College of Technology and Applied Sciences

technology.poly.asu.edu

Albert L. McHenry, PhD, Dean

Aeronautical Management Technology, Department of 249

Electronics and Computer Engineering Technology, Department of 254

Engineering, Department of 258

Mechanical and Manufacturing Engineering Technology, Department of 259

Technology Management, Department of 264

Computing Studies, Division of 271

PURPOSE

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

Engineering technology programs offer professional preparation through a BS 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, environmental technology management, graphic information technology, fire service management, 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 six academic units:

Department of Aeronautical Management Technology
Department of Electronics and Computer Engineering Technology
Department of Engineering
Department of Mechanical and Manufacturing Engineering Technology
Department of Technology Management
Division of Computing Studies

DEGREE PROGRAMS

See the "College of Technology and Applied Sciences Baccalaureate Degrees and Majors" table, page 246. For graduate degrees, see the "College of Technology and Applied Sciences Graduate Degrees and Majors" table, page 247.

The College of Technology and Applied Sciences offers programs leading to the BS degree and BAS degree. The college also offers the Master of Science in Technology (MST) degree and the Master of Computing Studies degree (MCST). For more information, see the *Graduate Catalog*.

ACCREDITATION

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

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

Both the professional flight and the air transportation management concentrations in the Department of Aeronautical Management Technology are fully accredited by the Council on Aviation Accreditation. For more information, call 334/844-2431, send e-mail to caa@auburn.edu, or write

L literacy and critical inquiry / **MA** mathematics / **CS** computer/statistics/quantitative applications / **HU** humanities and fine arts / **SB** social and behavioral sciences / **SG** natural science—general core courses / **SQ** natural science—quantitative / **C** cultural diversity in the United States / **G** global / **H** historical / See "General Studies," page 93.

College of Technology and Applied Sciences Baccalaureate Degrees and Majors

Major	Degree	Concentration[1]	Administered By
Aeronautical Management Technology[2]	BS	Air transportation management or professional flight	Department of Aeronautical Management Technology
Applied Computer Science	BS	—	Division of Computing Studies
Applied Science	BAS	Aviation maintenance management technology, aviation management technology, computer systems administration, digital media management, digital publishing, emergency management, fire service management, instrumentation, Internet and Web development, law enforcement management, manufacturing technology and management, materials joining and manufacturing technology, microcomputer systems, municipal operations management, operations management, semiconductor technology, software technology applications, or technical graphics	Bachelor of Applied Science Advisory Committee
Computer Systems[2]	BS	Computer hardware technology or embedded systems technology	Division of Computing Studies
Electronics Engineering Technology[2]	BS	Electronic systems, microelectronics, or telecommunications	Department of Electronics and Computer Engineering Technology
Engineering	BSE	—	Department of Engineering
Environmental Technology Management	BS	—	Department of Technology Management
Graphic Information Technology	BS	—	Department of Technology Management
Manufacturing Engineering Technology[2]	BS	Manufacturing engineering technology or mechanical engineering technology	Department of Mechanical and Manufacturing Engineering Technology
Mechanical Engineering Technology[2]	BS	Aeronautical engineering technology, automation engineering technology, or mechanical engineering technology	Department of Mechanical and Manufacturing Engineering Technology
Operations Management Technology	BS	—	Department of Technology Management

[1] If a major offers concentrations, one must be selected unless noted as *optional*.

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

COUNCIL ON AVIATION ACCREDITATION
3410 SKYWAY DRIVE
AUBURN AL 36830

The Bachelor of Science degrees in Environmental Technology Management, Graphic Information Technology, and Operations Management are fully accredited by the National Association of Industrial Technology (NAIT). For more information, call 734/677-0720, or write

NATIONAL ASSOCIATION OF INDUSTRIAL TECHNOLOGY
3300 WASHTENAW AVENUE SUITE 220
ANN ARBOR MI 48104-4200

ADMISSION—BS DEGREE

The College of Technology and Applied Sciences admits first-year students who meet the undergraduate admission requirements of ASU. See "Undergraduate Admission," page 66. High school precalculus, physics, and chemistry are recommended. Transfer applicants must meet the university requirements for transfer students as specified under "Transfer Credit," page 71.

First-year students (new freshmen) are admitted to CTAS with professional status if they meet the general aptitude criteria for admission. First-year students admitted upon completion of the GED may be admitted if they have also achieved the minimum ACT or SAT scores required for undergraduate admission to the university.

College of Technology and Applied Sciences Graduate Degrees and Majors

Major	Degree	Concentration*	Administered By
Computing Studies	MCST	—	Division of Computing Studies
Technology	MSTech	Aeronautical engineering technology, manufacturing engineering technology, or mechanical engineering technology	Department of Mechanical and Manufacturing Engineering Technology
		Aviation management and human factors	Department of Aeronautical Management Technology
		Computer systems	Division of Computing Studies
		Electronic systems engineering technology, instrumentation and measurement technology, or microelectronics engineering technology	Department of Electronics and Computer Engineering Technology
		Environmental technology management, fire service administration, global technology and development, graphic information technology, or management of technology	Department of Technology Management
		Security engineering technology	College of Technology and Applied Sciences

* If a major offers concentrations, one must be selected unless noted as *optional*.

Students transferring from other ASU colleges may be admitted to CTAS with professional status if they meet the required GPA.

Transfer students from other institutions must meet the minimum admission requirements for college transfer students as described under "Transfer Credit," page 71.

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

For those students who are admitted to the professional flight concentration, in the Department of Aeronautical Management Technology, a secondary application process is required.

Transfer Credit

Credit for courses taken at a community college or another four-year institution is awarded according to the guidelines under "Transfer Credit," page 71. Students who are transferring from an Arizona community college and have been in continuous residence may continue under the catalog in effect at the time of their entrance into the community college. Students should be aware that some course work that transfers to ASU may not be applicable toward CTAS degree requirements. Students should confer with an advisor. The College of Technology and Applied Sciences maintains a cooperative agreement with most Arizona community colleges and with selected out-of-state colleges and universities to structure programs that are directly transferable into the technology programs at Polytechnic campus. For assistance in transferring from Arizona community colleges, transfer guides are available at www.asu.edu/provost/articulation.

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

ADMISSION—BAS DEGREE

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

ADVISING

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

GRADUATION REQUIREMENTS

Students must meet all university graduation requirements given in "University Graduation Requirements," page 89, 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.

L literacy and critical inquiry / **MA** mathematics / **CS** computer/statistics/quantitative applications / **HU** humanities and fine arts / **SB** social and behavioral sciences / **SG** natural science—general core courses / **SQ** natural science—quantitative / **C** cultural diversity in the United States / **G** global / **H** historical / See "General Studies," page 93.

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 (BS Degree)

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

ACADEMIC STANDARDS

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

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

A student on probation is subject to disqualification if (1) a semester GPA of 2.25 is not attained and the cumulative GPA is below 2.00 at the end of the probationary semester or (2) the student is placed on probation for two consecutive semesters and is unable to achieve the standard GPA 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 College of Technology Dean's Office. Any disqualified student who is accepted by another college at ASU may not register for courses in CTAS unless the courses are required in the new major. Disqualified students who register for courses in CTAS may be withdrawn from these courses any time during the semester.

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

STUDENT RESPONSIBILITIES

Course Prerequisites. Students should consult the *Schedule of Classes* and the catalog for course prerequisites. Students who register for courses without the designated prerequisites may be withdrawn without their consent at any time before the final examination. The instructor, the chair of the department, or the dean of the college may initiate such withdrawals. In such cases, students do not receive monetary reimbursement.

SPECIAL PROGRAMS

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

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

Barrett Honors College. The College of Technology and Applied Sciences participates in the programs of the Barrett Honors College, which provides enhanced educational experiences to academically superior undergraduate students. Participating students can major in any academic program. For more information, see "General Studies," page 93.

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's Student Financial Assistance Office.

ROTC Students. Students pursuing a commission through either the Air Force or Army ROTC program must take 12 to 20 semester hours of courses in the Department of Aerospace Studies or Department of Military Science. To preclude excessive overloads, these students should plan on at least one additional semester to complete degree requirements. Because of accreditation requirements, aerospace studies (AES) or military science (MIS) courses are not accepted for engineering technology majors.

ENGINEERING TECHNOLOGY CORE (ETC)

E ETC 100 Languages of Technology. (4)
fall and spring
Introduces computer-aided design, programming, modeling, and technical documentation. Lecture, lab.
General Studies: CS

E ETC 191 First-Year Seminar. (1–3)
selected semesters

E ETC 194 Special Topics. (1–4)
selected semesters

E ETC 492 Honors Directed Study. (1–6)
selected semesters

E ETC 493 Honors Thesis. (1–6)
selected semesters

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 63.

SECURITY ENGINEERING TECHNOLOGY (SET)

Graduate-Level Courses. For information about courses numbered from 500 to 799, see the *Graduate Catalog*, or access www.asu.edu/aad/catalogs on the Web. In some situations, undergraduate students may be eligible to take these courses; for more information, see "Graduate-Level Courses," page 62.

Department of Aeronautical Management Technology

eastair.poly.asu.edu
480/727-1381
SIM 201

William K. McCurry, Chair

Professors: Gesell, McCurry

Professor of Practice: Karp

Clinical Associate Professor: Pearson

Assistant Professor: Niemczyk

Lecturer: O'Brien

PURPOSE

Graduates are prepared for entry into the aviation and air transportation 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

Admission to the Bachelor of Science professional flight concentration requires an additional admission process. New and transfer students who have been admitted to ASU and who meet the requirements for admission to the College of Technology and Applied Sciences may be admitted without separate application to the Department of Aeronautical Management Technology only in the Bachelor of Applied Science concentrations, or to the Bachelor of Science air transportation management concentration. Transfer credits are reviewed by department faculty advisors. To be accepted as department credit, transfer courses must be equivalent in both content and level of offering. No flight experience or theoretical training courses beyond the Private Pilot Certificate are accepted. For more information, access the department Web page at eastair.poly.asu.edu.

DEGREES

The faculty in the Department of Aeronautical Management Technology offer a BS degree in Aeronautical Management Technology with concentrations in professional flight and air transportation management. A BAS degree in Applied Science is also offered with concentrations in aviation maintenance management technology and aviation management technology.

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

ACCREDITATION

The professional flight and air transportation management concentrations in the Department of Aeronautical Management Technology are fully accredited by the Council on Aviation Accreditation. For more information, call 344/844-2431, send e-mail to caa@auburn.edu, or write

COUNCIL ON AVIATION ACCREDITATION
3410 SKYWAY DRIVE
AUBURN AL 36830

AERONAUTICAL MANAGEMENT TECHNOLOGY—BS

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

All degree requirements are shown on curriculum check sheets for the concentrations that are available by visiting the department or by accessing the department Web site at eastair.poly.asu.edu. Requirements include First-Year Composition, university General Studies (see "General Studies," page 93), and the Aeronautical Management Technology Core. Note that all three General Studies awareness areas are required. Consult an advisor for an approved list of courses. Refer to individual concentration degree requirements for additional required courses. Students must complete each Aeronautical Management Technology course with a grade of "C" (2.00) 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

L literacy and critical inquiry / **MA** mathematics / **CS** computer/statistics/quantitative applications / **HU** humanities and fine arts / **SB** social and behavioral sciences / **SG** natural science—general core courses / **SQ** natural science—quantitative / **C** cultural diversity in the United States / **G** global / **H** historical / See "General Studies," page 93.

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	350	Aircraft Design and Logistics Management 3
AMT	396	Aviation Professional 1
AMT	410	Aviation Safety and Human Factors 3
AMT	442	Aviation Law/Regulations 3
Total		 31

Professional Flight Concentration

Flight training is certified by the Federal Aviation Administration. An FAA Class I medical examination is required for admission. It is recommended that a medical examination be completed by an aviation medical examiner of the student's choice before application for admission.

This program is designed for students who are seriously interested in becoming professional airline pilots. Because of limited space, the program selection process is academically competitive. Only those applicants who meet the subject matter and quality requirements and who submit their applications by the appropriate deadlines will be considered for admission.

The ASU Professional Flight program is the initial phase of the qualification/application process to become an airline first officer. Individuals seeking admission to the program must participate in a secondary application process. The secondary process will assess a candidate's FAA-certified First Class medical qualification; driving record; work and/or personal references; and cognitive, psychomotor skill, and psychological test results. It may also include a personal interview. The secondary application deadlines vary. Contact the department for current deadlines.

U.S. citizens must provide proof of citizenship as part of the secondary admission process to the professional flight concentration.

International students must meet all TSA clearance requirements before being admitted to the professional flight concentration. For more information, see the department Web site at eastair.poly.asu.edu. International students should check with Undergraduate International Admissions for details concerning admission and visa requirements. A TOEFL score of 600 is required for admission into the professional flight concentration. International students should be aware that they may encounter difficulty in converting their student visa to a work permit and therefore may not be able to find employment with a U.S. air carrier following graduation. International students are also advised that all certificates and ratings are under FAA certification and may not be accepted by the aviation authority in their home country.

Total program costs, which include aircraft, flight instructor time, flight training devices, simulator time, tests, fees, and tuition, require careful financial planning. Students must make satisfactory progress throughout both the flight and academic areas to be considered for continued advancement in the program. To proceed at a satisfactory pace through the flight training program, students should expect and plan to fly during the winter intercession and the summer session to complete the program. A program fee of $275 per semester is required for the professional flight concentration. A program fee of $125 per semester is required for the air transportation management concentration.

For more information, requirements, and specific application procedures, access the AMT Department Web site at eastair.poly.asu.edu.

Flight instruction costs are not included in university tuition and fees. The estimated cost of flight training is $50,000 in addition to normal university costs.

Degree Requirements

Professional flight 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. Students should be aware that a higher cumulative GPA may be required for employment by an airline upon graduation. All degree requirements are shown on the student's curriculum check sheet.

Concentration Requirements

In addition to the required courses for First-Year Composition, university General Studies (see "General Studies," page 93), and the Aeronautical Management Technology core, the following additional courses are required for the professional flight management concentration:

AMT	100	Flight Safety I 2
AMT	200	Flight Safety II 1
AMT	214	Commercial/Instrument Ground School I 3
AMT	300	Flight Safety III 1
AMT	322	Commercial/Instrument Ground School II 3
AMT	382	Air Navigation 3
AMT	385	Flight Instructor Ground School 3
AMT	387	Multiengine Pilot Ground School 1
AMT	392	Flight Instructor Instrument Ground School 3
AMT	400	Flight Safety IV 1
AMT	408	National Aviation Policy 3
AMT	482	Airline Instrument Procedures 3
AMT	486	Regional Jet Aircraft Systems 3
AMT	489	Airline Administration 3
AMT	490	Regional Jet Operations Capstone 3
Technical electives or internship 19		
Total		 55

Suggested Course Pattern for Freshmen

First Semester

AMT	100	Flight Safety I 2
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	270	Calculus with Analytic Geometry I *MA* 4
Total		 16

Second Semester

AMT	214	Commercial/Instrument Ground School I 3
ENG	102	First-Year Composition 3
ECN	211	Macroeconomic Principles *SB* 3
		or ECN 212 Microeconomic Principles *SB* (3)
PHY	111	General Physics *SQ** 3
PHY	113	General Physics Laboratory *SQ** 1
Total		 13

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

Air Transportation Management Concentration

The air transportation management concentration is designed to prepare graduates for managerial and supervisory positions throughout the air transportation industry. An in-depth technical education is included along with broad exposure to business and management courses. This program of study is interdisciplinary in nature and prepares the aeronautical career-oriented student for positions such as air traffic control specialist, air carrier manager, airport manager, and general aviation operations manager. To facilitate career options, the student selects a focus area in either air carrier management or airport management.

Degree Requirements

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

Concentration Requirements

In addition to the required courses for First-Year Composition, university General Studies (see "General Studies," page 93), and the Aeronautical Management Technology core, the following additional courses are required in the air transportation management concentration:

ACC	230	Uses of Accounting Information I....3
AMT	408	National Aviation Policy....3
AMT	444	Airport Management and Planning....3
AMT	489	Airline Administration....3
AMT	491	Aviation Management Capstone....3
OMT	343	Occupational Safety and Ergonomics....3
OMT	430	Ethical Issues in Technology....3
OMT	452	Industrial Human Resource Management....3
OMT	456	Introduction to Organized Labor....3
OMT	480	Organizational Effectiveness....3
TMC	346	Management Dynamics....3
Technical electives or internship....22		
Total....55		

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	270	Calculus with Analytic Geometry I *MA*....4
Total....14		

Second Semester

ENG	102	First-Year Composition....3
ECN	211	Macroeconomic Principles *SB*....3
		or ECN 212 Microeconomic Principles *SB* (3)
PGS	101	Introduction to Psychology *SB*....3
PHY	111	General Physics *SQ**....3
PHY	113	General Physics Laboratory *SQ**....1
General Studies elective *HU*....3		
Total....16		

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

APPLIED SCIENCE—BAS

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

Admission

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

Degree Requirements

The BAS degree in the College of Technology and Applied Sciences consists of 60 semester hours of upper-division (300 level and above) courses, with 30 hours in residence.

AAS degree....60
Assignable credit....6
BAS core....15
General Studies....19
Technical concentration....20
Total....120

General Studies Curriculum

The BAS curriculum builds on the general education content of the AAS degree. Additional General Studies (L, CS, and awareness areas) are met with courses in the core concentration. General Studies courses focus on contextual learning.

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

Assignable Credit

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

BAS Core

The area core is focused on management and organization, professional communication, quantitative analysis, and computer competency.

APM	301	Introductory Statistics *CS*....3
GIT	335	Computer Systems Technology....3
TMC	346	Management Dynamics....3
		or OMT 344 Industrial Organization (3)
		or OMT 452 Industrial Human Resource Management (3)
TMC	470	Project Management....3

L literacy and critical inquiry / **MA** mathematics / **CS** computer/statistics/quantitative applications / **HU** humanities and fine arts / **SB** social and behavioral sciences / **SG** natural science—general core courses / **SQ** natural science—quantitative / **C** cultural diversity in the United States / **G** global / **H** historical / See "General Studies," page 93.

TWC 400 Technical Communications *L* 3
Total 15

Technical Concentrations

Aviation Maintenance Management Technology. This concentration is for those students who have completed an airframe and powerplant certification as part of their AAS degree. Students receive an orientation in management practices that prepares them for progressively more responsible positions in the field of aviation maintenance management.

Aviation Management Technology. This concentration is for those students who have received training and education in some aspect of the air transportation industry (other than aviation maintenance), such as flight certificates and ratings, as part of their AAS degree. Students receive an orientation in management practices that prepares them for progressively more responsible positions in the field of aviation management.

STUDENT ORGANIZATIONS

The department hosts the local chapter of Alpha Eta Rho, an international professional aviation fraternity open to all students with an interest in aviation. The American Association for Airport Executives is open to all students with an interest in airport management. The Student Advisory Council is a leadership organization that facilitates student communication with faculty, departmental leaders, and university administrative personnel. The Women in Aviation International organization is open to all students.

AERONAUTICAL MANAGEMENT TECHNOLOGY (AMT)

E AMT Note 1. Flight instruction costs are not included in university tuition and fees.

E AMT 100 Flight Safety I. (2)
fall, spring, summer
Supervised private pilot flight training and flight safety briefings. Requires continuous enrollment until completion of the FAA Private Pilot Certificate. May be repeated for credit. Integrated lecture/lab. Fee. See AMT Note 1. Pre- or corequisites: both AMT 182 and 220 (or their equivalents).

E AMT 101 Introduction to Aeronautical Management Technology. (1)
fall and spring
Facilitates entry into Aeronautical Management Technology programs. Emphasizes *General Catalog* and concentration requirements, registration, careers, and Polytechnic campus facilities.

E AMT 182 Private Pilot Ground School. (3)
fall, spring, summer
Ground school preparation for Private Pilot Certificate. Aerodynamics, navigation, performance, and regulations. Integrated lecture/lab. Corequisite: AMT 220.

E AMT 194 Special Topics. (1–4)
selected semesters

E AMT 200 Flight Safety II. (1)
fall, spring, summer
Supervised commercial instrument flight training and safety briefings. Requires continuous enrollment until completion of FAA Commercial Pilot Certificate with Instrument Rating. Integrated lecture/lab. Fee. See AMT Note 1. Prerequisites: AMT 100; Private Pilot Certificate. Pre- or corequisite: AMT 214 or 322.

E AMT 201 Air Traffic Control. (3)
fall
Ground and air operations; weather services communications and routing; flight plans, IFR operations, departures and arrivals; and airport conditions and emergencies. Prerequisite: AMT 182.

E AMT 214 Commercial/Instrument Ground School I. (3)
fall and spring
Ground school leading to FAA Instrument Pilot Rating/Commercial Pilot Certificate (part 1 of 2). 10 hours ground trainer included. Integrated lecture/lab. Fee. Pre- or corequisites: AMT 182, 220.

E AMT 220 Aviation Meteorology. (3)
fall, spring, summer
Evaluation, analysis, and interpretation of atmospheric phenomena. Low- and high-altitude weather from the pilot's viewpoint. Corequisite: AMT 182.

E AMT 280 Aerospace Structures, Materials, and Systems. (4)
fall
Basic aerodynamics, incompressible/compressible airflow, wind tunnel testing, wing theory; analysis of aircraft structures; properties and applications of materials, and aircraft systems. Lecture, lab. Fee. Prerequisites: PHY 111, 113.

E AMT 287 Aircraft Powerplants. (4)
spring
Theory and performance analysis of gas turbine and reciprocating aircraft engines. Engine accessories, systems, and environmental control. Lecture, lab. Prerequisites: PHY 111, 113.

E AMT 300 Flight Safety III. (1)
fall, spring, summer
Supervised instructor flight training and safety briefings. Requires continuous enrollment until completion of FAA Flight Instructor Certificate with Instrument Instructor Rating. Integrated lecture/lab. Fee. See AMT Note 1. Prerequisite: AMT 200. Pre- or corequisite: AMT 385.

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

E AMT 322 Commercial/Instrument Ground School II. (3)
fall and spring
Ground school leading to FAA Instrument Pilot Rating/Commercial Pilot Certificate (part 2 of 2). 10 hours ground trainer included. Integrated lecture/lab. Fee. Prerequisite: AMT 100 or instructor approval. Pre- or corequisite: AMT 214.

E AMT 350 Aircraft Design and Logistics Management. (3)
spring
Fundamental aircraft design principles, including performance factors associated with mission profiles and the identification of basic logistical support requirements. Integrated lecture/lab. Prerequisites: AMT 280, 287.

E AMT 360 Introduction to Helicopter Technology. (3)
selected semesters
Introduces the working functions of modern rotary wing aircraft, rotary wing flight theory, aerodynamics, controls, flight, and power requirements. Prerequisites: PHY 111, 113.

E AMT 370 Air Freight Operations. (3)
selected semesters
Air freight operations in National Aviation System; ramp operations, loading, weight and balance, and administration of airside and groundside operations. Prerequisite: junior standing.

E AMT 382 Air Navigation. (3)
fall and spring
Theory and application of modern advanced navigation and flight instrument systems. Introduces crew resource management in multiplace cockpits. Lecture, lab. Prerequisites: AMT 200, 322.

E AMT 385 Flight Instructor Ground School. (3)
fall and spring
Ground school in preparation for the FAA Flight Instructor Certificate. Integrated lecture/lab. Pre- or corequisite: AMT 200.

E AMT 387 Multiengine Pilot Ground School. (1)
fall and spring
Ground school preparation for the FAA Multiengine Rating. Integrated lecture/lab. Fee. See AMT Note 1. Prerequisite: AMT 200 or instructor approval.

E AMT 391 Multiengine Instructor Ground School. (2)
selected semesters
Ground school preparation for the FAA Multiengine Flight Instructor Rating. Integrated lecture/lab. See AMT Note 1. Prerequisites: AMT 300, 387, 400.

E AMT 392 Flight Instructor Instrument Ground School. (3)
fall and spring
Ground school preparation for the FAA Instrument Flight Instructor Rating. Lecture, lab. See AMT Note 1. Prerequisites: AMT 200, 385.

E AMT 394 Special Topics. (1–4)
selected semesters

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

E AMT 400 Flight Safety IV. (1)
fall, spring, summer
Multiengine crew training and safety briefings. Requires continuous enrollment until completion of multiengine rating. Integrated lecture/lab. Fee. See AMT Note 1. Prerequisite: AMT 300. Pre- or corequisite: AMT 387.

E AMT 401 Multiengine Instructor Rating. (1)
selected semesters
Normal and emergency flight operations. Instruction techniques and procedures for light multiengine land, airplane. Requires CFIAME Rating for course completion. Integrated lecture/lab. See AMT Note 1. Prerequisites: AMT 391, 400.

E AMT 408 National Aviation Policy. (3)
fall
Examines aviation and airspace policies and policy process, including agencies involved in formulation, implementation, and evaluation of aviation policy. Prerequisites: AMT 308; senior standing.

E AMT 410 Aviation Safety and Human Factors. (3)
fall
Aviation accident prevention, human factors, life support, fire prevention, accident investigation, and crash survivability. Development and analysis of aviation safety programs. Prerequisites: junior standing; completion of 1 semester of General Studies L requirement.

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

E AMT 442 Aviation Law/Regulations. (3)
fall
Aviation within context of U.S. Common Law system. Public law, administrative rule making, sovereignty, enforcement, and case law analysis. Prerequisite: junior standing.

E AMT 444 Airport Management and Planning. (3)
spring
Orientation to administration and management of modern public airports, including overview of planning, funding, and development of airport facilities. Prerequisite: junior standing.

E AMT 482 Airline Instrument Procedures. (3)
fall
Advanced instrument flight using airline instrument procedures and airline crew and cockpit resource management. Lecture, lab. Prerequisites: a combination of AMT 200 and 322 and 382 or only instructor approval.

E AMT 484 Aeronautical Internship. (1–12)
fall, spring, summer
Work experience assignment with aerospace industry commensurate with student's program. Special project guidance by industry with university supervision. Prerequisites: advisor approval; junior standing.

E AMT 486 Regional Jet Aircraft Systems. (3)
fall and spring
Regional jet airline aircraft systems and flight procedures. Includes theoretical educational education for regional jet commercial passenger aircraft. Integrated lecture/lab. Prerequisite: AMT 382. Pre- or corequisite: AMT 482.

E AMT 489 Airline Administration. (3)
spring
Administrative organizations, economics of airline administration, operational structure, and relationship with federal government agencies. Prerequisite: junior standing.

E AMT 490 Regional Jet Operations Capstone. (3)
fall and spring
Regional jet aircraft operations and flight procedures. Includes theoretical education for RJ aircraft, FTD and full-motion simulator time. Integrated lecture/lab. Prerequisites: AMT 382; professional flight major. Corequisite: AMT 482.

E AMT 491 Aviation Management Capstone. (3)
spring
Integrated group project with industry partner to address current problems in either air carrier or airport management focus area. Prerequisite: senior standing.

E AMT 494 Special Topics. (1–4)
selected semesters

E AMT 496 Airline Aircraft Systems Capstone. (3)
spring
Commercial airline aircraft systems and flight procedures. Includes theoretical education for large, commercial passenger aircraft. Integrated lecture/lab. Prerequisite: senior standing.

E AMT 498 Pro-Seminar. (1–7)
selected semesters

E AMT 499 Individualized Instruction. (1–3)
selected semesters

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 63.

Graduate-Level Courses. For information about courses numbered from 500 to 799, see the *Graduate Catalog*, or access www.asu.edu/catalog on the Web. In some situations, undergraduate students may be eligible to take these courses; for more information, see "Graduate-Level Courses," page 62.

L literacy and critical inquiry / **MA** mathematics / **CS** computer/statistics/quantitative applications / **HU** humanities and fine arts / **SB** social and behavioral sciences / **SG** natural science—general core courses / **SQ** natural science—quantitative / **C** cultural diversity in the United States / **G** global / **H** historical / See "General Studies," page 93.

Department of Electronics and Computer Engineering Technology

www.poly.asu.edu/ctas/ecet
480/727-1514
TECH 101

Lakshmi V. Munukutla, Chair

Professors: McHenry, Munukutla, Robertson

Associate Professors: Darveaux, Macia, Madakannan, Petrovic, Sundararajan, Zeng

PURPOSE

The Department of Electronics and Computer Engineering Technology prepares graduates to apply scientific and engineering knowledge, methods, and techniques in support of technological applications in electronics and computer engineering activities and processes.

The engineering technology curriculum is applications oriented and builds upon a background of applied science and mathematics, including the concepts and applications of calculus. Graduates are prepared to produce practical, workable, and safe solutions to technologically challenging problems. Graduates are employed in the electronics and computer industries with responsibilities such as designing, installing, and operating technical systems; analyzing and (re) engineering systems that embed computer hardware and software for unique applications; developing and producing products, managing manufacturing processes; and providing customer support for technical products and systems.

DEGREES

The faculty in the Department of Electronics and Computer Engineering Technology offer the BS degree in Electronics Engineering Technology (BS/EET).

For students holding an AAS degree, the department offers the BAS degree with a major in Applied Science. Two concentrations are available: instrumentation and semiconductor technology.

A Master of Science in Technology degree program with concentrations in electronic systems engineering technology, instrumentation and measurement technology, and microelectronics engineering technology is available for qualified BS graduates. See the *Graduate Catalog* for more information.

Electronics Engineering Technology—BS

Students interested in the BS degree in Electronics Engineering Technology may choose to specialize in one of the following three concentrations: electronic systems, microelectronics, and telecommunications.

The *electronic systems* concentration is aimed at preparing persons for careers in control, electronics, instrumentation, and power systems applications. This concentration allows a student to develop a broad-based knowledge of electrical/electronic fundamentals with an applications perspective.

The *microelectronics (UET)* concentration combines applied electronics, monolithic and hybrid integrated circuit processing and applications, device and component fabrication, and manufacturing. The objective of this concentration is to prepare persons to assume positions in the area of microelectronics manufacturing with immediately applicable knowledge as well as to develop a strong foundation of electronic fundamentals and methods. Graduates of this concentration secure positions in processing, manufacturing operations, and application areas in industry as members of diverse scientific engineering teams.

The *telecommunications* concentration encompasses the fundamentals of information and signal processing, modern bandwidth-efficient digital radio analysis with RF and microwave circuits and systems. Applications include telephone pulse code modulation, cable TV, fiber optic links, and satellite transmission circuits and systems.

The departmental curriculum is organized into two categories, technical studies and General Studies. Technical studies consist of core areas and the concentration specialty area. General Studies consist of courses selected to meet the university General Studies requirement (see "General Studies," page 93) as well as the math/science requirement of the Technology Accreditation Commission (TAC) of the Accreditation Board for Engineering and Technology (ABET). Note that all three General Studies awareness areas are required. Consult an advisor for an approved list of courses.

A minimum of 50 upper-division semester 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 or higher 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 BS/EET curriculum has been carefully structured to meet the specific requirements of the university and to include the content required by the TAC of the ABET, the professional accrediting agency for such curricula.

ELECTRONICS ENGINEERING TECHNOLOGY—BS 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:

CON	211	Applied Engineering Mechanics: Statics	3
ETC	100	Languages of Technology *CS*	4
MET	340	Applied Thermodynamics and Heat Transfer	3
Total			10

Electronics Engineering Technology Core and Major Requirements

CST	100	Object-Oriented Software Development I	3

CST	150	Digital Systems I *CS*	4
CST	350	Digital Systems II	4
CST	354	Microcomputer Architecture and Programming	4
EET	208	Electric Circuit Analysis I	4
EET	301	Electric Circuit Analysis II	4
EET	310	Electronic Circuits I	4
EET	372	Communication Systems	4
EET	396	Professional Orientation*	1
EET	407	Energy Conversion and Applications	4
EET	410	Electronic Circuits II	4
UET	331	Electronic Materials	3
UET	415	Electronic Manufacturing Engineering Principles	3
Total			46

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

Electronics Engineering Technology Concentrations

Electronic Systems

CST	383	Shell and Script Programming with UNIX	3
EET	406	Control System Technology	4
EET	430	Instrumentation Systems	4
EET	460	Power Electronics	4
Approved technical electives			7
Total			22

Microelectronics

CHM	116	General Chemistry II *SQ*	4
UET	416	Dopant Control Technology	3
UET	417	Semiconductor Technology Practice	3
UET	418	Systems on Silicon	3
UET	421	IC Device Characterization	3
UET	432	Semiconductor Packaging and Heat Transfer	3
Approved technical elective			2
Total			21

Telecommunications

CET	458	Digital Computer Networks	3
CET	473	Digital/Data Communications	4
EET	401	Digital Signal Processing for Multimedia	3
EET	494	ST: Digital Filter Hardware Design	3
Approved technical electives			9
Total			22

Electronics Engineering Technology
Program of Study
Typical First- and Second-Year Sequence

First Year

First Semester

ENG	101	First-Year Composition	3
ETC	100	Languages of Technology *CS*	4
MAT	170	Precalculus *MA*	3
PHY	111	General Physics *SQ*[1]	3
PHY	113	General Physics Laboratory *SQ*[1]	1
Total			14

Second Semester

CST	100	Object-Oriented Software Development I	3
CST	150	Digital Systems I *CS*	4
ENG	102	First-Year Composition	3
MAT	260	Technical Calculus I *MA*	3
PHY	112	General Physics *SQ*[2]	3
PHY	114	General Physics Laboratory *SQ*[2]	1
Total			17

Second Year

First Semester

CON	211	Applied Engineering Mechanics: Statics	3
CST	350	Digital Systems II	4
ECN	211	Macroeconomic Principles *SB*	3
EET	208	Electric Circuit Analysis I	4
MAT	261	Technical Calculus II *MA*	3
Total			17

Second Semester

CHM	113	General Chemistry I *SQ*	4
EET	301	Electric Circuit Analysis II	4
MAT	262	Technical Calculus III *MA*	3
MET	340	Applied Thermodynamics and Heat Transfer	3
HU, SB, or awareness area course			3
Total			17

[1] Both PHY 111 and 113 must be taken to secure SQ credit.
[2] Both PHY 112 and 114 must be taken to secure SQ credit.

APPLIED SCIENCE—BAS

The Bachelor of Applied Science degree is a "capstone" degree for the Associate of Applied Science degree. The BAS degree exposes students to advanced concepts and diverse critical thinking skills that prepare them for future career opportunities and professional advancement. Students wishing to enroll in the BAS concentrations offered by the Department of Electronics and Computer Engineering Technology should have an AAS in electronics technology or computer programming.

Admission

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

Degree Requirements

The BAS degree in the College of Technology and Applied Sciences consists of 60 semester hours of upper-division (300-level and above) courses, with 30 semester hours in residence.

AAS degree	60
Assignable credit	6
BAS core	15
General Studies	19
Technical concentration	20
Total	120

General Studies Curriculum

The BAS curriculum builds on the general education content of the AAS degree. Additional General Studies (L, CS, and awareness areas) are met with courses in the core or

L literacy and critical inquiry / **MA** mathematics / **CS** computer/statistics/quantitative applications / **HU** humanities and fine arts / **SB** social and behavioral sciences / **SG** natural science—general core courses / **SQ** natural science—quantitative / **C** cultural diversity in the United States / **G** global / **H** historical / See "General Studies," page 93.

concentration. General Studies courses focus on contextual learning.

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

Assignable Credit

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

BAS Core

The area core focuses on management and organization, professional communication, quantitative analysis, and computer competency. The BAS core consists of five courses and varies depending upon concentration.

BAS Core

CST	354	Microcomputer Architecture and Programming	4
CST	386	Operating Systems Principles	3
EET	494	ST: Data Analysis	3
TMC	346	Management Dynamics	3
TWC	400	Technical Communications *L*	3
Total			16

Technical Concentrations

Instrumentation. This concentration studies instrumentation, power systems, and computer systems. The curriculum prepares the graduate to specify and prepare solutions for a wide variety of electrical and electronic instrumentation systems. Graduates from this concentration are prepared for technical leadership positions in the various segments of the electronics industry.

Semiconductor Technology. This concentration prepares graduates for careers in the semiconductor industry. The BAS degree provides graduates with an understanding of integrated circuit processing, mask making, packaging, and the software tools used in this industry.

ELECTRONICS ENGINEERING TECHNOLOGY (EET)

E EET 191 First-Year Seminar. (1–3)
selected semesters

E EET 208 Electric Circuit Analysis I. (4)
fall and spring
Electrical models, AC/DC steady-state analysis of first and second order systems. Circuit theorems. Three-phase circuits. Lecture, lab. Pre- or corequisite: MAT 261.

E EET 294 Special Topics. (1–4)
selected semesters

E EET 301 Electric Circuit Analysis II. (4)
fall and spring
Analysis of continuous-time signals and linear systems of using Laplace and Fourier response of circuits. Lecture, lab. Prerequisite: EET 208. Pre- or corequisite: MAT 262.

E EET 304 Transmission Lines in Computer Networks. (3)
spring
Theory and application of transmission lines in high-speed computer networks. Signal propagation and impedance matching. Lecture, lab, computer labs. Prerequisite: EET 301.

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

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

E EET 394 Special Topics. (1–4)
selected semesters

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

E EET 401 Digital Signal Processing for Multimedia. (3)
fall
Applies DSP techniques to multimedia. Digital filter analysis and design. Time and frequency techniques. Computer applications. Cross-listed as CET 401. Credit is allowed for only CET 401 or EET 401. Prerequisites: EET 301; MAT 262.

E EET 403 PLCs, Sensors, and Actuators. (3)
spring
Applications, programming, and troubleshooting using PLCs. Interfacing to motors, sensors, and actuators. Fluid power principles. Lecture, lab, projects. Prerequisite: EET 208 (or equivalent electrical science course).

E EET 406 Control System Technology. (4)
spring
Control system components, analysis of feedback control systems, stability, performance, and application. Lecture, lab, computer simulations. Prerequisites: EET 301; MAT 262.

E EET 407 Energy Conversion and Applications. (4)
fall
Electricity, magnetism, mechanics, heat and units, and three-phase circuits. Electrical machines, transformers, generation, transmission, and distribution of electrical energy. Lecture, lab. Prerequisite: EET 208.

E EET 410 Electronic Circuits II. (4)
fall and spring
Analysis and design of OP-amps, power amplifiers, and digital logic families. Feedback design using frequency response. Computer analysis and design. Lecture, lab. Prerequisites: EET 301, 310.

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

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

E EET 482 Industrial Practice: Internship/Co-op. (1–4)
fall, spring, summer
Specially assigned or approved activities in electronic industries or institutions. Requires report. May be repeated for up to a maximum of 10 credits. Prerequisites: Electronics Engineering Technology major; junior or senior standing.

E EET 484 Internship. (1–3)
selected semesters

E EET 490 Electronics Project. (1–4)
fall, spring, summer
Individual or small group projects in applied electronics, with emphasis on laboratory practice or hardware solutions to practical problems. Prerequisite: instructor approval.

E EET 492 Honors Directed Study. (1–3)
selected semesters

E EET 493 Honors Thesis. (1–6)
selected semesters

E EET 494 Special Topics. (1–4)
fall and spring
Topics may include the following:
- Data Analysis. (3)
- Digital Filter Hardware Design. (3)

E EET 498 Pro-Seminar. (1–3)
selected semesters

E EET 499 Individualized Instruction. (1–3)
selected semesters

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 63.

Graduate-Level Courses. For information about courses numbered from 500 to 799, see the *Graduate Catalog*, or access www.asu.edu/catalog on the Web. In some situations, undergraduate students may be eligible to take these courses; for more information, see "Graduate-Level Courses," page 62.

MICROELECTRONICS ENGINEERING TECHNOLOGY (UET)

E UET 191 First-Year Seminar. (1–3)
selected semesters

E UET 194 Special Topics. (1–4)
selected semesters

E UET 294 Special Topics. (1–4)
selected semesters

E UET 305 Introduction to Microelectronics. (3)
fall, spring, summer
Quantifies the role of microelectronics technology and its associated skills as drivers for electronics systems development. Lecture with strong Web preparation and support. Prerequisite: junior standing.

E UET 331 Electronic Materials. (3)
fall
Physical, chemical, electromagnetic, and mechanical properties of electronic materials. Solid-state device characteristics and their material properties. Fee. Prerequisites: CHM 113; EET 208; PHY 112, 114.

E UET 411 Layer Deposition Technology. (3)
spring
Fundamentals, applications, and vacuum technology of layer deposition processes used in IC fabrication. Lecture with Web support. Fee. Credit is allowed for only UET 411 or 511. Prerequisite: UET 331. Corequisite: UET 417.

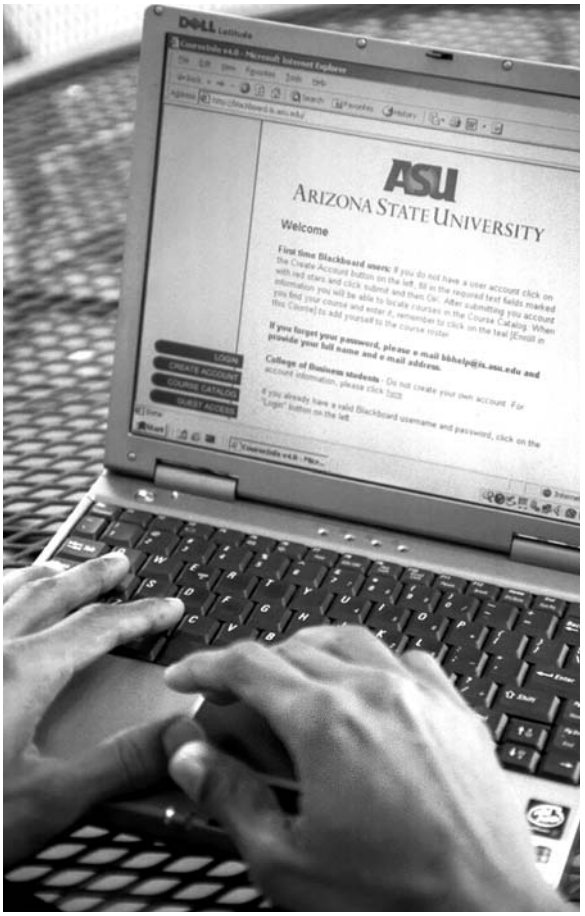
E UET 415 Electronic Manufacturing Engineering Principles. (3)
fall and spring
Electronic equipment design and fabrication principles and practice. Completion of electronics hardware design project and report. Lecture, lab. Fee. Prerequisite: senior standing (113 hours) in Electronics Engineering Technology.

E UET 416 Dopant Control Technology. (3)
fall
Design and practical realization of charge distribution in microelectronic devices, including ion implantation and diffusion processes. Lecture with Web support. Credit is allowed for only UET 416 or 516. Prerequisite: UET 331. Corequisite: UET 417.

E UET 417 Semiconductor Technology Practice. (3)
fall
Lab-based design and execution of safe and effective semiconductor fabrication operations. Lab. Prerequisite: UET 331 (or its equivalent). Corequisites: UET 411 and 416 and 424 (or their equivalents).

E UET 418 Systems on Silicon. (3)
spring
Factors that drive integration on silicon, including logic, memory, and interfaces. Economics of system-level solutions. Lecture with Web support and team activities. Credit is allowed for only UET 418 or 518. Prerequisite: UET 331. Corequisite: UET 417.

E UET 421 IC Device Characterization. (3)
fall
Design and operation of the major classes of semiconductor devices. Characterization by parameters and their extraction. Future technology trends. Lecture with Web support. Fee. Prerequisite: UET 331.



Many areas on campus accommodate wireless network connections, and wireless zones continue to expand on all ASU campuses.

Tim Trumble photo

E UET 424 Pattern Transfer Technology. (3)
spring
Maskmaking, lithography, and etch processes for integrated circuit fabrication. Lecture with Web support. Prerequisite: UET 331. Corequisite: UET 417.

E UET 426 Software Tools for the Semiconductor Industry. (3)
spring
Introduces software tools commonly used in the semiconductor industry, such as SUPREM IV, PSPICE, VIEWLOGIC, and ICED. Prerequisite: UET 331.

E UET 432 Semiconductor Packaging and Heat Transfer. (3)
spring
Packaging theory and techniques; hermetic and plastic assembly; thermal management; electrical characteristics and reliability. Prerequisite: UET 331 (or their equivalents).

E UET 437 Process Control and Validation. (3)
spring
Statistical process control and its application to IC fabrication. Design, control, and performance validation techniques throughout the manufacturing process. Lecture with Web support. Prerequisite: 300-level statistics course. Corequisite: UET 417.

L literacy and critical inquiry / **MA** mathematics / **CS** computer/statistics/quantitative applications / **HU** humanities and fine arts / **SB** social and behavioral sciences / **SG** natural science—general core courses / **SQ** natural science—quantitative / **C** cultural diversity in the United States / **G** global / **H** historical / See "General Studies," page 93.

E UET 484 Internship. (1–3)
selected semesters

E UET 492 Honors Directed Study. (1–3)
selected semesters

E UET 493 Honors Thesis. (1–6)
selected semesters

E UET 494 Special Topics. (1–4)
selected semesters

E UET 498 Pro-Seminar. (1–3)
selected semesters

E UET 499 Individualized Instruction. (1–3)
selected semesters

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 63.

Graduate-Level Courses. For information about courses numbered from 500 to 799, see the *Graduate Catalog,* or access www.asu.edu/catalog on the Web. In some situations, undergraduate students may be eligible to take these courses; for more information, see "Graduate-Level Courses," page 62.

Department of Engineering

www.poly.asu.edu/ctas/engineering
480/727-2727
CNTR 110

Chell Roberts, Chair

Professors: Henderson, Jakubowski

Associate Professors: Grondin, Hinks, Kuo, Roberts

Assistant Professor: Sugar

PURPOSE

The emerging problems that engineers must solve require a broad set of interdisciplinary skills. Engineers are challenged with improving the quality of life for human kind, designing new innovative products, preparing for potential catastrophes, and providing society with technological leadership. The Department of Engineering provides a flexible, new generation engineering education that serves as a foundation for a variety of technical and professional careers in a rapidly changing world.

Learning is approached through student-focused inquiry, through the investigation and solution of realistic engineering problems, and through frequent participation on interdisciplinary project teams. Learners are guided in the development of a strong foundation in modern engineering skills and in the ability to design, analyze, and build. The department is committed to mentoring students in learning, in the selection of career pathways, and in the transition to the professional world. Students graduating from the program have excellent engineering skills, global awareness, strong communication skills, good business skills, an understanding of entrepreneurship and the ability to continue life-long growth in their professional skills.

The engineering program provides a unique learning environment with faculty who make learning and students a top priority and where students are actively involved in their own education. Realistic projects permeate the curriculum, providing extensive experience in teaming with learners from other disciplines and in communicating to diverse audiences. Classrooms are design studios. The environment and learning approach connects engineering, science, math, and technology to real-world problems and smoothes the transition to a professional career.

The program structure is flexible and responsive to emerging engineering fields. The program integrates a broad knowledge base with study in multiple concentrations, providing both breadth and depth. This provides a greater flexibility in curricular and career pathways allowing for multidisciplinary experiences and novel combinations of expertise. Throughout the curriculum students learn to think critically, with a particular focus on how engineering addresses a variety of technical and societal problems.

DEGREE

The faculty in the Department of Engineering offer a BSE degree in Engineering.

ACCREDITATION

The program will seek accreditation through the Engineering Accreditation Council of the Accreditation Board for Engineering and Technology, Inc. (111 Market Place, Suite 1050, Baltimore, MD 21202, 410/347-7700) under the general engineering criteria applicable to all engineering degrees. The Accreditation Board requires that a program have graduates before accreditation can be granted. Typically, graduates from the year preceding accreditation are granted the status of having an accredited degree.

ENGINEERING—BSE

The Engineering curriculum is a flexible engineering undergraduate curriculum. Flexibility is achieved through a primary and a secondary concentration, automatically making the degree multidisciplinary in nature. The primary concentration is selected from a range of engineering specializations. The secondary concentration is selected from another engineering specialization or from an area of interest outside the engineering field. In addition, the curriculum has nine semester hours of unrestricted electives. This flexibility in the curriculum allows students to take 45 to 66 semester hours of engineering course work in addition to zero to 27 semester hours in the secondary concentration.

A minimum of 128 semester hours with a cumulative GPA of 2.00 is required for graduation. Students must complete First-Year Composition and the University General Studies requirements for Humanities, Social and Behavioral Science and the Global, Historical and Cultural diversity in the US awareness requirements and meet all other University degree requirements.

It is recommended that a student seeking transfer admission to this program at a later date plan on taking MAT 270 and 271; PHY 121 and 122 and CHM 113 or 114 as part of their university general studies requirements. Engineering courses covered by the standard articulation agreements

between the various Arizona universities and community colleges that are articulated as equivalent will be accepted as credit toward this degree.

For more information and advising on courses, send e-mail to engr@asu.edu, call (480) 727-2727, or access the Web site at www.poly.asu.edu/ctas/engineering.

ENGINEERING (EGR)

E EGR 194 Special Topics. (1–4)
selected semesters
Topics may include the following:
- Critical Inquiry in Engineering. (3)
- Introduction to Engineering. (3)
- Introduction to Engineering Design. (4)
- Technology and Society. (3)

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 63.

Department of Mechanical and Manufacturing Engineering Technology

www.poly.asu.edu/ctas/mmet
480/727-1584
SIM 295

Scott G. Danielson, Chair

Associate Professors: Biekert, Danielson, Nam, Palmgren, Rajadas, Rogers

Assistant Professor: Post

Senior Lecturer: Gintz

PURPOSE

The Department of Mechanical and Manufacturing Engineering Technology emphasizes applied engineering practice through four-year degree programs in Manufacturing Engineering Technology and Mechanical Engineering Technology. Math and science principles are applied to the solution of technical problems in a lecture/laboratory environment.

The Mechanical and Manufacturing Engineering Technology (MMET) degree programs endeavor to produce qualified and competent applied engineering professionals (engineering technologists). Graduates are prepared to make substantial contributions to their employers in as short a time as possible. Specifically, the MMET program strives to graduate individuals who possess

1. the scientific, technical, analytical, statistical, computational, and problem solving skills necessary for mechanical and manufacturing engineering practice (including specific aeronautical or automation skills, as appropriate);
2. the competencies appropriate to entry-level professionals in manufacturing systems engineering, enterprise engineering, analysis, product and system design, product realization testing, and quality control;
3. team building, leadership, communication, and project management skills;
4. an understanding of the social, political, and economic environment in which engineering operations function to include broad ethical considerations (i.e., work habits, safety, hazmat);
5. a depth of understanding in either aeronautical or automation practice (for mechanical engineering technology specialty concentrations only);
6. the basic knowledge of production processes taking design manufacturability into account (for Mechanical Engineering Technology graduates only); and
7. a depth of understanding in applications of manufacturing science, technology, and engineering in relation to process and production engineering (for Manufacturing Engineering Technology graduates only).

The goal of the manufacturing engineering technology program is to prepare students for employment in areas such as manufacturing engineering, manufacturing processes, automation, and quality control. Major emphasis is placed on reducing the amount of time required by industry to make the graduate productive in any area of work. The department actively supports the student chapter of the Society of Manufacturing Engineers.

The Mechanical Engineering Technology program produces graduates with the ability to design, develop, implement, and improve machinery, workstations, and systems. The curriculum prepares graduates for many job opportunities in engineering design, manufacturing, and laboratory environments. Graduates are prepared to design and develop machines and related mechanical equipment. Aircraft and their components, automation as used in manufacturing, machine tools, materials handling systems, and industrial production equipment are just a few examples. The department actively supports a student chapter of the Society of Automotive Engineers.

For more information about both programs, access the Web site at www.poly.asu.edu/ctas/mmet.

ACCREDITATION

The BS degree in Manufacturing Engineering Technology and the BS degree in Mechanical Engineering Technology are accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc. (See "Accreditation," page 245, for more information.)

L literacy and critical inquiry / **MA** mathematics / **CS** computer/statistics/quantitative applications / **HU** humanities and fine arts / **SB** social and behavioral sciences / **SG** natural science—general core courses / **SQ** natural science—quantitative / **C** cultural diversity in the United States / **G** global / **H** historical / See "General Studies," page 93.

DEGREES

The Department of Mechanical and Manufacturing Engineering Technology offers the BS degree in Manufacturing Engineering Technology and the BS degree in Mechanical Engineering Technology.

For students holding an AAS degree, the department offers the BAS degree with concentrations in manufacturing technology and management and materials joining and manufacturing technology.

A Master of Science in Technology degree with concentrations in manufacturing engineering technology, mechanical engineering technology, and aeronautical engineering technology is offered for graduate study. See the *Graduate Catalog* for more information.

BS Degree Requirements

All degree requirements for programs are shown on curriculum check sheets. Requirements include First-Year Composition, University General Studies (see "General Studies," page 93), and the Engineering Technology Core. All three General Studies awareness areas are required. Consult an 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—BS

The BS 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	54
Selected concentration	9
Total	128

The following courses constitute the Manufacturing Engineering Technology major and are required of all Manufacturing Engineering Technology students. Refer to the specific concentrations for additional requirements.

Manufacturing Engineering Technology Major

EET	403	PLCs, Sensors, and Actuators 3
MET	150	Introduction to Engineering Technology 1
MET	230	Introduction to Engineering Materials 2
MET	231	Manufacturing Processes 3
MET	300	Applied Material Science 3
MET	302	Welding Survey 3
MET	309	Nondestructive Testing and Quality Assurance 1
MET	313	Applied Mechanics of Materials 3
MET	314	Applied Mechanics of Materials Laboratory 1
MET	331	Machine Design I 3
MET	341	Manufacturing Analysis 3
MET	344	Casting and Forming Processes 3
MET	345	Advanced Manufacturing Processes 3
MET	351	Introduction to Automation 3
MET	396	Manufacturing Professional Orientation 1
MET	401	Quality Assurance 3
MET	416	Applied Computer-Integrated Manufacturing *CS* 3
MET	443	CNC Computer Programming 3
MET	444	Production Tooling 3
MET	460	Manufacturing Capstone Project I 3
MET	461	Capstone Project II 3
Total		54

A student participating in the Manufacturing Engineering Technology program may select from two concentrations: manufacturing engineering technology or mechanical engineering technology.

Manufacturing Engineering Technology Concentration. This concentration is designed to prepare technologists with both conceptual and practical applications of processes, materials, and products related to manufacturing industries. Accordingly, this concentration provides additional preparation for students to meet the responsibilities in planning the processes of production, developing the tools and machines, and integrating facilities for production or manufacturing.

Required Courses

MET	409	Applied Engineering Economics 3
MET	410	Manufacturing Resource Management 3
MET	442	Specialized Production Processes 3
Total		9

Mechanical Engineering Technology Concentration. The primary objective of the mechanical engineering technology concentration is to offer manufacturing students an emphasis in mechanics and thermal sciences. Required courses are as follows:

MET	410	Manufacturing Resource Management 3
MET	434	Applied Fluid Mechanics 3
MET	438	Machine Design II 3
Total		9

Mechanical Engineering Technology—BS

The BS degree in Mechanical Engineering Technology requires 128 semester hours as specified below:

Mechanical Engineering Technology major	63
Engineering technology core	14
First-year composition	6
General Studies/department requirements	45
Total	128

Students interested in the BS degree in Mechanical Engineering Technology choose one of the following three concentrations: mechanical, aeronautical, or automation engineering technology. Each concentration includes six courses for a total of 18 semester hours.

The mechanical engineering technology concentration builds a strong base of knowledge of the field and is available to students who do not desire a focused specialty area.

The aeronautical engineering technology concentration provides a specialty content area in aircraft airframe, propulsion, and aircraft production and operations. It prepares students for employment in areas such as aircraft design and manufacturing, aerodynamics, propulsion, and wind tunnel testing. However, aeronautical concentration graduates have a good general background in mechanical engineering technology and are not limited to employment opportunities in just the aviation industry.

The automation engineering technology concentration provides specialty content in mechanical automation. Automated assembly and testing are major components of most modern, high volume mechanical systems and manufacturing operations. As a specialty area, this concentration provides students with an opportunity to develop knowledge

and skill in the broad area of automation. It also dovetails well with the semiconductor industry where most process tools are highly automated.

The following courses constitute the Mechanical Engineering Technology major and are required of all Mechanical Engineering Technology students.

Mechanical Engineering Technology Major

AET	210	Measurements and Testing....3
AET	312	Applied Engineering Mechanics: Dynamics....3
MET	150	Introduction to Engineering Technology....1
MET	230	Introduction to Engineering Materials....2
MET	231	Manufacturing Processes....3
MET	300	Applied Material Science....3
MET	309	Nondestructive Testing and Quality Assurance....1
MET	313	Applied Mechanics of Materials....3
MET	314	Applied Mechanics of Materials Laboratory....1
MET	331	Machine Design I....3
MET	345	Advanced Manufacturing Processes....3
MET	396	Manufacturing Professional Orientation....1
MET	401	Quality Assurance....3
MET	409	Applied Engineering Economics....3
MET	432	Thermodynamics....3
MET	434	Applied Fluid Mechanics....3
MET	460	Capstone Project I....3
MET	461	Capstone Project II....3
Concentration....18		
Total....63		

APPLIED SCIENCE—BAS

The Bachelor of Applied Science (BAS) degree is a "capstone" degree for the Associate of Applied Science degree. The BAS degree exposes students to advanced concepts and diverse critical thinking skills that prepare them for additional career opportunities and professional advancement.

Admission

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

Degree Requirements

The BAS degree in the College of Technology and Applied Sciences consists of 60 semester hours of upper-division (300 level and above) courses, with 30 hours in residence. A total of 120 semester hours is required for graduation.

AAS degree	60
Assignable credit	6
BAS core	15
General Studies	19
Technical concentration	20
Total	120

General Studies Curriculum

The BAS curriculum builds on the general education content of the AAS degree. Additional General Studies (L, CS, and awareness areas) are met with courses in the core or concentration. General Studies courses focus on contextual learning.

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

Assignable Credit

Assignable credit allows space in the curriculum for prerequisite courses needed to succeed in the program or additional technical electives. The courses are determined by the student and the advisor.

BAS Core

The area core focuses on management and organization, professional communication, quantitative analysis, and computer competency.

MET	401	Quality Assurance....3
MET	416	Applied Computer-Integrated Manufacturing *CS*....3
OMT	344	Industrial Organization....3
TMC	470	Project Management....3
TWC	400	Technical Communications *L*....3
Total....15		

Technical Concentration

Manufacturing Technology and Management. This concentration prepares supervisors and other personnel for technical and management positions in the manufacturing industry. Students increase their knowledge of manufacturing and gain insight into other areas, such as management, that support their professional growth.

MET	300	Applied Material Science....3
MET	302	Welding Survey....3
MET	309	Nondestructive Testing and Quality Assurance....1
MET	341	Manufacturing Analysis....3
MET	344	Casting and Forming Processes....3
MET	345	Advanced Manufacturing Processes....3
MET	396	Manufacturing Professional Orientation....1
MET	444	Production Tooling....3
Total....20		

Materials Joining and Manufacturing Technology. This concentration requires students to have a solid welding background, preferably a welding-based AAS degree, with welding certification desirable. The materials joining concentration includes additional study in welding and materials joining plus a series of manufacturing-related courses to provide a broad understanding of the complex world of manufacturing. This background allows transition into positions in process development, direct manufacturing support, quality control and assurance, sales, and management.

MET	300	Applied Material Science....3
MET	309	Nondestructive Testing and Quality Assurance....1
MET	351	Introduction to Automation....3
MET	396	Manufacturing Professional Orientation....1
MET	400	Materials and Joining Processes....3

L literacy and critical inquiry / **MA** mathematics / **CS** computer/statistics/quantitative applications / **HU** humanities and fine arts / **SB** social and behavioral sciences / **SG** natural science—general core courses / **SQ** natural science—quantitative / **C** cultural diversity in the United States / **G** global / **H** historical / See "General Studies," page 93.

MET 402 Advanced Material Joining 3
MET 409 Applied Engineering Economics 3
MET 437 Design for Materials Joining.....3

Total 20

AERONAUTICAL ENGINEERING TECHNOLOGY (AET)

E AET 191 First-Year Seminar. (1–3)
selected semesters

E AET 194 Special Topics. (1–4)
selected semesters

E AET 210 Measurements and Testing. (3)
fall
Measurement systems, components, system response, and the characteristics of experimental data. Integrated lecture/lab. Prerequisites: MET 230; PHY 112, 114.

E AET 215 Mechanics of Aerospace Systems. (3)
spring
Basic physics of flight. Principles and design of aircraft systems and powerplants.

E AET 294 Special Topics. (1–4)
selected semesters

E AET 300 Aircraft Design I. (3)
fall
Applied aerodynamics, standard atmosphere, speed measurement, infinite and finite wings, airplane performance. Fee. Prerequisites: MAT 260; PHY 112, 114.

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

E AET 312 Applied Engineering Mechanics: Dynamics. (3)
fall
Masses; motion kinematics; dynamics of machinery. Prerequisite: MAT 261.

E AET 394 Special Topics. (1–4)
selected semesters

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

E AET 415 Gas Dynamics and Propulsion. (3)
spring
Introduces compressible flow, internal and external flow, and aerothermodynamic analysis of propulsion systems. Prerequisite: MET 434.

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

E AET 420 Applied Aerodynamics and Wind Tunnel Testing. (3)
fall
Introduces viscous and inviscid flow and their relationship to aircraft lift and drag. Wind tunnel design and testing. Integrated lecture/lab. Prerequisites: AET 300; MET 434.

E AET 432 Applied Heat Transfer. (3)
fall
Heat transfer by conduction, convection, and radiation. Applies heat transfer to engineering design problems. Pre- or corequisite: MET 434 or instructor approval.

E AET 484 Internship. (1–12)
selected semesters

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

E AET 492 Honors Directed Study. (1–6)
selected semesters

E AET 493 Honors Thesis. (1–6)
selected semesters

E AET 494 Special Topics. (1–4)
selected semesters

E AET 498 Pro-Seminar. (1–7)
selected semesters

E AET 499 Individualized Instruction. (1–3)
selected semesters

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see “Omnibus Courses,” page 63.

Graduate-Level Courses. For information about courses numbered from 500 to 799, see the *Graduate Catalog*, or access www.asu.edu/aad/catalogs on the Web. In some situations, undergraduate students may be eligible to take these courses; for more information, see “Graduate-Level Courses,” page 62.

MECHANICAL AND MANUFACTURING ENGINEERING TECHNOLOGY (MET)

E MET 150 Introduction to Engineering Technology. (1)
fall
Introduces mechanical, manufacturing, and aeronautical engineering technology. Covers aspects of the industries utilizing these majors.

E MET 160 CADD and Solid Modeling. (1)
selected semesters
Uses 3-D solid modeling software to model mechanical parts and produce valid engineering drawings, including use of geometric dimensioning and tolerancing. Integrated lecture/lab.

E MET 191 First-Year Seminar. (1–3)
selected semesters

E MET 194 Special Topics. (1–4)
selected semesters

E MET 211 Statics. (3)
fall and spring
Vectors, forces and moments, force systems, equilibrium, analysis of basic structures and structural components, friction, centroids, and moments of inertia. May be repeated for credit. Prerequisites: MAT 260 (or 270); PHY 111, 113.

E MET 230 Introduction to Engineering Materials. (2)
spring
Introduction to materials and their properties, emphasizing basic concepts and structures and how these properties relate to manufacturing and design.

E MET 231 Manufacturing Processes. (3)
fall
Design documentation and material processes on plastics, ferrous and nonferrous materials, emphasizing orthographic projection, geometric dimensioning and tolerances. Lecture, lab. Prerequisite: MAT 117 or 170.

E MET 294 Special Topics. (1–4)
selected semesters

E MET 300 Applied Material Science. (3)
fall
Principles of materials science emphasizing concepts relevant to design, manufacturing, and use. Covers metals, polymers, ceramics, and composites. 2 hours lecture, 1 hour lab. Prerequisite: MET 230 or instructor approval.

E MET 302 Welding Survey. (3)
fall
Theory and application of industrial welding processes; introductory welding metallurgy and weldment design; SMAW, GTAW, GMAW, oxyacetylene, and brazing experiences. Lecture, lab. Prerequisite: junior or senior standing.

E MET 309 Nondestructive Testing and Quality Assurance. (1)
fall
Part and material inspection using metrology and nondestructive inspection tools and techniques. Theory and application with use of pertinent standards. Lab. Prerequisite: MET 231.

E MET 313 Applied Mechanics of Materials. (3)
spring
Stress, strain, stress-strain relations. Axial, shear, bending, torsional and combined loads and deflections.

E MET 314 Applied Mechanics of Materials Laboratory. (1)
spring
Measurements of loads and deformations relating stress and strain in axial, shear, bending, torsional, and combined loading configurations. 3 hours lab. Pre- or corequisite: MET 313.

E MET 331 Machine Design I. (3)
fall
Applies mechanics to design of machine elements and structures. Stress analysis, failure modes, tolerances, cylindrical fits, and shaft design. Prerequisite: MET 313.

E MET 340 Applied Thermodynamics and Heat Transfer. (3)
fall and spring
Thermodynamic systems and processes, first and second laws of thermodynamics, properties of pure substances, and applications to heat engines and special systems. Fundamentals of conduction, radiation, and convection. May be repeated for credit. Prerequisites: MAT 261 (or 271); PHY 112, 114.

E MET 341 Manufacturing Analysis. (3)
spring
Organizational and functional requirements for effective production. Analysis of industrial specifications, geometric dimensioning and tolerancing, costs, and group technology. Writing assembly production plans. Prerequisite: MET 231.

E MET 344 Casting and Forming Processes. (3)
spring
Analyzes various forming processes to determine load requirements necessary for a particular metal-forming operation. Information used to select equipment and design tooling. Metal casting processes and design of castings. Introduces powder metallurgy. Prerequisite: MET 300.

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

E MET 351 Introduction to Automation. (3)
spring
Introduces automation. Topics include assembly techniques, fixed and flexible automation systems, robots, material-handling systems, sensors, and controls. Integrated lecture/lab. Prerequisite: EET 208 or instructor approval.

E MET 394 Special Topics. (1–4)
selected semesters

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

E MET 400 Materials and Joining Processes. (3)
fall
Effects of joining processes on metals and composites. Thermal cycle effects on solid-state and liquid-solid material transformations. Prerequisite: MET 300.

E MET 401 Quality Assurance. (3)
spring
Introduces statistical quality control methods design of experiments, sampling, gauge requirements, specifications, quality assurance tools emphasizing CNC-CMM programming. Integrated lecture/lab. Prerequisite: junior standing.

E MET 402 Advanced Material Joining. (3)
spring
In-depth analysis of common materials-joining processes and their process parameters. Includes automation, soldering, and adhesive bonding. Lecture, lab. Prerequisite: MET 302 (or its equivalent).

E MET 409 Applied Engineering Economics. (3)
spring
Fundamentals of engineering economics in a practical, industry-based approach. Includes effects of depreciation, taxes, inflation, and replacement analysis. Lecture, computer lab experiences.

E MET 410 Manufacturing Resource Management. (3)
fall
Measures like cycle time, throughput, capacity, work-in-process, inventory, variability, and how they drive operating relationships in a factory. Credit is allowed for only MET 410 or 510. Prerequisite: MET 341.

E MET 415 Manufacturing Simulation. (3)
spring
Computer simulation of manufacturing operations. Discrete event simulation models range from individual processes to whole factories. Lecture, computer lab experiences. Prerequisite: MET 341.

E MET 416 Applied Computer-Integrated Manufacturing. (3)
fall
Techniques and practices of computer-integrated manufacturing as applied in a broad range of industry. Integrated lecture/ lab. Prerequisite: MET 341.
General Studies: CS

E MET 418 Composites Materials Manufacturing. (3)
spring
Introduces composite materials and associated manufacturing issues, including tooling, processes, and quality control. Related issues, including testing and joining. Integrated lecture/lab. Credit is allowed for only MET 418 or 518. Prerequisite: MET 300 or instructor approval.

E MET 432 Thermodynamics. (3)
spring
Thermodynamics of mixtures. Combustion process. Applies thermodynamics to power and refrigeration cycles.

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

E MET 434 Applied Fluid Mechanics. (3)
spring
Fluid statics. Basic fluid flow equations. Viscous flow in pipes and channels. Compressible flow. Applies fluid measurement and flow in conduits.

E MET 435 Alternate Energy Sources. (3)
selected semesters
Alternate energy systems, energy use and its impact on the environment, and demonstrating practical alternative energy sources to fossil fuels. Prerequisite: instructor approval.

E MET 436 Turbomachinery Design. (3)
selected semesters
Applies thermodynamics and fluid mechanics to the analysis of machinery design and power cycle performance predictions. Prerequisite: MET 434.

E MET 437 Design for Materials Joining. (3)
spring
Uses design principles to analyze structures and determine appropriate weld/braze/solder or adhesive joint size. Uses welding codes. Lecture. Prerequisites: ASC 315, 325.

E MET 438 Machine Design II. (3)
spring
Applies mechanics to the design of machine elements and structures. Emphasizes basics of gears, springs, brakes, clutches, and bearings. Prerequisite: AET 312; MET 331.

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

E MET 443 CNC Computer Programming. (3)
fall
Theory and application of N/C languages using CAM software and CNC machine tools. Lecture, lab. Prerequisite: MET 345 or instructor approval.

L literacy and critical inquiry / **MA** mathematics / **CS** computer/statistics/ quantitative applications / **HU** humanities and fine arts / **SB** social and behavioral sciences / **SG** natural science—general core courses / **SQ** natural science—quantitative / **C** cultural diversity in the United States / **G** global / **H** historical / See "General Studies," page 93.

E MET 444 Production Tooling. (3)
spring
Design and fabrication of jigs, fixtures, and special industrial tooling related to manufacturing methods. Lecture, lab. Prerequisite: MET 345.

E MET 452 Implementation of Robots in Manufacturing. (3)
selected semesters
Robotic workcell design, including end effectors, parts presenters, and optimum material flow. Prerequisite: MET 351 or instructor approval.

E MET 455 Automation Systems Integration. (3)
fall
Applies sensors and devices and their integration with PLCs and computers into automated devices and systems. Integrated lecture/lab. Prerequisites: EET 403; MET 351.

E MET 460 Capstone Project I. (3)
fall
Group project designing, evaluating, and analyzing components, assemblies, and systems. Develop products/manufacturing techniques demonstrating state-of-the-art technology. Integrated lecture, lab. Prerequisites: MET 331, 341; senior standing.

E MET 461 Capstone Project II. (3)
spring
Small-group projects applying manufacturing techniques, with emphasis on demonstrating state-of-the-art technology. Integrated lecture/lab. Prerequisite: MET 460 or instructor approval.

E MET 484 Internship. (1–12)
selected semesters

E MET 492 Honors Directed Study. (1–6)
selected semesters

E MET 493 Honors Thesis. (1–6)
selected semesters

E MET 494 Special Topics. (1–4)
fall and spring
Topics may include the following:
- Composite Materials Manufacturing. (3)
- Consumer Manufacturing. (1–3)
- Manufacturing Resource Management. (3)
- Packaging Design. (1–3)

E MET 498 Pro-Seminar. (1–7)
selected semesters

E MET 499 Individualized Instruction. (1–3)
selected semesters

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see “Omnibus Courses,” page 63.

Graduate-Level Courses. For information about courses numbered from 500 to 799, see the *Graduate Catalog*, or access www.asu.edu/catalog on the Web. In some situations, undergraduate students may be eligible to take these courses; for more information, see “Graduate-Level Courses,” page 62.

Department of Technology Management

technology.poly.asu.edu/dtm
480/727-1781
TECH 102

Thomas E. Schildgen, Chair

Professors: Duff, Hild, Schildgen

Associate Professors: Grossman, Humble, Matson, Olson

Assistant Professor: Harris

Clinical Associate Professor: Thomas

Clinical Assistant Professor: Nelson

Professors of Practice: Kime, Peterson

Senior Lecturer: Wilson

Lecturers: Dolin, Lestar, Parmentier

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 Technology Management offer BS degrees in Environmental Technology, Graphic Information Technology, and Operations Management Technology. These degrees are fully accredited by the National Association of Industrial Technology (NAIT). For more information, call 734/677-0720, or write

NATIONAL ASSOCIATION OF INDUSTRIAL TECHNOLOGY
3300 WASHTENAW AVENUE
SUITE 220
ANN ARBOR MI 48104-4200

For students holding an AAS degree the department offers the BAS degree in Applied Science, with concentrations in digital media management, digital publishing,

emergency management, fire service management, operations management, municipal operations management, and technical graphics.

A Master of Science in Technology degree is offered for graduate study. The department offers five concentrations for the graduate degree: environmental technology management, fire service administration, global technology and development, graphic information technology, and management of technology. For more information about the graduate program, see the *Graduate Catalog*.

BACHELOR OF SCIENCE

The curriculum consists of First-Year Composition, University General Studies, and technical courses. Note that all three General Studies awareness areas are required. Consult with an advisor for an approved list of courses. The technical part of the curriculum includes a required technology management core, degree course work, and technical electives selected with approval of an advisor.

Technology management students are required to complete a minimum of 120 semester hours with a minimum 2.00 cumulative GPA, including a minimum of 50 semester hours of upper-division courses to graduate.

Technology Management Core*

ETC	100	Languages of Technology *CS*	4
GIT	303	Digital Publishing	3
TMC	331	Quality Assurance	3
TMC	346	Management Dynamics	3
TMC	396	Professional Orientation	1
TMC	470	Project Management	3
TMC	494	ST: Senior Project	3
Total			20

* These courses are for the operations management technology and graphic information technology majors.

ENVIRONMENTAL TECHNOLOGY MANAGEMENT—BS

The Environmental Technology Management degree prepares graduates to manage such challenging problems in industry as regulatory compliance, hazardous materials management, pollution prevention, and international environmental standards for manufacturing. The curriculum is designed to provide a unique blend of critical scientific, technical, and management skills. Degree requirements encompass the development of a broad background in the natural sciences and mathematics, social and behavioral sciences, management theory, regulatory issues, and applied sciences. The program is purposely structured to facilitate transfer students who are searching for a degree program that builds upon a strong technical background and focuses on the environmental issues faced by industry.

GRAPHIC INFORMATION TECHNOLOGY—BS

The Graphic Information Technology degree prepares students for technical and management positions in the diverse graphic communication and information technology industries: digital printing and publishing; technical/digital media production; management of graphic information assets; quality assurance of graphic products; planning and evaluation of print, Internet, multimedia, and computer-based communications. This is an intensive 120-semester-hour program of study emphasizing theory and hands-on laboratory practice. Students develop skills to plan and execute graphic solutions using visualization and prepress, engineering graphic standards, technical document design, higher-level graphic programming languages, computer drawing and illustration, commercial digital photography, multimedia and three-dimensional modeling, project management, quality assurance, and e-commerce practices.

The Graphic Information Solutions facility (GIS), located in the Technology Center, provides internship opportunities and exposes students to current production technology, problem-solving skills, cost analysis, and human resource issues. Graduates are able to present technical solutions using graphics in print and Internet publications, engineering documents, media-rich presentations, interactive training and instruction, models, and animations. Typical career opportunities include graphic operations management, sales and marketing, information technology support in graphics-related industries, graphic systems analysis, digital publishing (both print and online), and computer graphics content planning and creation.

OPERATIONS MANAGEMENT TECHNOLOGY—BS

The Operations Management Technology degree prepares students for supervisory and administrative positions in industry, manufacturing, and public service organizations. Course work includes data analysis, economics, effective decision making, international business, legal and ethical studies, marketing, operations management, organizational effectiveness, project management, and safety. Emphasis is placed on health and safety within the workplace.

The operations management technology program may be articulated with a broad range of community college technical courses. Community college specializations in areas such as aeronautics, construction, electronics, fire science, police science, graphic information technology, hazardous materials and waste management, computer graphics, safety and health, human resource management, production management, and manufacturing may form a technical specialty area within this program. Consultation with an advisor is required to coordinate the course selection for transfer to this program.

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

L literacy and critical inquiry / **MA** mathematics / **CS** computer/statistics/quantitative applications / **HU** humanities and fine arts / **SB** social and behavioral sciences / **SG** natural science—general core courses / **SQ** natural science—quantitative / **C** cultural diversity in the United States / **G** global / **H** historical / See "General Studies," page 93.

certificate program for nondegree students, a BS degree in Environmental Technology Management with a Certificate in Hazardous Materials and Waste Management, and a Master of Science in Technology degree with a Certificate in Hazardous Materials and Waste Management. Students must complete seven selected courses (five required and two electives) and earn a grade of "C" (2.00) 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.

BIS CONCENTRATION

Concentrations in hazardous materials and waste management, and fire service management are available under the Bachelor of Interdisciplinary Studies (BIS) degree, a program intended for the student who has academic interests that might not be satisfied with existing majors. Building on two academic concentrations (or one double concentration) and an interdisciplinary core, students in the BIS program take active roles in creating their educational plans and defining their career goals. For more information, see "School of Interdisciplinary Studies," page 139.

APPLIED SCIENCE—BAS

The Bachelor of Applied Science (BAS) degree is a "capstone" degree for the Associate of Applied Science degree. The BAS degree exposes students to advanced concepts and diverse critical thinking skills that prepare them for future career opportunities and professional advancement.

Admission

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

Degree Requirements

The BAS degree in the College of Technology and Applied Sciences consists of 60 semester hours of upper-division (300 level and above) courses, with 30 hours in residence.

AAS degree	60
Assignable credit	6
BAS core	15
General Studies	19
Technical concentration	20
Total	120

General Studies Curriculum

The BAS curriculum builds on the general education content of the AAS degree. Additional General Studies (L, CS, and awareness areas) are met with courses in the core or concentration. General Studies courses focus on contextual learning.

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

Assignable Credit

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

BAS Core

The area core focuses on management and organization, professional communication, quantitative analysis, and computer competency.

APM	301	Introductory Statistics *CS*	3
GIT	335	Computer Systems Technology	3
OMT	452	Industrial Human Resource Management or TMC 470 Project Management (3)	3
TMC	346	Management Dynamics	3
TWC	400	Technical Communications *L*	3
Total			15

Technical Concentrations

Operations Management Technology. The purpose of this technical concentration is to prepare supervisors for management functions in industry, manufacturing, and public service organizations. The BAS degree provides the management and supervision content required for industry and governmental agencies.

Digital Media Management. This concentration prepares graduates for technical positions in industries implementing, planning, and producing interactive communications, integrated media, and multimedia for design, training, and marketing. Prospective students with AAS degrees in areas such as multimedia, printing and publishing, commercial graphics, desktop publishing, or computer illustration may be interested in pursuing a digital media management concentration.

Technical Graphics. This concentration prepares graduates for positions in industries implementing technical and engineering graphics in computer-aided design and computer integrated manufacturing. AAS degrees in drafting and design, computer-aided design, computer integrated manufacturing technology, mechanical technology, architectural technology, or construction technology may provide an excellent foundation for a technical graphics concentration.

Digital Publishing. This concentration prepares graduates for lead technical and entry-level management positions in the printing and publishing industry. AAS degrees in multimedia, printing and publishing, commercial art, desktop publishing, or computer illustration may find that this technical concentration provides excellent opportunities.

Emergency Management. This concentration prepares graduates for positions in industry, municipal departments, and government agencies. The curriculum addresses the established Federal Emergency Management Administration (FEMA) guidelines, on-site emergency response contingency planning, first responder scene management, logistical analysis, and communications protocol.

Fire Service Management. This concentration prepares graduates for positions in industry, municipal departments, and governmental agencies. The curriculum addresses services delivered by fire departments, fire service personnel development, zoning, planning, inspections, and arson investigations.

Municipal Operations Management. This concentration prepares students for supervisory and management functions within municipalities, public service organizations, or businesses that provide services to the public sector. The curriculum addresses quality assurance, ethical issues, leadership practices, operations management, project management, marketing, finance, public sector management, and organizational effectiveness.

Internet and Web Development. This concentration provides graduates with employment skills in the fields of e-commerce, online databases, active server pages, FLASH, HTML, and other computer languages and software applications.

Law Enforcement Management. This concentration is designed for law enforcement officers who work with firefighters and emergency managers in a changing global environment. The concentration focuses on supervisory and leadership skills needed to operate in a municipal environment, along with technological solutions to organizational effectiveness and complex interagency law enforcement investigations.

JOINT DEGREE

The joint Bachelor of Science or Bachelor of Applied Science and Master of Science in Technology degree program is designed to provide students with exceptional undergraduate standing the opportunity to include nine semester hours of upper-division course credit (three semester hours at the 400 level, six semester hours at the 500 level) in their graduate program of study. This joint degree is available for the following Master of Science in Technology concentrations: environmental technology management, fire service administration, graphic information technology, global technology and development, and the management of technology.

ADMISSIONS REQUIREMENTS

Students must meet these requirements to be considered for joint degree admission:

1. a minimum junior-senior GPA of 3.20;
2. ninety semester hours of undergraduate credit in a Department of Technology Management BS or BAS program; and
3. two letters of recommendation from Department of Technology Management faculty.

Senior Project Requirement

All baccalaureate degree students (BS and BAS) in the Department of Technology Management are required to complete a senior project for the requirements of graduation. The TMC senior project is a capstone experience that integrates theory and application of the undergraduate curriculum in an effort to address industry-inspired subject matter. The senior project is carried out under faculty supervision in a scheduled class and is related to the student's technical interests, academic goals, and career employment. The senior project is a study or research project involving a written document and oral presentation, which can involve service learning. A bound document and/or electronic copy of the project becomes part of the department's archival collection, available for public review.

ENVIRONMENTAL TECHNOLOGY MANAGEMENT (ETM)

E ETM 294 Special Topics. (1–4)
selected semesters
Topics may include the following:
- Introduction to Organic Chemistry. (3)

E ETM 301 Environmental Management. (3)
selected semesters
Focuses on knowledge and skills necessary to manage environmental programs. Perspectives include regulatory, individual, corporate, and consulting. Lecture, full or partial Internet. Pre- or corequisites: CHM 101.

E ETM 302 Water and Wastewater Treatment Technology. (3)
selected semesters
Explores the development of treatment technologies. Addresses regulatory standards. Emphasizes theory and practice of system design, laboratory analysis standards and procedures. Pre- or corequisites: CHM 101; MAT 170.

E ETM 303 Environmental Regulations. (3)
selected semesters
Explores environmental laws, regulations, and directives. Addresses air, land, and water. Lecture, full or partial Internet.

E ETM 360 Introduction to Emergency Management. (3)
fall
Emergency management theories. Comprehensive emergency management. Mitigation, preparedness, response, and recovery. Post-disasters and policy formation. Current FEMA all-hazards approach.

E ETM 362 Managing Natural and Technological Disasters. (3)
spring
Federal, state, and local responses to emergencies. Management of mass casualties, evacuation, sheltering, and terrorism; declaration of emergency procedures.

E ETM 363 Computer Applications in Emergency Management. (3)
spring
Explores specific computer programs that are currently in use for contingency planning, tracking chemical inventories, and response resources. Cross-listed as FSM 363. Credit is allowed for only ETM 363 or FSM 363.

E ETM 364 Toxicology and Biohazards in Emergency Management. (3)
fall
Introduces poisons. Dose response routes of exposure and toxicokinetics. Diseases associated with natural disasters. Clinical presentation of treatments.

E ETM 401 Hazardous Waste Management. (3)
selected semesters
Definition of hazardous waste, RCRA and CERCLA regulations, hazardous waste classification system. Overview of hazardous waste management. Lecture, full or partial Internet. Prerequisite: ETM 301. Pre- or corequisite: CHM 101.

E ETM 402 Unit Treatment Technologies. (3)
selected semesters
Addresses various treatment technologies for contaminated air, water, and soil. Emphasizes design based upon medium, type of

L literacy and critical inquiry / **MA** mathematics / **CS** computer/statistics/ quantitative applications / **HU** humanities and fine arts / **SB** social and behavioral sciences / **SG** natural science—general core courses / **SQ** natural science—quantitative / **C** cultural diversity in the United States / **G** global / **H** historical / See "General Studies," page 93.

contamination, and concentration. Lecture, full or partial Internet. Prerequisite: ETM 302. Pre- or corequisites: CHM 101; MAT 170.

E ETM 406 Environmental Chemistry. (3)
selected semesters
Examines reactions, transport, and fates of hazardous chemicals in water, soil, air, and living organisms. Lecture, full or partial Internet. Prerequisites: CHM 101; MAT 170.

E ETM 407 Occupational Hygiene. (3)
spring
Overview of occupational health hazards, including recognition, evaluation, and control. Includes regulatory status and health standards. Prerequisites: CHM 101 (or 113 or 114); MAT 170.

E ETM 424 Comprehensive Emergency Management. (3)
summer
Addresses theory and management techniques for emergency preparedness, including mitigation, preparedness, response, and recovery. Pre- or corequisite: ETM 301.

E ETM 426 Environmental Issues. (3)
spring
Explores the science and policy implications of contemporary problems that threaten the environment. Pre- or corequisites: CHM 113; MAT 170.

E ETM 428 International Environmental Management. (3)
selected semesters
Emphasizes technological and economic pressures experienced by developing countries. Lecture, full or partial Internet.
General Studies: G

E ETM 460 National Incident Management System (NIMS). (3)
selected semesters
Covers concepts, terminology, players, compliance requirements including doctrine of National Incident Management System per HSPD-5. Discussion of National Response Plan.

E ETM 461 Homeland Security. (3)
selected semesters
In-depth analysis of policies, procedures, and organizational structure for effective homeland security program. Covers all hazard/all risk philosophy. Credit is allowed for only ETM 461 or 561. Prerequisite: junior or senior standing or instructor approval.

E ETM 468 Simulation and Exercising. (3)
selected semesters
Requirements, planning, conduct, and critique of exercises related to emergency planning. Emphasizes realism using moulage and props.

E ETM 469 Terrorism Defense. (3)
selected semesters
Explores the background and evolution of terrorism. Presents specific tactics for preparation for and response to acts of terrorism. Lecture, full or partial Internet.

E ETM 494 Special Topics. (1–4)
spring
Topics may include the following:

- Bioremediation. (3)
  Technical-regulatory and policy issues emanating from minetailing and animal waste. Lecture, case studies.

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 63.

Graduate-Level Courses. For information about courses numbered from 500 to 799, see the *Graduate Catalog*, or access www.asu.edu/aad/catalogs on the Web. In some situations, undergraduate students may be eligible to take these courses; for more information, see "Graduate-Level Courses," page 62.

FIRE SERVICE ADMINISTRATION (FSA)

Graduate-Level Courses. For information about courses numbered from 500 to 799, see the *Graduate Catalog*, or access www.asu.edu/aad/catalogs on the Web. In some situations, undergraduate students may be eligible to take these courses; for more information, see "Graduate-Level Courses," page 62.

FIRE SERVICE MANAGEMENT (FSM)

E FSM 304 Fire Personnel Management. (3)
fall
Promotion, personnel development, career and incentive systems, validation of physical requirements, managerial and supervisory procedures.

E FSM 305 Quality Emergency Services. (3)
selected semesters
Covers quality issues relating to services delivered by progressive fire departments. Covers management of personnel and resources during organizational change.

E FSM 306 Fire Prevention Organization and Management. (3)
selected semesters
Examines and evaluates the techniques, procedures, programs, and agencies involved in preventing fires.

E FSM 307 Fire Department Safety Organization and Management. (2)
summer
Focuses on the management of fire department safety programs.

E FSM 308 Fire Department Budgeting. (3)
spring
Examines the role of fire department budgets and their relationship to other levels of government as a planning tool.

E FSM 309 Emergency Medical Service Organization and Management. (3)
spring
Focuses on the administration and management of emergency medical services delivered by a fire department.

E FSM 363 Computer Applications in Emergency Management. (3)
spring
Explores specific computer programs that are currently in use for contingency planning, tracking chemical inventories, and response resources. Cross-listed as ETM 363. Credit is allowed for only ETM 363 or FSM 363.

E FSM 400 Human Behavior and the Fire Threat. (3)
selected semesters
Proper ways of conducting post-fire interviews; emphasizes the psychological effects of communications during emergencies.

E FSM 401 Labor Relations in the Fire Service. (3)
fall
Examines the relationships between management and unions using the Relations by Objectives model.

E FSM 404 Fire Service Program Management and Fire Department Accreditation. (3)
fall
Examines how to develop, manage, and implement fire department programs, including an examination of the ICMA/IAFC accreditation process.

E FSM 405 Fire Service Leadership. (3)
summer
Focuses on developing personal and organizational leadership qualities required to be successful in the fire service.

E FSM 421 Political and Legal Consideration in Fire Science. (3)
spring
Study of legal and political considerations that affect the decision making of fire service managers.

E FSM 425 Fire Service Administration. (3)
fall
Presents modern management and planning techniques that apply to organizing a fire department.

E FSM 460 Incident Management Systems and Emergency Operations Center. (3)
fall
Covers IMS, terminology, players, and management philosophy. EOC setup, activation, operation, and termination. EOC funding and politics.

E FSM 493 Fire Service Management Senior Project. (2)
fall and spring
Capstone applied project. Applies knowledge learned from FSM course work to solve a practical fire service problem.

E FSM 494 Special Topics. (1–4)
selected semesters

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see “Omnibus Courses,” page 63.

Graduate-Level Courses. For information about courses numbered from 500 to 799, see the *Graduate Catalog*, or access www.asu.edu/aad/catalogs on the Web. In some situations, undergraduate students may be eligible to take these courses; for more information, see “Graduate-Level Courses,” page 62.

GRAPHIC INFORMATION TECHNOLOGY (GIT)

E GIT 135 Graphic Communications. (3)
fall and spring
Introduces the technologies involved in the design, image generation, transmission, and industrial production of multiple images for consumer utilization. Integrated lecture/lab, field trips.

E GIT 194 Special Topics. (1–4)
selected semesters

E GIT 210 Creative Thinking and Design Visualization. (3)
fall and spring
Fundamental methods, concepts, and techniques of creative thinking, design visualization, and problem solving. Also includes communication, cultural, and societal influences. Integrated lecture/lab. Prerequisite: ETC 100.

E GIT 212 Computer-Aided Design and Drafting (CADD). (3)
fall and spring
CADD for product design, representation, and documentation; includes projection theory, descriptive geometry, graphics analysis, drafting standards, and precision dimensioning techniques. Integrated lecture/lab. Prerequisite: ETC 100 (or its equivalent).
General Studies: CS

E GIT 215 Introduction to Graphics Programming. (3)
fall
Introduces analyzing, planning, and executing graphic programs using industry-standard programming tools. Integrated lecture/lab. Prerequisite: ETC 100 (or its equivalent).

E GIT 230 Digital Illustration in Publishing. (3)
fall and spring
Raster and vector illustration in publishing. Integrated lecture/lab. Pre- or corequisite: GIT 135.

E GIT 237 Web Content Design. (3)
spring
Introduces design principles for visual content on the World Wide Web; raster, vector, fonts, portable documents, color palettes, file formats. Integrated lecture/lab. Prerequisite: GIT 135 (or its equivalent). Pre- or corequisite: GIT 303.

E GIT 303 Digital Publishing. (3)
fall and spring
Introduces software and hardware used for digital publishing and infographics. Integrated lecture/lab. Prerequisites: GIT 135, 230.

E GIT 312 3-D Computer Graphics Modeling and Representation. (3)
fall
3-D solid modeling applications: concepts, techniques, data structures, modeling strategies, assemblies, geometric representation. Integrated lecture/lab. Prerequisite: GIT 212.
General Studies: CS

E GIT 313 Technical Illustration and Photorealistic Rendering. (3)
fall
Computer-generated graphics for technical illustration and design presentation: axonometric and perspective drawing; shading, shadowing, materials and textures; photorealistic rendering for PostScript output. Integrated lecture/lab. Prerequisite: GIT 212.

E GIT 314 Multimedia Design, Planning, and Storyboards. (3)
spring
Creative and conceptual process of content selection, planning, designing, flowcharting, storyboarding, proposing, configuring, prototyping, and presenting multimedia projects. Integrated lecture/lab. Prerequisite: GIT 237.

E GIT 333 Printing Technology. (3)
spring
Theory and application of sheet and web press technology for offset-lithography, flexography, screen process, and digital printing. Integrated lecture/lab. Pre- or corequisite: GIT 135.

E GIT 334 Image Capture and Manipulation. (3)
fall
Theory and application of image capture techniques used for all copy formats and conversion processes required for reproduction or dissemination. Integrated lecture/lab. Prerequisite: GIT 303.

E GIT 335 Computer Systems Technology. (3)
selected semesters
Survey of computer-based technology covering hardware, software, storage, networking, Internet, telecommunications, and information systems. Integrated lecture/lab. Prerequisite: junior standing.

E GIT 337 Web Content Design. (3)
fall and spring
Introduces design principles for visual content on the World Wide Web; raster, vector, fonts, portable documents, color palettes, file formats. Integrated lecture/lab. Pre- or corequisite: GIT 303.

E GIT 352 Technical Presentations. (3)
spring
Technologies for planning, creating, and delivering individual and group presentations. Prerequisites: ENG 102; GIT 303.

E GIT 384 Commercial Digital Photography. (3)
fall, spring, summer
Digital image, conversion, and output in a commercial studio emphasizing publishing workflow. Integrated lecture and lab. Prerequisite: GIT 334.

E GIT 394 Special Topics. (1–4)
selected semesters

E GIT 411 Computer Animation. (3)
fall and spring
2-D and 3-D computer animation methods: project planning, scripting, storyboards, advanced modeling, lighting, materials mapping, and motion. Integrated lecture/lab. Prerequisites: GIT 312, 334.

E GIT 412 Multimedia Authoring, Scripting, and Production. (3)
fall and spring
Production of multimedia projects using industry-standard authoring applications: project management, client considerations, and project documentation; user interface design, interactivity, media, and databases. Integrated lecture/lab. Prerequisite: GIT 314.

E GIT 413 Professional Portfolio Design and Presentation. (3)
spring
Digital media portfolio design and production: planning, audience analysis, media selection, authoring, media formats, production, copyright considerations, marketing, and delivery. Integrated lecture/lab. Prerequisites: GIT 314, 334.

E GIT 414 Web Site Design and Internet/Web Technologies. (3)
spring
Web site design, authoring, standards, protocols, tools, and development techniques for commercial client-sided Web-based graphic information systems. Integrated lecture/lab. Prerequisites: GIT 334, 337.

E GIT 415 Computer Graphics: Business Planning and Management. (3)
spring
Implementation planning: feasibility and application studies; needs assessment and operational analysis techniques; organization, managerial, and technology considerations; business plan development. Integrated lecture/lab, field trips. Prerequisite: senior standing in Information Technology (graphic information technology concentration).

L literacy and critical inquiry / **MA** mathematics / **CS** computer/statistics/quantitative applications / **HU** humanities and fine arts / **SB** social and behavioral sciences / **SG** natural science—general core courses / **SQ** natural science—quantitative / **C** cultural diversity in the United States / **G** global / **H** historical / See “General Studies,” page 93.

E GIT 417 Advanced Internet Programming. (3)
fall
Uses industry-standard programming languages and techniques to create interactive graphic information Web sites and applications. Integrated lecture/lab. Prerequisite: GIT 414.

E GIT 432 Graphic Industry Business Practices. (3)
selected semesters
Business practices related to press/prepress/Web industries; trade customs, cost analysis, marketing and management approaches. Integrated lecture/lab, field trips. Prerequisite: GIT 333.

E GIT 435 Web Management and E-commerce. (3)
spring
Internet Web site management, security, online databases, and new e-commerce business models. Integrated lecture/lab. Prerequisite: GIT 414.

E GIT 436 Gravure Technology. (3)
spring
In-depth study of the market profile and production sequences related to the gravure method of printing. Prerequisite: GIT 135.

E GIT 437 Color Reproduction Systems. (3)
fall
Scientific analysis for the engineering of color reproduction systems and color models used in the graphics industry. Prerequisite: GIT 334.

E GIT 441 Graphic Information Systems. (3)
selected semesters
Graphic information systems common to the workplace: graphic user interfaces for online databases, geographic, industrial, architectural, and management applications. Integrated lecture/lab. Prerequisite: senior standing in Information Technology (graphic information technology concentration).

E GIT 450 Digital Workflow in Graphic Industries. (3)
fall
Analyzes digital production systems for input, assembly, and output of graphic information to print and Web, including networking and job tracking. Integrated lecture/lab. Prerequisite: GIT 334.

E GIT 494 Special Topics. (1–4)
fall and spring
Topics may include the following:
- Computer Systems Applications. (3)

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GLOBAL TECHNOLOGY AND DEVELOPMENT (GTD)

Graduate-Level Courses. For information about courses numbered from 500 to 799, see the *Graduate Catalog*, or access www.asu.edu/aad/catalogs on the Web. In some situations, undergraduate students may be eligible to take these courses; for more information, see "Graduate-Level Courses," page 62.

TECHNOLOGY MANAGEMENT CORE (TMC)

E TMC 191 First-Year Seminar. (1–3)
selected semesters

E TMC 194 Special Topics. (1–4)
selected semesters

E TMC 233 Desktop Publishing and Infographics. (3)
fall and spring
Introduces software and hardware used for desktop publishing and infographics. Lecture, lab.

E TMC 294 Special Topics. (1–4)
selected semesters

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

E TMC 346 Management Dynamics. (3)
fall and spring
Management challenges and the leadership skills needed to achieve organizational objectives in the changing industrial and technical environments. Prerequisite: junior standing.

E TMC 394 Special Topics. (1–4)
selected semesters

E TMC 396 Professional Orientation. (1)
fall and spring
Senior advising, industry presentations, and career counseling.

E TMC 470 Project Management. (3)
spring
Introduces techniques for managing small groups within larger organizations, including team building, motivating, planning, tracking activities, and computer tools. Prerequisites: ECN 211; OMT 344; TMC 346.

E TMC 484 Internship. (1–12)
selected semesters

E TMC 494 Special Topics. (1–4)
selected semesters
Topics may include the following:
- Senior Project. (3)

E TMC 498 Pro-Seminar. (1–7)
selected semesters

E TMC 499 Individualized Instruction. (1–3)
selected semesters

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 63.

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OPERATIONS MANAGEMENT TECHNOLOGY (OMT)

E OMT 191 First-Year Seminar. (1–3)
selected semesters

E OMT 194 Special Topics. (1–4)
selected semesters

E OMT 294 Special Topics. (1–4)
selected semesters

E OMT 343 Occupational Safety and Ergonomics. (3)
fall
Health and safety movement, accident theories and effects, OSHA standards and liability, safeguarding, hazards, workers' compensation, ergonomics, and safety. Prerequisite: junior standing.

E OMT 344 Industrial Organization. (3)
spring
Industrial organization concepts. Topics relate to industrial relations, governmental regulations, organizational structure, labor relations, human factors, and current industrial practices. Prerequisite: TMC 346.

E OMT 345 Public Sector Management. (3)
fall and spring
Management in government and public agencies. Includes mission, planning and organizing to provide services, human resource issues, conflict resolution, coordination. Prerequisite: junior standing.

E OMT 394 Special Topics. (1–4)
selected semesters

E OMT 402 Legal Issues for Technologists. (3)
fall
American legal system and impact on technology management issues: contracts, torts, intellectual property, white collar crime, antitrust, environmental, and employment.

E OMT 405 Forecasting and Evolution of Technology. (3)
selected semesters
History and evolutionary nature of selected technologies, issues in the management of emerging technologies, and methods of technological forecasting. Prerequisite: TMC 346 (or its equivalent).

E OMT 430 Ethical Issues in Technology. (3)
spring
Topics in social responsibility for industrial technology and engineering. Prerequisite: TMC 346.

E OMT 440 Introduction to International Business. (3)
spring
International business principles and operations, including partnerships, trade agreements, currency issues, international sales, and cultural differences between countries. Prerequisite: TMC 346.
General Studies: G

E OMT 445 Industrial Internship. (1–10)
fall, spring, summer
Work experience assignment in industry commensurate with student's program. Specialized instruction by industry with university supervision. Pass/fail. Prerequisites: advisor approval; junior standing; 2.50 GPA.

E OMT 451 Industrial Distribution and Materials Management. (3)
selected semesters
Surveys topics in industrial distribution, including, but not limited to, materials handling, purchasing, receiving, warehousing, traffic, inventory control, and shipping. Prerequisite: OMT 343 or TMC 346.

E OMT 452 Industrial Human Resource Management. (3)
fall
Concepts and practices of human resource management in a global industrial environment. Prerequisite: TMC 346.

E OMT 453 Safety Management. (3)
selected semesters
Development and management of safety programs, education and training, and relationships within an organization. Prerequisite: OMT 343 or instructor approval.

E OMT 456 Introduction to Organized Labor. (3)
spring
Introduces labor relations, unions, federations, collective bargaining, grievances, and labor legislation. Prerequisites: OMT 344; TMC 346.

E OMT 461 Operations Management. (3)
fall
Introduces supervisory principles as applied to production of goods and services. Prerequisites: OMT 344; TMC 346.

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

E OMT 484 Internship. (1–12)
selected semesters

E OMT 494 Special Topics. (1–4)
selected semesters

E OMT 498 Pro-Seminar. (1–7)
selected semesters

E OMT 499 Individualized Instruction. (1–3)
selected semesters

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Division of Computing Studies

www.poly.asu.edu/ctas/dcst
480/727-1257
SUTON 140

Timothy E. Lindquist, Associate Dean and Director

Professor: Lindquist

Associate Professors: Koehnemann, Millard, Morrell, O'Grady

Assistant Professors: B. Gannod, G. Gannod, Gary

Senior Lecturer: Whitehouse

PURPOSE

The Division of Computing Studies provides educational programs rich in contextual experiences, which prepare graduates for success in the rapidly evolving computing profession. With the increasingly diverse application of computing and software technologies comes a need for individuals who are well versed in the fundamentals of the computing profession. Course offerings focus on the languages, methods, and tools reflecting computing best practices, and provide an education that is rich in hands-on problem-based learning experiences. The curriculum builds upon a background of applied science and mathematics, including the concepts and application of calculus and discrete structures. Graduates are employed in the computing industry with responsibilities such as analyzing, designing, implementing, evaluating, and operating computer-based systems, including (re)engineering systems that embed computer hardware and software, Web-based applications, and systems of internetworked cooperating components.

DEGREES

The faculty in the Division of Computing Studies offer the BS degree in Applied Computer Science and the BS degree in Computer Systems. For students holding an AAS degree with the appropriate computer science and mathematical background, the Division offers the Bachelor of Applied Sciences (BAS) degree. Three BAS concentrations are available: computer systems administration, microcomputer systems, and software technology applications.

The division also offers the Master of Computing Studies and the Master of Technology with a concentration in computer systems degree programs that are available for qualified BS graduates. For more information, see the *Graduate Catalog* or access the division Web site at www.poly.asu.edu/ctas/dcst.

L literacy and critical inquiry / **MA** mathematics / **CS** computer/statistics/quantitative applications / **HU** humanities and fine arts / **SB** social and behavioral sciences / **SG** natural science—general core courses / **SQ** natural science—quantitative / **C** cultural diversity in the United States / **G** global / **H** historical / See "General Studies," page 93.

APPLIED COMPUTER SCIENCE—BS

The BS degree in Applied Computer Science is designed to provide students with an education that targets the computing profession. The program prepares students who are interested in employment or advanced study in software applications or software systems by providing broad-based knowledge and skills in software processes and their application. The program focuses on computer software as used in networked, distributed, and Web-based systems and applications.

The program prepares students for careers in software applications in the context of an industry in which software solutions are increasingly distributed using object-oriented languages and frameworks, and in which the internet, Web, and wireless technologies play an important role.

Each student must satisfy the courses listed for First-Year Composition and the university General Studies requirements. In addition, the following courses are required.

DEGREE REQUIREMENTS

Social/Behavioral Sciences
ECN 211 Macroeconomic Principles *SB* 3
or ECN 212 Microeconomic Principles *SB* (3)

Literacy
TWC 400 Technical Communications *L* 3

Natural Sciences
Choose one of the following combinations 8–9
CHM 113 General Chemistry I *SQ* (4)
CHM 115 General Chemistry with Qualitative Analysis *SQ* (5)
——— *or* ———
PHY 111 General Physics *SQ*[1] (3)
PHY 113 General Physics Laboratory *SQ*[1] (1)
PHY 112 General Physics *SQ*[2] (3)
PHY 114 General Physics Laboratory *SQ*[2] (1)
Natural Science Laboratory elective 4
Total 18–19

[1] Both PHY 111 and 113 must be taken to secure SQ credit.
[2] Both PHY 112 and 114 must be taken to secure SQ credit.

Mathematics
APM 301 Introductory Statistics *CS* 3
MAT 243 Discrete Mathematical Structures 3
MAT 294 ST: Mathematics of Change I 3
MAT 294 ST: Mathematics of Change II 3
MAT 294 ST: Mathematics of Change III 3
Numeracy elective 3
Total 18

Lower-Division Core
CST 100 Object-Oriented Software Development I 3
CST 150 Digital Systems I *CS* 4
CST 200 Object-Oriented Software Development II 3
CST 230 Applied Data Structures 3
Total 13

Upper-Division Core
CST 315 Software Enterprise I: Tools and Process 3
CST 316 Software Enterprise II: Construction and Transition 3
CST 326 Programming Languages for Technology with C/C++ and Visual Basic 4
CST 335 Applications of Computer Theory 3
CST 354 Microcomputer Architecture and Programming 4
CST 364 Computer Architecture 3
CST 386 Operating Systems Principles 3
CST 415 Software Enterprise III: Inception and Elaboration 3
CST 420 Foundations of Distributed and Web-Based Applications in Java 3
CST 433 Database Technology 3
CST 459 Internet Networking Protocols 3
CST 496 Ethics and Professionalism in Computing 3
Total 38

Major Electives
Choose from the following electives 12
CST 425 Server Software Programming (3)
CST 427 Distributed Object Systems (3)
CST 428 Web-Client User Interface Programming (3)
CST 441 Software for Personal Digital Assistants (3)
CST 452 Digital Logic Applications (4)
CST 456 Microcomputer Systems Interfacing (4)
CST 457 Advanced Assembly Language Applications (3)
CST 486 Embedded C Programming (3)
CST 488 Systems Administration of UNIX (3)
CST 489 Network Administration with TCP/IP (3)
Technical electives 10

Applied Computer Science
Program of Study
Typical First- and Second-Year Sequence

First Year

First Semester
CHM 113 General Chemistry I *SQ* 4
CST 100 Object-Oriented Software Development I 3
ENG 101 First-Year Composition 3
MAT 294 ST: Mathematics of Change I 3
Total 13

Second Semester
CHM 115 General Chemistry with Qualitative Analysis *SQ* 5
CST 150 Digital Systems I *CS* 4
ENG 102 First-Year Composition 3
MAT 294 ST: Mathematics of Change II 3
HU or SB elective 3
Total 18

Second Year

First Semester
CST 200 Object-Oriented Software Development II 3
CST 315 Software Enterprise I: Tools and Process 3
CST 354 Microcomputer Architecture and Programming 4
ECN 211 Macroeconomic Principles *SB* 3
MAT 243 Discrete Mathematical Structures 3
Total 16

Second Semester
CST 230 Applied Data Structures 3
CST 364 Computer Architecture 3
MAT 294 ST: Mathematics of Change III 3
HU or SB elective 3
Laboratory science elective 4
Total 16

COMPUTER SYSTEMS—BS

Students interested in the BS degree in Computer Systems may choose to specialize in one of the following concentrations: computer hardware technology or embedded systems technology.

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

The embedded systems technology concentration prepares students for the application, interconnection, design, analysis, and realization of special-purpose systems that involve both software and hardware components. This concentration balances the concerns of computer hardware with the processes and technologies involved in producing reliable software solutions.

Each student must satisfy the courses listed for First-Year Composition and the university General Studies requirements. In addition, the following courses are required.

DEGREE REQUIREMENTS

Social/Behavioral Sciences

ECN 211 Macroeconomic Principles *SB* 3
or ECN 212 Microeconomic Principles *SB* (3)

Literacy

TWC 400 Technical Communications *L* 3

Natural Sciences

PHY 111 General Physics *SQ*[1] 3
PHY 112 General Physics *SQ*[2] 3
PHY 113 General Physics Laboratory *SQ*[1] 1
PHY 114 General Physics Laboratory *SQ*[2] 1
Natural Science Laboratory elective 4
Natural Science Laboratory elective 4
Total 22

[1] Both PHY 111 and 113 must be taken to secure SQ credit.
[2] Both PHY 112 and 114 must be taken to secure SQ credit.

Mathematics

APM 301 Introductory Statistics *CS* 3
MAT 243 Discrete Mathematical Structures 3
MAT 294 ST: Mathematics of Change I 3
MAT 294 ST: Mathematics of Change II 3
MAT 294 ST: Mathematics of Change III 3
Total 15

Lower-Division Core

CST 100 Object-Oriented Software Development I 3
CST 150 Digital Systems I *CS* 4
CST 200 Object-Oriented Software Development II 3
CST 230 Applied Data Structures 3
EET 208 Electric Circuit Analysis I 4
Total 17

Major (54 semester hours)

CST 326 Programming Languages for Technology with C/C++ and Visual Basic 4
CST 350 Digital Systems II 4
CST 354 Microcomputer Architecture and Programming 4
CST 364 Computer Architecture 3
CST 383 Shell and Script Programming with UNIX 3
CST 386 Operating Systems Principles 3
CST 400 Software Engineering Technology 3
CST 415 Software Enterprise III: Inception and Elaboration 3
or UET 415 Electronic Manufacturing Engineering Principles (3)
CST 456 Microcomputer Systems Interfacing 4
CST 494 ST: Professional Orientation 1
Total 32

Computer Hardware Technology Concentration

CET 458 Digital Computer Networks 3
or CET 473 Digital/Data Communications (4)
CST 452 Digital Logic Applications 4
EET 301 Electric Circuit Analysis II 4
EET 401 Digital Signal Processing for Multimedia 3
Technical electives 7–8

Embedded Systems Technology Concentration

CST 420 Foundations of Distributed Web-Based Applications in Java 3
CST 441 Software for Personal Digital Assistants 3
or CST 494 ST: Internet-Enabled Embedded Devices (3)
CET 458 Digital Computer Networks 3
or CST 459 Internet Networking Protocols (3)
CST 486 Embedded C Programming 3
EET 401 Digital Signal Processing for Multimedia 3
Technical electives 7

Computer Systems Program of Study
Embedded Systems Concentration
Typical First- and Second-Year Sequences

First Year

First Semester

CST 150 Digital Systems I *CS* 4
ENG 101 First-Year Composition 3
MAT 294 ST: Mathematics of Change I 3
PHY 111 General Physics *SQ*[1] 3
PHY 113 General Physics Laboratory *SQ*[1] 1
Total 14

Second Semester

CST 100 Object-Oriented Software Development I 3
ENG 102 First-Year Composition 3
MAT 294 ST: Mathematics of Change II 3
PHY 112 General Physics *SQ*[2] 3
PHY 114 General Physics Laboratory *SQ*[2] 1
HU/SB elective 3
Total 16

Second Year

First Semester

CST 200 Object-Oriented Software Development II 3
CST 350 Digital Systems II 4
CST 354 Microcomputer Architecture and Programming 4
ECN 211 Macroeconomic Principles *SB* 3
MAT 243 Discrete Mathematical Structures 3
Total 17

Second Semester

CST 230 Applied Data Structures 3
EET 208 Electric Circuit Analysis I 4
MAT 294 ST: Mathematics of Change III 3
Laboratory science elective 4
Total 14

[1] Both PHY 121 and 122 must be taken to secure SQ credit.
[2] Both PHY 112 and 114 must be taken to secure SQ credit.

L literacy and critical inquiry / **MA** mathematics / **CS** computer/statistics/quantitative applications / **HU** humanities and fine arts / **SB** social and behavioral sciences / **SG** natural science—general core courses / **SQ** natural science—quantitative / **C** cultural diversity in the United States / **G** global / **H** historical / See "General Studies," page 93.

APPLIED SCIENCE—BAS

For students who have completed an Associate of Applied Science from a regionally accredited institution, the Bachelor of Applied Science (BAS) offers a pathway to a bachelor's degree. The BAS is a flexible 60-semester-hour degree that builds on the associate's degree with upper-division course work. Computing Studies offers three concentrations: computer systems administration, microcomputer systems, and software technology applications.

Admission

Students interested in a BAS concentration offered by Computing Studies must have completed an Associate of Applied Science degree from a regionally accredited U.S. postsecondary educational institution. A GPA of 2.00 or higher is required for all resident applicants and 2.50 or higher for nonresident applicants. Applicants should have sufficient background in the area of intended study—software, microcomputer systems, or networking.

Degree Requirements

The BAS degree in the College of Technology and Applied Sciences consists of 60 semester hours of upper-division courses, with 30 semester hours in residence. The BAS course of study includes general studies, an area core, discipline-specific course work, and assignable credit.

AAS degree	60
Assignable credit	6
BAS core	15
General Studies	19
Technical concentration	20
Total	120

General Studies Curriculum

The BAS curriculum builds on the general education content of the AAS degree. Additional portions of the General Studies requirement (L, CS, and awareness areas) are met with courses in the core or concentration. General Studies courses focus on contextual learning.

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

Assignable Credit

Assignable credit allows space in the curriculum for prerequisite courses needed to succeed in the program or additional technical electives. The courses are determined by the student and the advisor.

Technical Concentration

Computer Systems Administration

Choose from the following 20
- CST 354 Microcomputer Architecture and Programming (4)
- CST 383 Shell and Script Programming with UNIX (3)
- CST 386 Operating Systems Principles (3)
- CST 459 Internet Networking Protocols (3)
- CST 488 Systems Administration of UNIX (3)
- CST 489 Network Administration with TCP/IP (3)

CST 300- or 400-level major electives (7)

Microcomputer Systems

Choose from the following 20
- CST 326 Programming Languages for Technology with C/C++ and Visual BASIC (4)
- CST 354 Microcomputer Architecture and Programming (4)
- CST 364 Computer Architecture (3)
- CST 383 Shell and Script Programming with UNIX (3)
- CST 386 Operating Systems Principles (3)
- CST 457 Advanced Assembly Language Applications (3)

CST 300- or 400-level major electives (6)

Software Technology Applications

Choose from the following 20
- CST 326 Programming Languages for Technology with C/C++ and Visual BASIC (4)
- CST 354 Microcomputer Architecture and Programming (4)
- CST 386 Operating Systems Principles (3)
- CST 400 Software Engineering Technology (3)
- CST 420 Foundations of Distributed Web-Based Applications in Java (3)

Choose one of the following combinations (3)
- CST 425 Software Server Programming (3)

— — — or — — —

- CST 427 Distributed Object Systems (3)

— — — or — — —

- CST 428 Web-Client User Interface Programming (3)

CST 433 Database Technology 3
CST 300- or 400-level major electives 3

COMPUTER ENGINEERING TECHNOLOGY (CET)

E CET 401 Digital Signal Processing for Multimedia. (3)
fall
Applies DSP techniques to multimedia. Digital filter analysis and design. Time and frequency techniques. Computer applications. Cross-listed as EET 401. Credit is allowed for only CET 401 or EET 401. Prerequisites: EET 301; MAT 262.

E CET 458 Digital Computer Networks. (3)
spring
Network hardware and software, topologies, protocols, OSI model, LANs, WANs, Internet; basic concepts of packet switching, routing, error controlling. Prerequisite: CST 354.

E CET 473 Digital/Data Communications. (4)
fall
Signals, distortion, noise, and error detection/correction. Transmission and systems design. Interface techniques and standards. Lecture, lab. Prerequisites: CST 354; EET 372.

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 63.

Graduate-Level Courses. For information about courses numbered from 500 to 799, see the *Graduate Catalog*, or access www.asu.edu/catalog on the Web. In some situations, undergraduate students may be eligible to take these courses; for more information, see "Graduate-Level Courses," page 62.

COMPUTING STUDIES (CST)

E CST 100 Object-Oriented Software Development I. (3)
fall
Basic concepts of object-oriented analysis, design, and programming using Java. Basic Java variables, expressions, arrays, statements, methods, and classes.

E CST 150 Digital Systems I. (4)
fall and spring
Number systems, Boolean algebra, combinational logic, K-maps, flip-flops, sequential circuits, state machines, and minimization techniques. Lecture, lab. Prerequisite: MAT 117 (or its equivalent).
General Studies: CS

E CST 191 First-Year Seminar. (1–3)
selected semesters

E CST 200 Object-Oriented Software Development II. (3)
fall and spring
Object modeling with class and interaction diagrams; inheritance and run-time binding; introduces frameworks with Java collections and windowing. Prerequisite: CST 100.

E CST 230 Applied Data Structures. (3)
fall
Introduces data structures: strings, stacks, queues, binary trees, recursion, searching, and sorting. Prerequisite: CST 200.

E CST 256 C Programming for Engineering Technology. (3)
fall, spring, summer
Applied and practical problem solving using the C programming language. Prerequisite: ETC 100.

E CST 294 Special Topics. (1–4)
selected semesters

E CST 315 Software Enterprise I: Tools and Process. (3)
fall
Introduces tools and techniques used in software enterprise/ development, including coding, design, testing, configuration management, and personal process management. Prerequisite: CST 200.

E CST 316 Software Enterprise II: Construction and Transition. (3)
spring
Best practices in software construction in the context of a team project, including refactoring, defensive programming, unit testing, and configuration and release management. Lecture, lab. Prerequisites: CST 230, 315, 326.

E CST 326 Programming Languages for Technology with C/C++ and Visual BASIC. (4)
fall and spring
Programming language design and implementation concepts through programming C/C++, Visual BASIC; execution, run-time management, data control, pointers, templates, multiple inheritance. Lecture, lab. Prerequisites: CST 200; CST 150.

E CST 335 Applications of Computer Theory. (3)
fall
Introduces and applies formal language theory and automata, Turing machines, decidability, undecidability, recursive function theory, and complexity theory. Prerequisites: CST 230; MAT 243.

E CST 350 Digital Systems II. (4)
fall
Analysis and design of synchronous and asynchronous state machines. Introduces VHDL. Lecture, lab. Prerequisite: CST 150.

E CST 354 Microcomputer Architecture and Programming. (4)
fall and spring
Microcomputer architecture, assembly language programming, I/O considerations, exception and interrupt handling. Introduces interfacing. Lecture, lab. Prerequisite: CST 150.

E CST 364 Computer Architecture. (3)
fall
Processor performance, RISC/CISC, processor design and implementation, basic pipelining, memory hierarchy, I/O. Lecture, lab. Prerequisites: CST 200, 354.

E CST 383 Shell and Script Programming with UNIX. (3)
spring
UNIX operating system programming of shells, environment and 4th-generation languages and tools, such as sed, awk, perl, grep, make. Prerequisite: CST 100.

E CST 386 Operating Systems Principles. (3)
fall
Fundamentals of operating systems, process management, scheduling and synchronization techniques, memory and file management, protection and security issues. Prerequisites: CST 100 (or 256), 354.

E CST 394 Special Topics. (1–4)
selected semesters
Topics may include the following:
- Applications of Computing Theory. (3)

E CST 400 Software Engineering Technology. (3)
spring
Software life-cycle models; project management; team development environments; software specification, design, implementation techniques and tools, validation, and maintenance; user documentation. Prerequisite: CST 326.

E CST 415 Software Enterprise III: Inception and Elaboration. (3)
fall
Third course in the four-course enterprise sequence. Students perform inception (project launch) and elaboration (requirements analysis) activities in project teams. Integrated lecture/lab, project. Prerequisite: CST 316 or 400.

E CST 420 Foundations of Distributed Web-Based Applications in Java. (3)
fall and spring
Principles underlying design and implementation of distributed software components; sockets, protocols, threads, XML, serialization, reflection, security, and events. Prerequisites: CST 230; CST 386.

E CST 425 Server Software Programming. (3)
once a year
Design and implementation of software servers, threaded socket servers, servers for distributed Web-based applications; security for the Web. Prerequisite: CST 420 or instructor approval.

E CST 427 Distributed Object Systems. (3)
fall
Distributed applications with Web services, NET, RMI, CORBA; concepts and frameworks for managing, registering, locating, and securing distributed object applications. Corequisite: CST 420.

E CST 428 Web-Client User Interface Programming. (3)
fall
Client-server model for window interfaces. Java Swing, Applets, mark-up and scripting languages; Web tools and related technologies. Prerequisite: CST 420 or instructor approval.

E CST 433 Database Technology. (3)
fall
Introduces database technologies and DBMS, data models, and languages. Prerequisites: CST 230, 326.

E CST 441 Software for Personal Digital Assistants. (3)
fall
Mobile computing using Java's K, Virtual Machine, MIDP for wireless applications; user interfaces, persistent data storage, and networking. Prerequisite: CST 420.

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

E CST 456 Microcomputer Systems Interfacing. (4)
fall
Programming using BIOS and DOS routines. Disk operations, TSR routines, and device drivers. Lecture, lab. Prerequisite: CST 354.

E CST 457 Advanced Assembly Language Applications. (3)
spring
Applies 32-bit assembly language programming using advanced assembler techniques and interfacing to high-level languages. Prerequisite: CST 354.

E CST 459 Internet Networking Protocols. (3)
fall
Computer networking for application, transmission control and network layers using the Internet protocols as a model; reliability and security. Prerequisites: CST 200 (or 256), 354.

E CST 484 Internship. (1–3)
selected semesters

L literacy and critical inquiry / **MA** mathematics / **CS** computer/statistics/ quantitative applications / **HU** humanities and fine arts / **SB** social and behavioral sciences / **SG** natural science—general core courses / **SQ** natural science—quantitative / **C** cultural diversity in the United States / **G** global / **H** historical / See "General Studies," page 93.

E CST 486 Embedded C Programming. (3)
fall
Programming concepts for embedded systems. Interfacing and controlling LED, LCD, keypads, buttons. Embedded OS concepts. Timers and interrupts. Serial communication. Integrated lecture/lab. Prerequisites: CST 326, 354.

E CST 488 Systems Administration of UNIX. (3)
fall
Administration of UNIX, its processes, system calls, kernel, file structure, and interprocess communication using command line tools. Integrated lecture/lab. Prerequisites: CST 383, 386.

E CST 489 Network Administration with TCP/IP. (3)
spring
Writing C programs and shell scripts to create, control, and administer computer networks. Installation and maintenance of computer networks. Prerequisites: CST 383, 459.

E CST 490 Reading and Conference. (1–12)
selected semesters

E CST 492 Honors Directed Study. (1–3)
selected semesters

E CST 493 Honors Thesis. (1–6)
selected semesters

E CST 494 Special Topics. (1–4)
selected semesters
Topics may include the following:
- Applied Software Process. (3)
- Computer Project
- Embedded C. (3)
- Internet-Enabled Embedded Devices
- Professional Orientation. (1)

E CST 496 Ethics and Professionalism in Computing. (3)
fall
Studies major social and ethical issues in computing, including impact of computing on society, ethical behavior, and social responsibility. Prerequisite: senior standing.

E CST 498 Pro-Seminar. (1–3)
selected semesters

E CST 499 Individualized Instruction. (1–3)
selected semesters

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see “Omnibus Courses,” page 63.

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The Polytechnic campus maintains facilities at the leading edge of technology.

Tim Trumble photo