for career positions and leadership responsibility in industry, government and commercial enterprise. Each student is guided to select a major which 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 several programs leading to the B.S. degree (see table on page 437). The college also offers the Master of Technology (M.Tech.) degree. For more information on courses, faculty, and programs in the M.Tech. degree see the *Graduate Catalog*.

## ACCREDITATION

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

## ADMISSION

The College of Technology and Applied Sciences admits first-year students who meet the undergraduate admission requirements of Arizona State University. See "Undergraduate Admission" on pages 59–66. High school precalculus, physics, and chemistry are recommended. Transfer applicants must meet the university requirements for transfer students as specified on page 62 with the exception that Arizona resident transfer students must have a 2.25 GPA. Students admitted to 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 will be 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 are in good standing in the university.

Transfer students from other institutions must meet the minimum admission requirements for college transfer students as described on page 62. The CTAS, in addition, 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 which 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 will be awarded according to the guidelines on page 63. 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.

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.

## 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 in the department of their major who assist them with planning a program of study. 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 (see pages 79–83) 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

Before enrolling in courses at the 300 level and above, CTAS students must be in good academic standing within the college and have the approval of their advisors. Students who are not in good academic standing must secure approval from their advisor and the dean's office. Students enrolled in another ASU college may not register for any 300- and 400-level CTAS courses unless those courses are required in their 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 in order 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; or
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.

## 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 will not receive monetary reimbursement. Such withdrawals are considered to be unrestricted as described on page 73 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.

**Transfer Programs.** 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.

**University Honors College.** The College of Technology and Applied Sciences participates in the programs of the University Honors College, which provides enhanced educational experiences to academically superior undergraduate students. Participating students can major in any academic program. A description and the opportunities offered by the University Honors College can found on pages 293–295.

**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 in the Department of Aerospace Studies or Department of Military Science courses. 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: N3.*

**ETC 101 Languages of Technology Lab.** (0) F, S
Introduction to computer-aided design, programming, modeling, and technical documentation.

**ETC 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: L1.*

**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.

**ETC 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; L1 course; senior standing as a CTAS major. *General Studies: L2.*

## Department of Aeronautical Management Technology

**William K. McCurry**
***Chair***
**(SIM 205) 602/727–1381**
**FAX 602/727–1730**

**PROFESSOR**
GESELL

**ASSOCIATE PROFESSOR**
MCCURRY

**ASSISTANT PROFESSORS**
JACKSON, KARP

**LECTURERS**
BORRMANN, O'BRIEN, SPENCE

### 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 are admitted without separate application to the Department of Aeronautical Management Technology. 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 and includes options in airway science flight management and airway science management.

A Master of Technology degree is offered for graduate study. For more information about the graduate program, 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, design, management skills, business principles, systems analysis, and a variety of course work specific to aircraft flight, airport operations, and air transportation systems. The degree offers two options: airway science flight management and airway science management, both of which have the approval of the Federal Aviation Administration as Airway Science programs. The options are described separately below.

All degree requirements are shown on curriculum check sheets for the options that are available through the department. Requirements include First-Year Composition, university General Studies (see pages 84–108), 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 option 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 *N3* | 4 |
| ETC | 201 | Applied Electrical Science | 4 |
| Total | | | 36 |

### Airway Science Flight Management Option

*Flight training is certified by the Federal Aviation Administration.*

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 option 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.

*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 pages 84–108), and the Aeronautical Management Technology core, the following additional courses are required for the airway science flight management option:

| | | | |
|---|---|---|---|
| AET | 300 | Aircraft Design I | 3 |
| AMT | 100 | Flight Safety I | 1 |
| AMT | 200 | Flight Safety II | 2 |
| AMT | 222 | Instrument Pilot Ground School | 3 |
| AMT | 300 | Flight Safety III | 2 |
| AMT | 314 | Commercial Pilot Ground School | 3 |
| AMT | 382 | Air Navigation | 3 |
| AMT | 385 | Flight Instructor Ground School | 3 |
| AMT | 387 | Multiengine Pilot Ground School | 1 |
| AMT | 392 | Flight Instructor Instrument Ground School | 2 |
| AMT | 400 | Flight Safety IV | 1 |
| AMT | 408 | National Aviation Policy | 3 |
| AMT | 444 | Airport Management and Planning | 3 |
| AMT | 482 | Airline Instrument Procedures | 3 |
| AMT | 489 | Airline Administration | 3 |
| AMT | 496 | Airline Aircraft Systems Capstone | 3 |
| IMC | 346 | Management Dynamics | 3 |
| Technical electives | | | 6 |
| Total | | | 48 |

#### Suggested Course Pattern for Freshmen

**First Semester**

| | | | |
|---|---|---|---|
| AMT | 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 *N1* | 3 |
| Total | | | 13 |

**Second Semester**

| | | | |
|---|---|---|---|
| AMT | 100 | Flight Safety I | 1 |
| AMT | 222 | Instrument Pilot Ground School | 3 |
| ENG | 102 | First-Year Composition | 3 |
| ETC | 100 | Languages of Technology *N3* | 4 |
| MAT | 260 | Technical Calculus I *N1* | 3 |
| PHY | 111 | General Physics *S1/S2** | 3 |
| PHY | 113 | General Physics Laboratory *S1/S2** | 1 |
| Total | | | 18 |

* Both PHY 111 and 113 must be taken to secure S1 or S2 credit.

### Airway Science Management Option

The airway science management option 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 pages 84–108), and the Aeronautical Management Technology core, the following additional courses are required in the airway science management option:

| | | | |
|---|---|---|---|
| ACC | 230 | Uses of Accounting Information | 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 *N1* | 3 |
| Total | | | 13 |

**Second Semester**

| | | | |
|---|---|---|---|
| ENG | 102 | First-Year Composition | 3 |
| ETC | 100 | Languages of Technology *N3* | 4 |
| MAT | 260 | Technical Calculus I *N1* | 3 |
| PHY | 111 | General Physics *S1/S2** | 3 |
| PHY | 113 | General Physics Laboratory *S1/S2** | 1 |
| General Studies elective | | | 3 |
| Total | | | 17 |

* Both PHY 111 and 113 must be taken to secure S1 or S2 credit.

## 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 (AAAE) is open to all students with an interest in airport management. 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. Prerequisites: AMT 182 and 220 *or* equivalents.

**AMT 101 Introduction to Aeronautical Management Technology.** (1) F, S
Facilitates entry into Aeronautical Management Technology programs. Emphasizes general catalog and specialization 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 222 or 314.

**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 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 222 Instrument Pilot Ground School.** (3) S
Ground school leading to the FAA Instrument Pilot Rating. 10 hours ground trainer included. Lecture, lab. Pre- or corequisites: AMT 182, 220.

**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 314 Commercial Pilot Ground School.** (3) F
Ground school leading to FAA Commercial Pilot Certificate. 10 hours ground trainer included. Lecture, lab. Prerequisite: Private Pilot Certificate. Pre- or corequisite: AMT 222.

**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 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 222.

**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.

**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. 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 literacy and critical inquiry (L1) requirement.

**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 222, 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

**Robert W. Nowlin**
***Chair***
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**Fax 602/727–1723**

**PROFESSORS**
MAISEL, McHENRY, MUNUKUTLA

**ASSOCIATE PROFESSORS**
FORDEMWALT, MACIA, NOWLIN, WOOD, ZENG

**ASSISTANT PROFESSORS**
LIPARI, PETERSON, SUNDARARAJAN

## PURPOSE

Electronics engineering technology is a technological field of specialization that requires the application of scientific and engineering knowledge and methods combined with technical skills in support of electrical/electronics engineering activities. The electronics engineering technologist is a member of the electronics engineering team that consists of electronics engineers, electronics engineering technologists, and electronics engineering technicians.

The electronics engineering technologist is applications oriented, and builds upon a background of applied science and mathematics including the concepts and applications of calculus. Using state-of-the-art technology, the electronics engineering technologist is able to produce practical, workable, and safe results quickly and economically, to install and operate technical systems, to configure hardware for unique applications, to develop and produce products, to service machines and systems, to manage manufacturing processes, and to provide customer support to 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). Four options are available: computer systems, electronic systems, microelectronics, and telecommunications.

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

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

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

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

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

### Electronics Engineering Technology—B.S.

The departmental curriculum is organized into two categories, technical studies and General Studies. Technical studies consist of core areas and the option specialty area. General Studies consist of courses selected to meet the university General Studies requirement (see pages 84–108) 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 TAC of ABET, the professional accrediting agency for such curricula.

## 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 *N3* | 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 and Microprocessors *N3* | 3 |
| CET | 256 | "C" Programming for Engineering Technology | 3 |
| CET | 354 | Microprocessor Principles | 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 | Electrical Power Systems | 4 |
| EET | 410 | Electronic Circuits II | 3 |
| UET | 331 | Electronic Materials | 3 |
| UET | 415 | Electronic Manufacturing Engineering Principles | 3 |
| Total | | | 40 |

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

### Electronics Engineering Technology Options

**Computer Systems**

| | | | |
|---|---|---|---|
| CET | 452 | Digital Logic Applications | 4 |
| CET | 456 | Assembly Language Applications | 3 |
| CET | 457 | Microcomputer Systems Interfacing | 4 |
| CET | 473 | Digital/Data Communications | 4 |
| CET | 483 | UNIX Utilities Using "C" Language | 3 |
| Approved technical electives | | | 5 |
| Total | | | 23 |

**Electronic Systems**

| | | | |
|---|---|---|---|
| CET | 483 | UNIX Utilities Using "C" Language | 3 |
| EET | 406 | Control System Technology | 4 |
| EET | 430 | Instrumentation Systems | 4 |
| EET | 460 | Power Electronics | 4 |
| Approved technical electives | | | 8 |
| Total | | | 23 |

**Microelectronics**

| | | | |
|---|---|---|---|
| CHM | 116 | General Chemistry *S1/S2* | 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 | Transmission Lines and Waveguides | 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 and Microprocessors *N3* | 3 |
| ENG | 101 | First-Year Composition | 3 |
| MAT | 170 | Precalculus *N1* | 3 |
| PHY | 111 | General Physics *S1/S2*[1] | 3 |
| PHY | 113 | General Physics Lab *S2/S2*[1] | 1 |
| Total | | | 13 |

**Second Semester**

| | | | |
|---|---|---|---|
| ENG | 102 | First-Year Composition | 3 |
| ETC | 100 | Languages of Technology *N3* | 4 |
| MAT | 260 | Technical Calculus I *N1* | 3 |
| PHY | 112 | General Physics *S1/S2*[2] | 3 |
| PHY | 114 | General Physics Laboratory *S1/S2*[2] | 1 |
| HU, SB, and awareness area course | | | 3 |
| Total | | | 17 |

#### Second Year

**First Semester**

| | | | |
|---|---|---|---|
| CET | 256 | "C" Programming for Engineering Technology | 3 |
| CHM | 113 | General Chemistry *S1/S2* | 4 |
| ECN | 111 | Macroeconomic Principles *SB* | 3 |
| EET | 208 | Electric Circuit Analysis I | 4 |
| MAT | 261 | Technical Calculus II | 3 |
| Total | | | 17 |

**Second Semester**

| | | | |
|---|---|---|---|
| EET | 301 | Electric Circuit Analysis II | 4 |
| ETC | 200 | Impact of Communications Technology on Society *L1* | 3 |
| ETC | 211 | Applied Engineering Mechanics: Statics | 3 |
| MAT | 262 | Technical Calculus III | 3 |
| HU, SB, and awareness area course | | | 3 |
| Total | | | 16 |

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

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

## STUDENT ORGANIZATIONS

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

## COMPUTER ENGINEERING TECHNOLOGY (CET)

**CET 150 Digital Systems and Microprocessors.** (3) F, S
Fundamentals of digital systems and microprocessors, with Boolean Algebra and combinational logic. Microprocessor programming and applications. Lecture, lab. Prerequisite: freshman standing. *General Studies: N3.*

**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 336 Programming in Visual BASIC.** (3) S
Introduction to BASIC and programming in the Visual BASIC environment. Prerequisite: CET 256.

**CET 350 Digital Logic Principles.** (4) F, S
Combinational and sequential logic analysis, design concepts, and applications. Lecture, lab. Prerequisite: CET 150.

**CET 354 Microprocessor Principles.** (4) F, S
Microprocessor organization, programming, and 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 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. Prerequisite: UET 331.

**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.** (4) S
Microcontroller interfacing, organization, programming, and structure. Lecture, lab. Prerequisite: CET 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, S
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 Utilities Using "C" Language.** (3) S
Applications of "C" language to the development of practical programs for the UNIX operating system. Prerequisite: senior standing in technology or equivalent.

**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. Prerequisites: CET 350; EET 310.

**CET 486 Electronics Computer-Aided Design.** (3) F
CAD/EHDL for digital logic simulations and electronic circuit designs. Various software packages will be used. Prerequisites: CET 350; EET 310.

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

**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 583 UNIX Utilities Using "C" Language II.** (3) S
"C" language applications using the UNIX operating system. Also Fourth Generation languages and other UNIX utilities. Prerequisite: graduate standing in technology.

**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 205 Electronic Devices and Circuits.** (4) F, S
Active device characteristics, models, and basic circuit analysis. Lecture, lab. Prerequisite: ETC 201.

**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 Transmission Lines and Waveguides.** (4) S
Theory and application of transmission lines, waveguides, antennas, microwave components, and impedance matching techniques. 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 Electrical Power Systems.** (4) F
Electrical power systems analysis, generation, transmission, distribution, and utilization, including system protection. 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 420 Analog Filters and Applications.** (3) A
Active and passive analog filter design. Frequency domain approximations, computer simulations using PSPICE. Lecture, lab. Prerequisites: EET 301, 410.

**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 440 Electrical Power Systems Technology.** (4) S
Principles and analysis of rotating machines, transformers, and related control equipment. Lecture, lab. Prerequisite: EET 407.

**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 Digital Communication Systems.** (3) S
Theory, design, and application of digital, data, and fiber optics communication systems. Prerequisites: EET 304, 372; MAT 262.

**EET 482 Industrial Practice: Internship/Coop.** (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 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 501 Digital Signal Processing and Applications I.** (3) F
Applications of discrete-time signals and systems, design of IIR and FIR filters using computer-aided design techniques. Prerequisites: EET 401 (or instructor approval); MAT 262.

**EET 502 Digital Signal Processing and Applications II.** (3) S
Application of FFT, fundamentals of probability theory and random processes, and quantization effects in digital filters. Prerequisite: EET 501.

**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. Prerequisites: EET 301, 501 (or 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, applications, and design of linear integrated circuits and systems. Prerequisites: CET 350; EET 301, 310.

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

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

**EET 540 Electrical Power Systems.** (3) S
Electrical power system analysis, transmission, distribution, instrumentation, protection and related system components. Prerequisites: EET 301, 407.

**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 576 Modern Telecommunication Systems.** (3) F
Applied design and integration of microwave and satellite communication systems. Prerequisites: CET 473 and MAT 262 *or* instructor approval.

**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.

### MICROELECTRONICS ENGINEERING TECHNOLOGY (UET)

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

**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. 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) F
Hardware/software aspects of digital testing technology systems, board and logic testing equipment. Lecture, lab. Cross-listed as CET 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, fermilevel, pn junctions, diodes, and bipolar and MOS transistors. Prerequisite: graduate standing in the department.

# Department of Information and Management Technology

**Thomas E. Schildgen**
***Chair***
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**PROFESSORS**
DUFF, HILD,
HOROWITZ, SCHILDGEN

**ASSOCIATE PROFESSORS**
BARCHILON, GROSSMAN, HIRATA,
HUMBLE, MATSON, OLSON

**LECTURERS**
LESTAR, WILSON

## 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 options in the following areas: information technology, environmental technology management, and industrial technology management.

A Master of Technology degree is offered for graduate study. For more information about the graduate program, see the *Graduate Catalog.*

### Degree Requirements

The curriculum consists of First-Year Composition, university General Studies (see pages 84–108), 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 option course work, and technical electives selected with approval of an advisor. Information and Management Technology students are required to complete a minimum of 128 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

Required courses follow:

| | | | |
|---|---|---|---|
| ETC | 100 | Languages of Technology *N3* | 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 |

**Information Technology Option.** The information technology option prepares students for positions in the communication and information technology

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

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 option has three areas of emphasis: graphic communications, interactive computer graphics, and technical communications.

*Graphic Communications Emphasis Area.* The purpose of the graphic communications emphasis is to prepare students for a wide variety of professional positions in the printing and graphic communications industry. This area of emphasis 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 Emphasis Area.* The purpose of the interactive computer graphics emphasis is to prepare students for entry into the diverse field of computer graphics. The emphasis is 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 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.

*Technical Communications Emphasis Area.* The purpose of the technical communications emphasis is to prepare students for a variety of professional positions in technical writing and corporate communications. Proposal writing, publication design, database management, and online publications provide diverse opportunities for career employment.

**Environmental Technology Management Option.** The environmental technology management option 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 Management with a Certificate in Hazardous Materials and Waste Management, and a Master of Technology 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 Option.** The industrial technology management option 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.

### 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 211 Digital Imaging Video and Audio Technologies.** (3) F
Digital video and audio technology systems, standards, procedures, and techniques for capturing, editing, mixing, and producing creative nonlinear media. 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: N3.*

**CGC 213 Digital Media Technologies: Hardware, Software, and Peripherals.** (3) S
The study of the computer technology systems, hardware, software, and peripherals used in the computer graphics and digital media environments. Lecture, lab. Prerequisite: ETC 100 or instructor approval.

**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: N3.*

**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: ETC 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: N3.*

**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 Offset Press Technology.** (3) S
Function of offset printing equipment. Dynamics of offset-lithography for both sheetfed and web systems. Lecture, lab. Prerequisite: CGC 332 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 335 Printing and Finishing Technology.** (3) N
Analysis of production bindery and finishing procedures in combination with the theory flexography and screen process printing. Prerequisite: CGC 135.

**CGC 336 Color Theory and Reproduction.** (3) S
Analysis of color theory and separation techniques used for the reproduction of color originals. Lecture, lab. Prerequisite: CGC 334.

**CGC 339 Estimating and Cost Analysis.** (3) S
Management decision-making and cost-finding procedures for reproduction processes, includes analysis of equipment, labor, and material costs. Prerequisite: CGC 135.

**CGC 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.

**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 336 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 416 Emerging Computer Graphics and Digital Media Technologies.** (3) S
Emerging computer graphics and digital media technologies and databases: VR/VRML; inverse kinematics; F/X plug-ins; hybrid modeling; Web intermedia; GIS/mapping. Lecture, lab, field trips. Prerequisites: CGC 410 and 411 *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 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 used in industry. Prerequisite: CGC 336.

**CGC 438 Graphic Arts Techniques and Processes.** (3) N
Survey of production sequences and profile of the printing and publishing industry. Lecture, lab. Prerequisite: junior standing.

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**CGC 439 Digital Prepress.** (3) N
The study of digital prepress systems, hardware, software, networks, and direct imaging technology. Lecture, lab. Prerequisite: IMC 233.

**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.

**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 513 Computer Graphics Systems Design and Development.** (3) N
Research, design, and development of computer graphics systems; involves project proposal, scheduling, management, production, analysis, testing, evaluation, documentation, and implementation. Lecture, lab, field trips. Prerequisites: CGC 414 and 415 *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 and 513 (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.** (3) F
Explores the development of treatment technologies. Addresses regulatory standards. Emphasizes theory and practice of system design. 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 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 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. Pre-emergency 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 Issues: Radon, Asbestos.** (3) F
Topics of current interest in environmental technology and management. Prerequisites: CHM 113 and 115 (or CHM 114); ETM 501; MAT 170.

**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.

## 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.

## 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 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.

**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.

**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 548 Quantitative Research Methods.** (3) F, S
Use of statistical techniques to analyze and interpret data. Concentration on computerized statistical software and practical applications. Prerequisite: STP 420.

**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.

Charles Brownson, ASU East's director of library services, demonstrates the capabilities of the virtual library to East Campus students Matt Cochran (center) and Anja Hassell (right). Tim Trumble photo

# Department of Manufacturing and Aeronautical Engineering Technology

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COLLINS

**ASSOCIATE PROFESSORS**
BIEKERT, KELLEY, PALMGREN, REED, SCHMIDT

**ASSISTANT PROFESSORS**
RAJADAS, ROGERS

**LECTURER**
OKONKWO

## PURPOSE

The mission of the Department of Manufacturing and Aeronautical Engineering Technology is to emphasize the application of 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, applied thermodynamics, fluid mechanics and aerodynamics, propulsion, aerospace manufacturing and wind tunnel testing.

## ACCREDITATION

The programs of Manufacturing Engineering Technology and Aeronautical Engineering Technology are accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc. (TAC of ABET).

## DEGREES

The Department of Manufacturing and Aeronautical Engineering Technology offers two baccalaureate degrees: the B.S. degree in Manufacturing Engineering Technology and the B.S. degree in Aeronautical Engineering Technology.

A Master of Technology degree is offered for graduate study. See the *Graduate Catalog* for more information about the graduate programs.

### Degree Requirements

All degree requirements for the program are shown on curriculum check sheets. Requirements include First-Year Composition, university General Studies (see pages 84–108), 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 Emphasis Area | 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 emphasis areas 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 | 346 | Numerical Control Point to Point and Continuous Path Programming | 3 |
| MET | 396 | Manufacturing Professional Orientation | 1 |
| MET | 401 | Statistical Process Control | 3 |
| MET | 416 | Applied Computer Integrated Manufacturing | 3 |
| MET | 444 | Production Tooling | 3 |
| MET | 451 | Introduction to Robotics | 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 areas of emphasis: manufacturing engineering technology or mechanical engineering technology.

**Manufacturing Engineering Technology Emphasis.** This emphasis area is designed to prepare technologists with both conceptual and practical applications of processes, materials, and products related to metalworking industries. Accordingly, this emphasis area 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 fluids, 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 Emphasis.** The primary objective of the mechanical engineering technology emphasis area 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 |

All degree requirements for the program are shown on curriculum check sheets. Requirements include First-Year Composition, university General Studies (see pages 84–108), 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.

## Aeronautical Engineering Technology—B.S.

The B.S. degree in Aeronautical Engineering Technology degree 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 | Measurement 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 |
| CET | 483 | UNIX Utilities Using "C" Language (Or other language program) | 3 |
| EET | 406 | Control System Technology | 4 |
| MET | 230 | Engineering Materials and Processing | 3 |
| MET | 300 | Applied Material Science | 4 |
| MET | 313 | Applied Engineering Mechanics: Materials | 4 |
| MET | 331 | Design for Manufacturing I | 3 |
| MET | 432 | Thermodynamics II | 3 |
| MET | 434 | Applied Fluid Mechanics | 3 |
| MET | 438 | Design for Manufacturing II | 4 |
| Technical elective | | | 2 |
| Total | | | 63 |

### AERONAUTICAL ENGINEERING TECHNOLOGY (AET)

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

**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. Prerequisite: AMT 280 or MET 230.

**AET 415 Gas Dynamics and Propulsion.** (3) F
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 531 Experiments and Design in Aeronautics.** (3) N
Advanced measurement techniques for fluid flows, wind tunnel testing, and treatment of experimental data. Automatic control systems.

**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.

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

## 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
Metal removal processes, emphasizing drilling, milling, and lathe processes, including tool bit grinding. Emphasis on production speeds and feeds. Lecture, lab.

**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 303 Machine Control Systems.** (3) S
Theory and application of electromechanical, hydraulic, pneumatic, fluidic, and electrical control systems for manufacturing. Lecture, lab. Prerequisites: ETC 201 (or PHY 112); MAT 260.

**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 321 Engineering Evaluation of Welding Processes.** (3) N
Theory and application of the arc welding processes and oxy-fuel cutting; fixturing, procedures, safety, codes, and experimental techniques are covered. Lecture, lab. Prerequisites: MET 302; PHY 112.

**MET 322 Engineering Evaluation of Nontraditional Welding Processes.** (3) N
Theory and applications of EBW, LBW, solid-state bonding, brazing, and soldering. Lecture, lab. Prerequisites: MET 302; PHY 112.

**MET 325 Electrical Power Source Analysis.** (4) S
Design and operating characteristics of electrical power sources and related equipment. Equipment selection, setup, and troubleshooting procedures covered. Lecture, lab. Prerequisites: ETC 201; MET 302; PHY 112, 114.

**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) S
Introduction to the organizational and functional requirements for effective production. Includes writing production operation plans. Prerequisite: MET 231.

**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
Metal removal processes, emphasizing milling, grinding, turret and tracer lathe, and cutter sharpening. Application of machinability theory to practice. Production feeds, speeds, and tool wear measurement. Lecture, lab. Prerequisites: MET 231 and 300 *or* instructor approval.

**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 354 Mechanics of Materials.** (4) F
Vectors, force systems, friction, equilibrium, centroids, and moment of inertia. Concepts of stress, strain, and stress analysis as applied to beams, columns, and combined loading. Prerequisites: MAT 170; PHY 111; nonmajor.

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

**MET 401 Statistical Process Control.** (3) S
Introduction to statistical quality control methods as applied to tolerances, process control, sampling, and reliability. Prerequisite: MAT 117 or 170.

**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: N3.*

**MET 420 Welding Metallurgy I.** (4) N
Metallurgical principles applied to structural and alloy steel and aluminum weldments; laboratory emphasis on welding experiments, metallography, and mechanical testing. Lecture, lab. Prerequisites: MET 300, 302.

**MET 421 Welding Metallurgy II.** (3) N
Metallurgical principles as applied to stainless steel, super alloy, titanium, and other refractory metal weldments and braze joints. Prerequisite: MET 300.

**MET 425 Welding Codes.** (2) N
Familiarization with and application of the various codes, standards, and specifications applicable to weldments. Prerequisite: MET 302 or equivalent.

**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 Robotics.** (3) F
Introduction to industrial robots. Topics included are robot geometry, robot workspace, trajectory generation, robot actuators and sensors, design of end effectors, and economic justification. Prerequisite: MET 303 or instructor approval.

**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: MET 303 or 325 or instructor approval.

**MET 460 Manufacturing Capstone Project I.** (3) F
Small-group projects to design, evaluate and analyze components, assemblies, and systems. Lecture, lab. Prerequisite: MET 303 or instructor approval.

**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 462 Capstone Project/Weldment Design.** (3) S
Design of welded structures and machine elements in terms of allowable stresses, joint configurations, process capabilities, and cost analysis; welding procedures emphasized. Prerequisites: MET 302, 313.

**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: MET 303 or 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.

# School of Agribusiness and Resource Management

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***Dean***
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**PROFESSORS**
CHALQUEST, EDWARDS, GORDON, KAGAN, MARQUARDT, STILES, THOR

**ASSOCIATE PROFESSORS**
RACCACH, SEPERICH

**ASSISTANT PROFESSORS**
PATTERSON, RICHARDS, STANTON

## PURPOSE

The School of Agribusiness and Resource Management (SABR) provides academic programs that combine business and technology. It 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 focuses on the basics of agriculture management, marketing, and finance to provide a sustainable system for the needs of future generations. Courses in the School of Agribusiness and Resource Management are designed to prepare students for the wide range of job opportunities that exist in the agricultural industries and governmental agencies. 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.

### 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. The center 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 of the Center for Agribusiness Policy Studies at 602/727–1583.

### 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. Current 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 of the National Food and Agricultural Policy Project at 602/727–1334.

## DEGREES

The faculty in the School of Agribusiness and Resource Management offer the B.S. degree in Agribusiness with concentrations in general agribusiness (with options in food industry/food science and international agribusiness) and preveterinary medicine.

An M.S. degree in Agribusiness is also offered by the school. The program includes research and preparation of a thesis. A minimum of 30 semester hours of graduate-level course work is required for the degree. Additional details for this degree are given in the *Graduate Catalog.*

## ADMISSION

The School of Agribusiness and Resource Management admits students who meet the undergraduate admission requirements of Arizona State University (see "Admission Requirements" on pages 60–62).

## GRADUATION REQUIREMENTS

The completion of a minimum of 120 semester hours—including First-Year Composition, university General Studies (see pages 84–108), and the school and major requirements—leads to the B.S. degree. Note that all three General Studies awareness areas are required. Consult your advisor for an approved list of courses. An overall GPA of 2.00 is required. Of the semester hours required for graduation, a minimum of 45 semester hours must be upper division. Also see special graduation requirements under the "Preveterinary Concentration Requirements" described on this page.

### First-Year Composition

Most students will meet the First-Year Composition requirement by completing ENG 101 and 102 First-Year Composition (6 semester hours). International students from non-English speaking countries may take ENG 107 and 108 English for Foreign Students (6 semester hours) instead. Students who place into ENG 105 Advanced First-Year Composition (3 semester hours) may complete the requirement with that course alone.

### Prerequisite Courses

Students who wish to major in Agribusiness should take the following courses, which can also be used to meet General Studies requirements (as indicated in italics):

| | | | |
|---|---|---|---|
| BIO | 100 | The Living World *S1/S2* | 4 |
| | | or BIO 181 General Biology *S1/S2* (4) | |
| CHM | 101 | Introductory Chemistry *S1/S2* | 4 |
| | | or CHM 113 General Chemistry *S1/S2* (4) | |
| ECN | 111 | Macroeconomic Principles *SB* | 3 |
| ECN | 112 | Microeconomic Principles *SB* | 3 |
| ENG | 301 | Writing for the Professions *L1* | 3 |
| MAT | 210 | Brief Calculus *N1* | 3 |
| A course in statistics *N2* | | | 3 |
| A course in computer literacy *N3* | | | 3 |
| Total | | | 26 |

**General Agribusiness Concentration.** A student selecting the general agribusiness concentration may focus on general agribusiness or choose an option in food industry and food science or in international agribusiness.

*Food Industry/Food Science.* A student studying agribusiness could be preparing for a career in the food industry as a food technologist. Students will learn to develop the world's food products and ensure their safety through mastery of courses in food design, food manufacturing processes, and food safety.

*International Agribusiness.* A student studying agribusiness could be preparing for a career in international agribusiness. This option requires a mastery of courses in domestic and global economics, commodity trading and financing, international monetary exchange, and other global business subjects.

General agribusiness concentration requirements include:

**SABR Core**

| | | | |
|---|---|---|---|
| AGB | 300 | Livestock Management | 3 |
| AGB | 310 | Crop Management | 3 |
| Total | | | 6 |

**Agribusiness Concentration Core**

| | | | |
|---|---|---|---|
| AGB | 312 | Agribusiness Marketing | 3 |
| AGB | 332 | Agribusiness Finance I | 3 |
| AGB | 342 | Agribusiness Management I | 3 |
| AGB | 364 | Agribusiness Technology | 3 |
| AGB | 390 | Agribusiness Accounting | 3 |
| | | or ACC 230 Accounting I (3) | |
| AGB | 444 | Agribusiness Analysis *L2* | 3 |
| Total | | | 18 |

An additional 15 semester hours of upper-division agribusiness courses are required for all agribusiness degrees. See the curriculum check sheet in the department for a selection of courses. Faculty advisor approval is required.

Fifteen semester hours of departmental electives are also required. See faculty or departmental advisor for approved courses.

**Preveterinary Medicine Concentration.** A student studying agribusiness could also be preparing for admission to a professional veterinary school. While the student is completing the courses needed for acceptance into veterinary school he or she is broadening his or her career potential with agribusiness courses. The major reason for lack of success of 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 medical schools in the United States and Canada. The curriculum permits the student to obtain some course work in agribusiness as it relates to professional practice and industry.

### Preveterinary Concentration Requirements

**SABR Core**

| | | | |
|---|---|---|---|
| AGB | 300 | Livestock Management | 3 |
| AGB | 310 | Crop Management | 3 |
| Total | | | 6 |

**Preveterinary Core**. Students who wish to major in Agribusiness with a preveterinary concentration should take the following courses, some of which may also be used to meet General Studies requirements (as indicated in italics).

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

| | | | |
|---|---|---|---|
| BIO | 181, 182 | General Biology *S1/S2* | 8 |
| CHM | 113 | General Chemistry *S1/S2* | 4 |
| CHM | 115 | General Chemistry with Qualitative Analysis *S1/S2* | 5 |
| CHM | 231 | Elementary Organic Chemistry *S1/S2*[1] | 4 |
| | | or CHM 331 General Organic Chemistry, and CHM 335 General Organic Chemistry Laboratory, and CHM 332 General Organic Chemistry, and CHM 336 General Organic Chemistry Laboratory | (8) |
| MAT | 117 | College Algebra *N1* | 3 |
| | | or MAT 210 Brief Calculus | (3) |
| MIC | 206 | Microbiology Laboratory *S2*[2] | 1 |
| MIC | 220 | Biology of Microorganisms | 3 |
| Additional agribusiness courses | | | 15 |
| Total | | | 43 |

[1] Both CHM 231 and 235 must be taken to secure S1 or S2 credit.

[2] Both MIC 205 and 206 must be taken to secure S2 credit.

## Veterinary College Acceptance

Some schools of veterinary medicine will admit students who have completed the entrance requirements but have not completed their baccalaureate degree. Preveterinary students can use the first year of veterinary school toward a B.S. in Agribusiness if that course work combined with course work taken at ASU or elsewhere meets all ASU graduation requirements. Students must receive a written statement from the Dean of the School of Agribusiness and Resource Management giving senior-in-absentia privileges.

A student is eligible to receive the B.S. degree after the Office of the Registrar receives a recommendation from the dean of the veterinary medicine school and a transcript of credit indicating the student has completed a total of 120 semester hours with a cumulative GPA of 2.00 or higher. Students should see an advisor in the School of Agribusiness and Resource Management for further information.

### AGRIBUSINESS (AGB)

**AGB 101 Global Resources.** (3) F, S
Dependence of the quality, quantity, and cost of national food supplies on technology, marketing, and world agricultural policies.

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

**AGB 160 Veterinary Medicine Today.** (3) S
Introduction to the role of the veterinarian as related to the fields of food supply and veterinary medicine.

**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 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 300 Livestock Management.** (3) F
Methods of managing livestock enterprises, economics, loss prevention, and marketing. Prerequisite: BIO 100.

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

**AGB 305 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 310 Crop Management.** (3) S
Crop production, management principles, and their application to crop growth and development.

**AGB 312 Agribusiness Marketing.** (3) F
Marketing arrangements for agricultural products. Prerequisite: ECN 111.

**AGB 332 Agribusiness Finance.** (3) F
Agribusiness investment management and financial institutions that serve agriculture. Prerequisite: ACC 230 or AGB 390.

**AGB 335 Establishing an Agribusiness.** (3) F
Establishing entrepreneurship in agriculture, including legal status, financing, planning, marketing, and management.

**AGB 342 Agribusiness Management I.** (3) F
Principles of management, including planning, organizing, integrating, measuring, and developing people in agribusiness organizations.

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

**AGB 364 Agribusiness Technology.** (3) F
Biotechnology and other technologies of the three sectors of agribusiness, including input, production, and commodity and food processing and distribution. Prerequisite: BIO 100.

**AGB 368 Food Processing.** (3) N
An introduction to processed food quality assurance, statistical sampling, and inspection procedures. Prerequisite: AGB 364.

**AGB 369 Food Analysis.** (3) N
Processing control and scientific instrumentation used in food quality assurance laboratories. Lecture, lab. Prerequisite: CHM 101.

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

**AGB 402 Agricultural Cooperatives.** (3) N
Organization, operation, and management of agricultural cooperatives.

**AGB 404 Sales and Merchandising in Agribusiness.** (3) SS
The principles and techniques of selling and commodity merchandising in the agricultural industries.

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

**AGB 413 Agribusiness Finance II.** (3) S
Advanced agribusiness investment management and financial practices.

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

**AGB 423 Food and Industrial Microbiology.** (3) N
Food- and industrial-related microorganisms; deterioration and preservation of industrial commodities. Lecture, lab. Prerequisite: MIC 205 or 206 or instructor approval.

**AGB 424 Food and Industrial Fermentations.** (4) N
Management, manipulation, and metabolic activities of industrial microbial cultures and their processes. Lecture, lab. Prerequisite: AGB 423 or instructor approval.

**AGB 425 Food Safety.** (3) N
Control, prevention, and prediction of microbial and chemical food-borne diseases. Prerequisite: AGB 423 or instructor approval.

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

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

**AGB 433 Diseases of Domestic Animals.** (3) S
Control and prevention of infectious and noninfectious diseases of domestic animals. Prerequisite: MIC 206 or 220.

**AGB 435 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 439 Veterinary Practices.** (3) F, S
Observation of and participation in veterinary medicine and surgery supervised by local veterinarians. Prerequisite: advanced preveterinary student.

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

**AGB 443 Agribusiness Management II.** (3) S
Principles of human resource management, with emphasis on the special problems of agribusiness systems.

**AGB 444 Agribusiness Analysis.** (3) S
Analysis of agribusiness firm decisions in the ecological, economic, social, and political environments. Special emphasis on ethical issues surrounding food production and consumption. *General Studies: L2.*

**AGB 450 International Agricultural Development.** (3) S
Transition of developing countries from subsistence to modern agriculture. Technology transfer and food improvement programs are emphasized. *General Studies: G.*

**AGB 453 World Agricultural Resources.** (3) SS
World production and consumption of agricultural products, international relationships, and agencies concerned with world agricultural development problems. *General Studies: G.*

**AGB 454 International Agricultural Trade.** (3) S
Dimensions, locations, mix, methods, and changes of international trade in agricultural products. Prerequisite: AGB 312.

**AGB 455 Agricultural Marketing Channels.** (3) F
Operational stages of agricultural commodities in normal distribution systems and implementation of marketing strategies. Prerequisite: AGB 312.

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

**AGB 474 Agribusiness Policy and Government Regulations.** (3) F
The development and implementation of government food, drug, pesticide, and farm policies and regulations that affect the management of agribusiness.

**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 505 Commodity Analysis.** (3) N
Analysis of commodity markets. Prerequisite: 1 year of economics or marketing.

**AGB 508 Advanced Agribusiness Marketing.** (3) F
Theory and analysis of marketing farm commodities, risks, and the effect of future trading on cash prices.

**AGB 509 Advanced Agribusiness Marketing Channels.** (3) S
Analysis of agribusiness market channel systems. Formulation of marketing strategies.

**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 342.

**AGB 511 Advanced Agribusiness Management II.** (3) S
Analysis of organization behavior, change, and resource requirements within agribusiness systems. Prerequisite: AGB 342.

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

**AGB 516 International Agricultural Techniques.** (3) N
Coordination of production and marketing techniques to consumption objectives with agricultural products in foreign countries.

**AGB 518 World Agricultural Development.** (3) N
Factors that influence production, processing, and marketing of agricultural products in developing countries.

**AGB 520 Advanced Agribusiness Analysis I.** (4) S
Vertical integration and differentiation in food and agricultural industries. Lecture, recitation. Prerequisite: AGB 508 or 510.

**AGB 521 Agribusiness Coordination.** (4) N
Organizational alternatives for agribusiness, with emphasis on cooperatives and trading companies. Lecture, recitation. Prerequisite: AGB 508 or 510.

**AGB 525 Advanced Agribusiness Management Systems.** (3) N
Development and use of decision support systems for agribusiness management decision making. Prerequisite: AGB 510.

**AGB 527 Agribusiness Research Methods.** (3) N
The use of model building, hypothesis testing, and empirical analysis in solving agribusiness problems. Prerequisite: basic statistics course.

**AGB 530 Advanced Agribusiness Policy.** (3) N
Policy-making history, structure, and process. Prerequisite: AGB 342.

**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 Advanced Food Science.** (3) N
Chemical and physical nature of processed foods. Emphasis on food product development. Prerequisite: AGB 364.

ASU East flight simulator facility.

Jim Painter photo

# ASU East Map

# ASU East Directory

For the "ASU Main Directory," see pages 528–530.
For the "ASU West Directory," see page 537.
Unless otherwise stated, the area code is 602.

## Academic Units

| | | |
|---|---|---|
| Agribusiness and Resource Management, School of | CNTR 20 | 727–1585 |
| East College | CNTR 30 | 727–1028 |
| Technology and Applied Sciences, College of | CNTR 10 | 727–1874 |
| Aeronautical Management Technology, Department of | SIM Bldg–201 | 727–1775 |
| Electronics and Computer Engineering Technology, Department of | ELAB–LAB | 727–1191 |
| | CLRB 157 | 727–1137 |
| Information and Management Technology, Department of | CNTR 92 | 727–1781 |
| Manufacturing and Aeronautical Engineering Technology, Department of | SIM Bldg–295B | 727–1584 |

## Administrative

| | | |
|---|---|---|
| General Information | CNTR Garden Level | 727–3278 |
| American Indian Programs | CNTR 52 | 727–1161 |
| Bookstore | CNTR 102 | 727–1146 |
| Campus Union | CU | 727–1116 |
| Cashiering Services | CNTR 81 | 727–1081 |
| Computer Commons, ASU East | CNTR 150 | 727–1184 |
| Copy Center | CNTR 147 | 727–1175 |
| Educational Opportunity Center | CNTR Garden Level | 727–1153 |
| Housing, Williams Campus | WCHO Bldg. 7 | 988–9160 |
| Library Services | CNTR 110 | 727–1037 |
| OASIS | CNTR Garden Level | 727–3278 |
| ASU Sun Cards | | |
| Office of the Registrar | | |
| Student Business Services | | |
| Student Financial Assistance | | |
| Undergraduate Admissions | | |
| Williams Campus Parking Decals | | |
| Physical Education Center, Williams Campus | WCFC Bldg. | 988–8400 |
| Provost, Office of the | CNTR 30 | 727–1028 |
| Student Health Services | Veterans Administration Clinic | 222–6568 |
| Vice Provost, Academic Programs and Services | CNTR 30 | 727–1028 |

# ASU East Administrative and Academic Personnel

## Academic Administration

Provost ..... Charles E. Backus
Vice Provost, Academic Programs and Dean, East College ..... David E. Schwalm
Associate Vice President, Student Affairs ..... Leon G. Shell
Dean, College of Technology and Applied Sciences ..... Albert L. McHenry
Associate Dean, College of Technology and Applied Sciences ..... Lakshmi V. Munukutla
Interim Assistant Dean, College of Technology and Applied Sciences ..... Dale E. Palmgren
Chair, Department of Aeronautical Management Technology ..... William K. McCurry
Chair, Department of Electronics and Computer Engineering Technology ..... Robert W. Nowlin
Chair, Department of Information and Management Technology ..... Thomas E. Schildgen
Chair, Department of Manufacturing and Aeronautical Engineering Technology ..... Dale E. Palmgren
Project Director, International Projects Institute ..... Gary M. Grossman
Dean, School of Agribusiness and Resource Management ..... Raymond A. Marquardt
Assistant Dean, School of Agribusiness and Resource Management ..... Philip G. Stiles
Director, Academic Services ..... Vinette Cowart
Director, Administrative Services ..... Terry C. Isaacson
Director, American Indian Programs ..... Marigold L. Linton
Director, Campus Life Services ..... Gary L. Kleemann
Director, Center for Agribusiness Policy Studies ..... Eric P. Thor
Director, Institutional Advancement ..... Wanda L. Kay
Director, Library Services ..... Charles W. Brownson
Director, Research and Sponsored Projects ..... Jean N. Humphries

# ASU East Faculty and Academic Professionals

## A

**Autore, Donald D.** (1959), Professor Emeritus of Technology; B.S.E., University of Michigan; M.S.E., Arizona State University

## B

**Barchilon, Marian G.** (1989), Associate Professor of Information and Management Technology; B.S., State University of New York, Binghamton; M.S., Northeastern University

**Barrett, Thomas W.** (1950), Professor Emeritus of Agribusiness and Resource Management; B.S., Brigham Young University; M.S., Ph.D., Cornell University

**Biekert, Russell G.** (1993), Associate Professor of Manufacturing and Aeronautical Engineering Technology; B.S., M.S., Southern Illinois University; Ed.D., Arizona State University

**Borrmann, David W.** (1996), Lecturer of Aeronautical Management Technology; B.S., Drexel University; M.A., Arizona State University

**Brown, Walter C.** (1966), Professor Emeritus of Technology; B.S., Northwest Missouri State University; M.Ed., Ed.D., University of Missouri, Columbia

**Brownson, Charles W.** (1980), Librarian, ASU East Library Services; Director, ASU East Library Services; B.A., South Dakota State University; M.F.A., University of Oregon; M.L.S., University of California, Berkeley

**Burdette, Walter E.** (1956), Professor Emeritus of Technology; B.S., M.S., Kansas State College of Pittsburg; Ed.D., University of Missouri, Columbia

**Burk, Karl W.** (1949), Professor Emeritus of Technology; B.A., M.A., Arizona State University; Ed.D., Bradley University

## C

**Carlsen, Paul A.** (1978), Professor Emeritus of Technology; B.A.E., M.N.S., Ed.D., Arizona State University

**Cavalliere, William A.** (1946), Professor Emeritus of Technology; B.A., M.A., Arizona State University

**Chalquest, Richard R.** (1971), Professor of Agribusiness and Resource Management; B.S., D.V.M., Washington State University; M.S., Ph.D., Cornell University

**Collins, Donald G.** (1989), Professor of Manufacturing and Aeronautical Engineering Technology; B.Arch., Virginia Polytechnic Institute and State University; M.S., Ph.D., University of Illinois

**Cox, Frank E.** (1972), Professor Emeritus of Technology; B.S.M.E., Purdue University; M.S.E., Arizona State University

## D

**Daneke, Gregory A.** (1982), Professor of Technology and Applied Sciences; B.A., M.A., Brigham Young University; Ph.D., University of California, Santa Barbara

**Duff, Jon M.** (1997), Professor of Information and Management Technology; B.S., M.S., Purdue University; Ph.D., Ohio State University

## E

**Edwards, Mark R.** (1978), Professor of Agribusiness and Resource Management; B.S.M.E., United States Naval Academy; M.B.A., D.B.A., Arizona State University

**Edwards, Marvin J.** (1959), Professor Emeritus of Technology; B.S., M.A., Arizona State University

## F

**Fordemwalt, James N.** (1987), Associate Professor of Electronics and Computer Engineering Technology; B.S., M.S., University of Arizona; Ph.D., Iowa State University of Science and Technology

## G

**Gesell, Laurence E.** (1984), Professor of Aeronautical Management Technology; B.A., Upper Iowa University; M.P.A., University of San Francisco; Ph.D., Arizona State University

**Gordon, Richard S.** (1980), Professor of Agribusiness and Resource Management; A.B., University of Rochester; M.A., Harvard University; Ph.D., Massachusetts Institute of Technology

**Grossman, Gary M.** (1994), Associate Professor of Information and Management Technology; B.A., University of the Pacific; M.S., Ph.D., Purdue University

## H

**Hefner, Stephen P.** (1973), Instructional Professional of Agribusiness and Resource Management; Academic Professional, School of Agribusiness and Resource Management; B.S., Illinois State University; M.S., Arizona State University

**Hild, Nicholas R.** (1983), Professor of Information and Management Technology; B.S.M.E., M.S.Enve., University of Iowa; Ph.D., Union Graduate School

**Hirata, Ernest T.** (1974), Associate Professor of Information and Management Technology; B.A., San Diego State College; Ed.D., Arizona State University

**Horowitz, Renee B.** (1986), Professor of Information and Management Technology; B.A., Brooklyn College; M.A., Ph.D., University of Colorado

**Humble, Jane E.** (1989), Associate Professor of Information and Management Technology; B.S.E., M.S.E., Ph.D., Arizona State University

## J

**Jackson, Andrew E.** (1995), Assistant Professor of Aeronautical Management Technology; B.A., University of Louisville; M.B.A., Embry-Riddle Aeronautical University; Ph.D., University of Central Florida

## K

**Kagan, Albert** (1992), Professor of Agribusiness and Environmental Resources; B.S., M.S., Ph.D., Iowa State University of Science and Technology

**Karp, Merrill R.,** (1994), Assistant Professor of Aeronautical Management Technology; B.S., Arizona State University; M.A., Central Michigan University; Ph.D. Walden University

**Keith, Marlow F.** (1946), Professor Emeritus of Technology; B.A., M.A., Arizona State University

**Kelley, Donald G.** (1980), Associate Professor of Manufacturing and Aeronautical Engineering Technology; B.S., M.S., Arizona State University

**Kigin, Denis J.** (1958–65; 1967), Professor Emeritus of Technology; Dean Emeritus, Continuing Education and Summer Sessions; B.S., Mankato State University; M.S., University of Wisconsin, Stout; Ed.D., University of Missouri

**Kisielewski, Robert V.** (1978), Professor Emeritus of Technology; B.S.M.E., M.S.M.E., University of Wisconsin, Madison

## L

**Lawler, Eugene D.** (1967), Professor Emeritus of Technology; B.S., Northern State College; M.A., Arizona State University

**Lestar, Dorothy Jo** (1996), Lecturer of Information and Management Technology; B.S., Arizona State University

**Lipari, Charles A.** (1995), Assistant Professor of Electronics and Computer Engineering Technology; B.S.E.E., M.S.E.E., University of Southwestern Louisiana; Ph.D., Louisiana State University

**Lytle, Robert G.** (1972), Professor Emeritus of Agribusiness and Resource Management; B.S., Western Kentucky University; M.S., Arizona State University

## M

**Macia, Narciso F.** (1990), Associate Professor of Electronics and Computer Engineering Technology; B.S., M.S., University of Texas, Arlington; Ph.D., Arizona State University

**Maddy, Kenneth H.** (1980), Professor Emeritus of Agribusiness and Resource Management; B.S., Pennsylvania State University; M.S., University of Wisconsin, Madison; Ph.D., Pennsylvania State University

**Maisel, James E.** (1985), Professor of Electronics and Computer Engineering Technology; B.Eng.Sci., B.E.E., Fenn College; M.S.E.E., Ohio State University

**Marquardt, Raymond A.** (1997), Professor of Agribusiness and Resource Management; Dean, School of Agribusiness and Resource Management; B.S., M.S., Colorado State University; Ph.D., Michigan State University

**Matson, John H.** (1978), Associate Professor of Information and Management Technology; B.S., M.S., Illinois State University

**Matthews, James B.** (1989), Professor Emeritus of Aeronautical Technology; B.S., Rose-Hulman Institute of Technology; M.S., Massachusetts Institute of Technology; Ph.D., University of Arizona

**McBrien, Edward F.** (1986), Professor Emeritus of Electronic/Computer Technology; B.S.E., Fenn College; M.S.E.E., Cleveland State University

**McCurry, William K.** (1995), Associate Professor of Aeronautical Management Technology; Chair, Department of Aeronautical Management Technology; B.S., Purdue University; M.S., Troy State University; Ph.D., University of Kansas

**McHenry, Albert L.** (1978), Professor of Technology; Dean, College of Technology and Applied Sciences; B.S., Southern University and A&M College; M.S., Ph.D., Arizona State University

**Miller, Victor J.** (1958), Professor Emeritus of Agribusiness and Resource Management; B.S., M.S., Ph.D., University of Illinois

**Minter, Marshall R. Jr.** (1965), Professor Emeritus of Technology; B.S.M.E., Purdue University; M.S.M.E., University of Arizona

**Moody, E. Grant** (1951), Professor Emeritus of Agribusiness and Resource Management; B.S., University of Arizona; M.S., Kansas State University; Ph.D., Purdue University

**Munukutla, Lakshmi V.** (1987), Professor of Technology; Associate Dean, College of Technology and Applied Sciences; B.S., M.S., Andhra University (India); Ph.D., Ohio University

## N

**Nowlin, Robert W.** (1990), Associate Professor of Electronics and Computer Engineering Technology; Chair, Department of Electronics and Computer Engineering Technology; B.S.E.E., University of Washington; M.S.E.E., San Diego State University; Ph.D.E.E., Texas Tech University

## O

**O'Brien, Marc H.** (1997), Lecturer of Aeronautical Management Technology; B.A., Boston University; M.S., Indiana State University

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## P

**Palmgren, Dale E.** (1984), Associate Professor of Manufacturing and Aeronautical Engineering Technology; Chair, Department of Manufacturing and Aeronautical Engineering Technology; B.S., M.S., Ph.D., University of Wisconsin, Madison

**Pardini, Louis J.** (1967), Professor Emeritus of Technology; B.A., A.M., Idaho State University; Ed.D., University of Northern Colorado

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**Pearce, Martha V.** (1977), Professor Emeritus of Technology; B.S., Columbia University; M.S., Boston University; Ed.D., Arizona State University

**Peterson, Edward R.** (1977), Assistant Professor of Electronics and Computer Engineering Technology; B.S.E.E., Fairleigh Dickinson University; M.S.E.E., Arizona State University

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## R

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**Rajadas, John N.** (1996), Assistant Professor of Manufacturing and Aeronautical Engineering Technology; B.Tech., Indian Institute of Technology (India); M.S., Ph.D., Georgia Institute of Technology

**Rasmussen, Robert D.** (1949), Professor Emeritus of Agribusiness and Resource Management; B.S., Iowa State University; M.S., Washington State University

**Reed, William H.** (1968), Associate Professor of Manufacturing and Aeronautical Engineering Technology; B.S., University of Oklahoma; M.S., Arizona State University

**Richards, Timothy J.** (1994), Assistant Professor of Agribusiness and Resource Management; B.Comm., University of British Columbia; M.A., Ph.D., Stanford University

**Richardson, Grant L.** (1953), Professor Emeritus of Agribusiness and Resource Management; B.S., M.S., University of Arizona; Ph.D., Oregon State University

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**Roe, Keith B.** (1979), Professor Emeritus of Technology; B.S., Wisconsin State College; M.A., University of Michigan

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## S

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**Schildgen, Thomas E.** (1981), Professor of Information and Management Technology; Chair, Department of Information and Management Technology; B.S., M.S., Illinois State University; Ed.D., Northern Arizona University

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**Schwalm, David E.** (1986), Associate Professor of English; Dean of East College, Vice Provost ASUE; B.A., Carlton College; M.S., Ph.D., University of Chicago

**Schoen, Robert A.** (1966), Professor Emeritus of Technology; B.S., M.S., Arizona State University

**Seperich, George J.** (1976), Associate Professor of Agribusiness and Resource Management; B.S., Loyola University, Chicago; M.S., Ph.D., Michigan State University

**Sheller, Don** (1986), Professor Emeritus of Manufacturing Technology; B.M.E., Ohio State University; M.S., Arizona State University

**Spence, Gary L.** (1994), Lecturer of Aeronautical Management Technology; B.S., University of West Florida; M.S., Embry-Riddle Aeronautical University

**Stanton, Julie V.** (1996), Assistant Professor of Agribusiness; B.A., Georgetown University; Ph.D., University of Maryland, College Park

**Stiles, Philip G.** (1969), Professor of Agribusiness and Resource Management; B.S., University of Arkansas; M.S., University of Kentucky; Ph.D., Michigan State University

**Sundararajan, Rajeswari** (1996), Assistant Professor of Electronics and Computer Engineering Technology; B.S., University of Madras (India); M.S., Indian Institute of Science (India); Ph.D., Arizona State University

## T

**Taysom, Elvin D.** (1953), Professor Emeritus of Agribusiness and Resource Management; B.S., University of Idaho; M.S., Utah State University; Ph.D., Washington State University

**Thomason, Leslie L.** (1969), Professor Emeritus of Technology; A.B., M.A., Ed.D., University of Oklahoma

**Thor, Eric P.** (1990), Professor of Agribusiness and Environmental Resources; Director, Center for Agribusiness Policy Studies; B.S., M.S., Ph.D., University of California, Berkeley

## W

**Watkins, Thomas B.** (1972), Professor Emeritus of Technology; B.S., University of Wyoming; M.S., Arizona State University

**Welty, Ellen L.** (1996), Reference/Instruction Librarian, ASU East Library Services; B.A., University of Wyoming; M.L.S., University of Arizona

**Wilcox, Sidney W.** (1955), Professor Emeritus of Engineering; B.A., Bethany-Peniel College; M.A., University of Oklahoma

**Wilson, Daniel** (1978), Senior Lecturer of Information and Management Technology; B.S., Drexel University; M.S.E., Ph.D., Arizona State University

**Wood, Billy G.** (1977), Associate Professor of Electronics and Computer Engineering Technology; A.B., University of California; B.S., Eastern Illinois University; M.S., University of Arizona

## Z

**Zeng, Guoliang** (1991), Associate Professor of Electronics and Computer Engineering Technology; B.S., Chengdu Telecommunication Institute (China); M.S., University of California, San Diego; M.N.S., Ph.D., Arizona State University

East Campus students Deborah Syden (right), Eric Green (center), and LaRae Kendrick take a break in the Oasis, the new student lounge at ASU East. Tim Trumble photo