College of Technology and Applied Sciences

technology.east.asu.edu

Albert L. McHenry, PhD, Dean

PURPOSE

The College of Technology and Applied Sciences (CTAS), at the East campus, offers professional degree programs leading to the Master of Science in Technology (MSTech) degree and to the Master of Computing Studies (MCST) degree. These degree programs are intended as preparation for a career in a selected branch of technology or as the foundation for further study. Graduates of these programs are provided with technical and professional skills for use in leadership positions in industry and education.

ORGANIZATION

The MSTech and MCST degrees are offered through the Division of Graduate Studies by the faculty in the College of Technology and Applied Sciences and its units: the Departments of Aeronautical Management Technology, Electronics and Computer Engineering Technology, Information and Management Technology, and Mechanical and Manufacturing Engineering Technology and the Division of Computing Studies. Faculty members administering the programs have been selected because of their relevant backgrounds in industry and business along with their academic training and teaching experience.

GRADUATE PROGRAMS

Graduate programs as shown in the "College of Technology and Applied Sciences Graduate Degrees and Majors" table, page 354, are offered by the faculty within the college.

ADMISSION REQUIREMENTS

Admission to the degree program requires the completion of all general admission requirements and procedures set forth by the Division of Graduate Studies. CTAS also requires an appropriate baccalaureate degree from an accredited college or university, with a minimum of 30 semester hours in technology or its equivalent and 16 semester hours of physical science and mathematics appropriate to the program pursued. The specific requirements vary within each department.

Graduate work presupposes an adequate technical preparation in a selected technology at the undergraduate level. Deficiencies for admission to the graduate program, if any, are specified at the time of admission. The applicant's past work and professional experience are also evaluated and taken into consideration when determining admission classification. To be considered for regular admission, a 3.00 GPA is required.

ADVISING AND PROGRAM OF STUDY

The program of study is planned in consultation with an appointed supervisory committee. It is designed for flexibility, permitting the student to select a combination of courses in a technological area and a supporting area to meet individual career goals.

A minimum of 33 semester hours is required for the degree program. Of these, a minimum of 15 semester hours must be 500-level courses and part of the approved program. A maximum of 12 hours of course work may be taken from offerings outside CTAS with approval of the appropriate academic program or department. Programs of study for the MSTech, with an interdisciplinary area of concentration, may have up to but not more than 15 hours of course work drawn from areas outside CTAS at the discretion of the program or department in which the concentration is administered. A maximum of nine semester hours of appropriate course work completed before admission may be included in the program of study. Specific credit requirements are as follows:

Thesis Option

Technical area of emphasis	15–18
Supporting area	6–9
Thesis writing course	3
Research	6
Total minimum semester hours required	33

Applied Project Option

Technical area of emphasis	15–18
Supporting area	9–12
Research/applied project	3
Research/writing course	3
Total minimum semester hours required	33

A master's degree candidate forms a supervisory committee, the chair of which is from one of four CTAS departments or the Division of Computing Studies. The chair and the committee members assist the student in selecting and approving appropriate courses to meet the degree requirements and student's goals.

The Department of Aeronautical Management Technology offers a concentration in aviation management and human factors.

The Department of Electronics and Computer Engineering Technology offers concentrations in electronic systems engineering technology, instrumentation and measurement technology, and microelectronics engineering technology.

The Department of Information and Management Technology provides students the opportunity to study environmental technology management, fire service administration, information technology, and management of technology.

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, information technology, or management of technology	Department of Information and Management Technology
		Security engineering technology	College of Technology and Applied Sciences

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

The Department of Mechanical and Manufacturing Engineering Technology offers concentrations in aeronautical engineering technology, manufacturing engineering technology, and mechanical engineering technology.

The Division of Computing Studies offers the Master of Computing Studies degree and the Master of Technology with a concentration in computer systems.

Computing Studies

Master's Program

www.east.asu.edu/ctas/dcst

480 727-1029

SUTTON 140

Timothy E. Lindquist, Associate Dean and Director

Professor: Lindquist

Associate Professors: Koehnemann, Millard, O'Grady

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

Senior Lecturer: Whitehouse

The faculty of the Division of Computing Studies offer the Master of Computing Studies (MCST) graduate degree program as well as the computer systems concentration of the Master of Science in Technology degree. The Division offers professional bachelor's and master's programs in applied computer science through curricular focus on the languages, methods, and tools in use today. Graduate programs prepare students with technical and professional knowledge necessary for career advancement and positions of leadership in computing through challenging problem-based, laboratory-rich course work and an applied research component. Graduates work in a variety of areas, including digital design applications, distributed Web-based systems, embedded systems, and networks, and some graduates may be involved in some aspect of their employer's software process. Others pursue careers in allied fields by leveraging computing interests in application areas such as engineering, biology, or business. In addition to academic credentials, faculty administering the program have amassed extensive computing industry experience.

RESEARCH ACTIVITY

Faculty engage in a broad range of professional and scholarly activities reflecting the practical nature of programs offered. As a consequence, upper-division and graduate course work pace the evolving state of computing practice. Students can study topics such as embedded systems with C and related digital system concepts; software engineering of distributed Web-based applications; distributed systems; software processes and supporting tools for outsourced systems, project management, and software testing; as well as (wireless) networking and related applications such as those found on limited devices (game boxes, cell phones, and digital assistants). Computing Studies teaching and research laboratories provide a learning environment where students can explore these topics, as well as their application to other disciplines. For more information on research areas and laboratories, access the division's Web site at www.east.asu.edu/ctas/dcst.

MASTER OF COMPUTING STUDIES

The MCST requires a minimum of 33 semester hours of graduate credit, including course work and an applied research component. The program is designed with sufficient flexibility to permit the student to select a combination of courses in a technical specialization augmented with a

breadth requirement. The required research component provides students opportunities to develop special research and application skills directly related to individual needs and objectives. The division offers a number of specializations, all of which are based upon a sound undergraduate degree.

Admission. Applicants are expected to satisfy all requirements for admission to the Division of Graduate Studies with high success in completing a bachelor's degree in computing. Excellent applicants with partial computing background may be admitted with undergraduate computing deficiencies that must be completed early in the graduate program. Applicants must submit scores for the Graduate Record Examination, including verbal, quantitative, and analytical. The subject test in computer science is not required. International applicants must also submit results of the Test of English as a Foreign Language. Applicants for fall semester admission should plan to have all materials arrive at the Division of Graduate Studies by March 1 and applicants for spring semester admission should have all materials in by October 1.

Program of Study

Course Work. The program of study must contain a minimum of 33 semester hours of approved graduate-level work. At least 18 of these hours must be computing studies 500 level credits (excluding computing studies 598 courses). Students in the project option must complete 27 semester hours of course work, and students selecting the thesis option must complete 24 semester hours of course work. At most three semester hours of supervised internship (CST 584) or reading and conference (CST 590) may be used to fulfill course work requirements. All MCST students must take at least three semester hours in three of the four specialization areas:

1. digital systems;
2. embedded systems;
3. software engineering and distributed Web-based applications; and
4. networks.

At least two out of the three area courses must be at the 500 level (excluding CST 598). Students must complete at least four courses in a single area of specialization that is also used as the topical area for the research component. All MCST students must complete three semester hours of seminar and research writing (CST 591 and 500).

The Research Component. MCST students may select either a thesis or project as the research component. Thesis students must register for three semester hours of CST 592 Research and three hours of CST 599 Thesis in consecutive semesters. The thesis should be a rigidly formatted and reviewed work that contributes to the knowledge base or state-of-practice in the selected area of specialization. Students who select a project as the research component must register for three hours of CST 593 Final Project in their final semester. Nonthesis students complete an in-depth project and report that reflect advanced expertise and critical thinking in the selected area of specialization. The project/thesis is carried out under the direction of a Division of Computing Studies ranked faculty member who serves as the major advisor and two additional faculty committee members. The research component should reflect an advanced level of expertise in the student's specialization area, in accordance with the program's mission of producing graduates with in-discipline knowledge of immediate interest to computing employers. The project/thesis is presented to the committee in a public forum that constitutes a final oral examination.

MASTER OF SCIENCE IN TECHNOLOGY COMPUTER SYSTEMS CONCENTRATION

The Master of Science in Technology (MSTech) degree offered through the College of Technology and Applied Sciences promotes greater depth of understanding in the chosen discipline. A minimum of 33 semester hours of graduate credit is required. The division supports the MSTech concentration in computer systems. The program is designed for sufficient flexibility to permit the student to select a combination of courses in a technical concentration and supporting area to meet individual career goals. The required research component provides students opportunities to develop research and application skills directly related to individual educational objectives. The graduate courses are designed to furnish graduates with technical and professional knowledge necessary for career advancement and positions of leadership in industry, education, government, and the military.

Admission. Applicants are expected to satisfy all requirements for admission to the Division of Graduate Studies with high success in completing a bachelor's degree in computing. Excellent applicants with partial computing background may be admitted with undergraduate computing deficiencies that must be completed early in the graduate program. Neither the Graduate Record Examination nor the subject test in computer science is required to apply. International applicants must submit results of the Test of English as a Foreign Language. Applicants for fall semester admission should plan to have all materials arrive at the Division of Graduate Studies by March 1 and applicants for spring semester should have all admission materials in by October 1.

Program of Study

Course Work. The MSTech with a concentration in computer systems requires a minimum of 33 semester hours, including course work and research components. At most three semester hours of supervised internship (CST 584) or reading and conference (CST 590) may be used to fulfill course work requirements. Students may select the thesis option or nonthesis option. Specialization and supporting area course work are taken from the four areas:

1. digital systems;
2. embedded systems;
3. software engineering and distributed Web-based applications; and
4. networks.

Thesis Option

Specialization	15–16
Supporting area	8–9
Research methods courses	7–9
CST 500 Research/writing (2)	
CST 591 Graduate seminar (1)	
CST 592 Research (3)	
CST 599 Thesis (3)	
Total minimum semester hours	33

A minimum of 20 semester hours must be in 500-level courses. At least nine semester hours of 500-level course work must be included in the technical concentration. Students may take up to 13 semester hours of 400-level course work to broaden their technical knowledge within the specialization or supporting area. Students are required to complete three hours of research (CST 592) and three hours of thesis (CST 599), write a thesis, and make an oral defense. All course work applied toward the minimum 33-hour total must be at the 400 and 500 level.

Nonthesis Option

Specialization	15–18
Supporting area	9–12
Research methods courses	4–6
CST 500 Research/writing (2)	
CST 591 Graduate seminar (1)	
CST 593 Project (3)	
Total minimum semester hours	33

A minimum of 20 semester hours must be in 500-level courses. At least nine semester hours of 500-level course work must be included in the technical concentration. A maximum of three semester hours of Applied Project (CST 593) may be applied toward the 20-hour 500-level minimum. All course work applied toward the minimum 33 semester hour total must be graduate eligible courses at the 400 and 500 level.

The Research Component. MSTech computing systems concentration students may select either a thesis or project as the research component. Thesis students must register for three semester hours of CST 592 Research and three hours of CST 599 Thesis in consecutive semesters. The thesis should be a rigidly formatted and reviewed work that contributes to the knowledge base or state-of-practice in the selected area of concentration. Students who select a project as the research component must register for three semester hours of CST 593 Final Project in their final semester. Nonthesis students complete an in-depth project and report that reflect advanced expertise and critical thinking in the selected area of concentration. The project/thesis is carried out under the direction of a Division of Computing Studies ranked faculty member who serves as the major advisor and two additional faculty committee members. The research component should reflect an advanced level of expertise in the student's concentration area, in accordance with the program's mission of producing graduates with in-discipline knowledge of immediate interest to computing employers. The project/thesis is presented to the committee in a public forum that constitutes a final oral examination.

COMPUTING STUDIES (CST)

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.

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.

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.

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.

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.

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

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

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.

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.

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.

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.

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.

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.

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.

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.

CST 500 Research Methods. (1–12)
selected semesters
Topics may include the following:
- Research/Writing

CST 520 Computer Architecture. (3)
spring
Basics of computer architecture. RTN, RISC, CISC concepts; computer arithmetic; ALUs; memory systems; I/O. Prerequisite: CST 364.

CST 533 Database-centric Enterprise Applications Development. (3)
spring
Solutions for enterprise software systems based on relational database technology. Persistence solutions in middleware frameworks. O/R, XML, and scalability issues. Prerequisites: CST 230, 433; MAT 243.

CST 540 Internet-Enabled Embedded Devices. (3)
spring
Accessing hardware devices through Internet, including Applets, HTTP, custom byte streams, XML-RPC, SOAP. Building network-based applications that interface hardware. Prerequisite: CST 420.

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

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

CST 556 Distributed Applications for Windows Platforms. (3)
fall
Distributed Web-based applications using Windows frameworks such as.NET. Essential components, XML, remoting, Web services, windows services, user interfaces. Prerequisite: CST 420.

CST 557 Embedded Applications Development. (3)
fall
Current trends in embedded system development using C, assembly, and special purpose hardware. Development versus target environment issues. Prerequisites: CST 326, 457.

CST 566 Principles and Practices of Operating Systems. (3)
spring
Principles and practices of operating systems: virtual memory systems, I/O devices and systems, file systems and organization, and other topics. Prerequisite: CST 386.

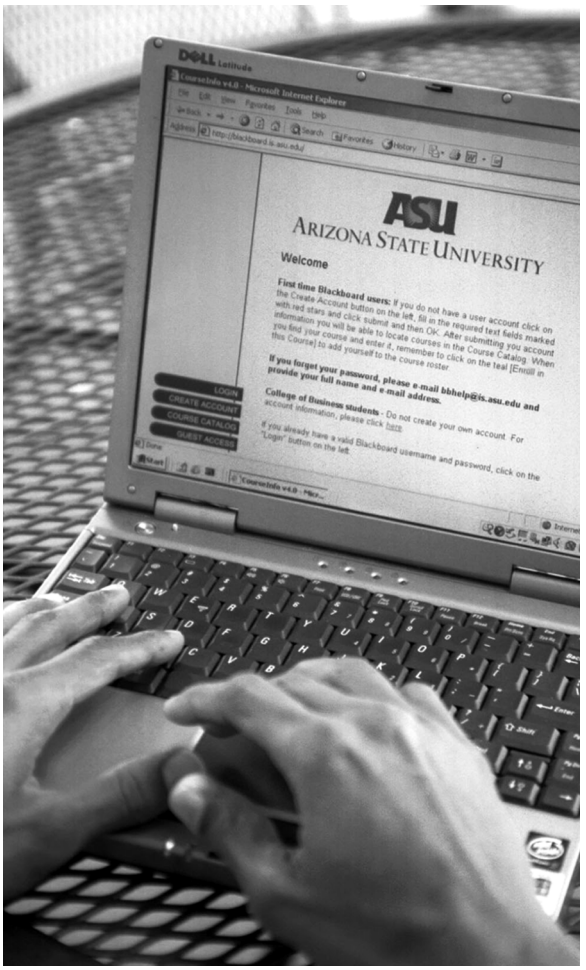
CST 576 Embedded Real-Time Programming. (3)
fall
Topics in real-time embedded operating systems such as synchronization, communications, file systems, and memory sharing. Prerequisite: CST 420.

CST 580 Practicum. (1–3)
selected semesters

CST 583 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. Lecture, project. Prerequisites: CST 383, 458, 473.

CST 584 Internship. (1–12)
selected semesters
Topics may include the following:
- Supervised Internship

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



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

Tim Trumble photo

CST 590 Reading and Conference. (1–12)
selected semesters

CST 591 Seminar. (1–12)
selected semesters
Topics may include the following:
- Graduate Seminar

CST 592 Research. (1–12)
selected semesters

CST 593 Applied Project. (1–12)
selected semesters

CST 594 Conference and Workshop. (1–3)
selected semesters

CST 595 Continuing Registration. (1)
selected semesters

CST 598 Special Topics. (1–4)
selected semesters

CST 599 Thesis. (1–12)
selected semesters

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see “Omnibus Courses,” page 56.

Technology

Master's Programs

Department of Aeronautical Management Technology

eastair.east.asu.edu

480/727-1775

SIM 201

Department of Electronics and Computer Engineering Technology

www.east.asu.edu/ctas/ecet

480/727-1514

TECH 101

Department of Information and Management Technology

technology.east.asu.edu/dtm

480/727-1781

TECH 102

Department of Mechanical and Manufacturing Engineering Technology

www.east.asu.edu/ctas/mmet

480/727-1584

SIM 295

Division of Computing Studies

www.east.asu.edu/ctas/dcst

480/727-1029

SUTTON 140

William K. McCurry, Chair,
Department of Aeronautical Management Technology

Professors: Gesell, McCurry

Associate Professor: Karp

Assistant Professors: Niemczyk, Pearson

Lecturers: O'Brien, Tripp

Lakshmi V. Munukutla, Interim Chair,
Department of Electronics and Computer Engineering Technology

Professors: McHenry, Munukutla, Robertson

Associate Professors: Darveaux, Macia, Sundararajan, Zeng

Thomas E. Schildgen, Chair,
Department of Information and Management Technology

Professors: Duff, Hild, Schildgen

Associate Professors: Grossman, Hirata, Humble, Matson, Olson

Assistant Professors: Harris, Nelson

Professors of Practice: Kime, Peterson

Senior Lecturer: Wilson

Lecturers: Dolin, Lestar, Parmentier

Scott G. Danielson, Chair,
Department of Mechanical and Manufacturing Engineering Technology

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

Assistant Professor: Post

Timothy E. Lindquist, Associate Dean and Director,
Division of Computing Studies

Professor: Lindquist

Associate Professors: Koehnemann, Millard, O'Grady

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

Senior Lecturer: Whitehouse

The Master of Science in Technology (MSTech) degree program is offered by the faculty in four departments of the College of Technology and Applied Sciences—Aeronautical Management Technology, Electronics and Computer Engineering Technology, Information and Management Technology, and Mechanical and Manufacturing Engineering Technology—and the Division of Computing Studies. Courses are offered at the East campus. Both a thesis and applied project option are available.

The professional programs leading to the MSTech degree are intended as preparation for a career in a selected branch of technology or as the foundation for further advanced study. Graduates of this program are provided with technical and professional skills for use in leadership positions in industry and education.

Faculty members administering the program have been selected because of relevant backgrounds in industry and business, along with their academic training and teaching experience.

A Master of Computing Studies (MCST) degree is offered by the Division of Computing Studies. For more information see "Master of Computing Studies," page 354.

Admission. Admission to the degree program requires the completion of all general admission requirements and procedures set forth by the Division of Graduate Studies. The College of Technology and Applied Sciences also requires an appropriate baccalaureate degree from an accredited college or university, with a minimum of 30 semester hours in technology or equivalent and 16 hours of physical science and mathematics appropriate to the program pursued. The specific requirements vary within each department.

Graduate work presupposes an adequate technical preparation in a selected technology at the undergraduate level. Deficiencies for admission to the graduate program, if any, are specified at the time of admission. The applicant's past work and professional experience are also evaluated and taken into consideration when determining admission classification.

To be considered for regular admission, a 3.00 GPA or higher, as determined by the department, is required.

Program of Study. The program of study is designed to promote greater depth of understanding and preparation in technology as it can be applied to industry and education. The program of study is planned in consultation with a supervisory committee. It is designed for flexibility, permitting the student to select a combination of courses in a technological area and a supporting area to meet individual career goals.

A minimum of 33 semester hours is required for the degree program. Of these, a minimum of 15 semester hours must be 500-level courses and part of the approved program. Specific credit requirements vary within each department. The minimum requirements are as follows:

Thesis Option

Technical area of emphasis	15–18
Supporting area	9–12
Thesis writing course	3
Research	3
Total minimum semester hours required	33

Applied Project Option

Technical area of emphasis	15–18
Supporting area	9–12
Research writing course	3
Research/applied project	3
Total minimum semester hours required	33

A maximum of nine semester hours of appropriate course work completed before admission may be included in the program of study.

A master's degree candidate forms a supervisory committee, the chair of which is from one of the academic units within the College of Technology and Applied Sciences. The chair and the committee members assist the student in selecting appropriate courses to meet the degree requirements and the student's goals. Specific program patterns are approved by the committee.

The Department of Aeronautical Management Technology provides students the opportunity to select courses, to be included in the technical area of their program of study, in aviation management and human factors.

The Department of Electronics and Computer Engineering Technology offers concentrations in electronics systems engineering technology, instrumentation and measurement technology, and microelectronics engineering technology.

The Department of Information and Management Technology provides students the opportunity to study environmental technology management, fire service administration, global technology and development, information technology, and management of technology.

The Department of Mechanical and Manufacturing Engineering Technology offers concentrations in aeronautical engineering technology, manufacturing engineering technology, and mechanical engineering technology.

The Division of Computing Studies offers the concentration in computer systems and the Master of Computing Studies degree.

The college offers one other concentration: security engineering technology (SET).

SECURITY ENGINEERING TECHNOLOGY (SET)

SET 540 Explosives Surety. (3)
fall
Physical and chemical nature of explosives; detonation models; initiating systems; commercial, military, and improvised explosives; investigations; and counter measures. Integrated lecture/lab. Prerequisite: graduate standing.

SET 560 Physical Security I. (3)
spring
Systems engineering principles and concepts to guide the design, analysis, and implementation of protection systems. Lecture, lab. Prerequisite: graduate standing.

SET 561 Physical Security II. (3)
fall
Scientific theory behind analysis of physical protection systems. Includes probability and statistics, data collection techniques, algorithm processing. Integrated lecture/lab. Prerequisite: SET 560.

SET 570 Security System Instrumentation. (3)
fall
Operating principles, limitations, and test procedures of security instrumentation and sensors. Lecture, lab. Prerequisite: SET 560.

SET 592 Research. (1–12)
selected semesters

SET 598 Special Topics. (1–4)
selected semesters

SET 599 Thesis. (1–12)
selected semesters

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 56.

Department of Aeronautical Management Technology

Admission. Applicants are expected to satisfy all requirements for admission to the Division of Graduate Studies. Industrial experience beyond completion of a baccalaureate degree is strongly recommended. Applicants having deficiencies or not meeting the prerequisites may be required to complete them before being admitted to the MSTech degree program.

Program of Study. All candidates for the degree program are required to complete a minimum of 33 semester hours of approved courses. Additional courses may be assigned by the supervisory committee depending on the background of the candidate.

An applied project or thesis is required. Upon completion of the approved course of study or during the last semester, an oral defense of the applied project or thesis is required.

The program is designed for flexibility, permitting the student to select a combination of courses in a technical area and supporting area to meet individual goals.

Students taking courses in aviation management and human factors work with a faculty advisor to define specific classes that satisfy degree requirements.

Final Examination. A final oral examination in defense of the applied or research project is required.

RESEARCH ACTIVITY

The Department of Aeronautical Management Technology has established a broad research agenda that includes both technical and management disciplines. Current research initiatives include: aviation education and training; human factors in aviation; aviation physiology; hypobarics; hyperbarics; retention of women in aviation; air traffic control enhancement; runway incursion analyses; human factors in aviation maintenance; and the development of broad-based industrial partnerships through teaming arrangements, internships, and capstone course participation.

AERONAUTICAL MANAGEMENT TECHNOLOGY (AMT)

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

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.

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

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

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

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.

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

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

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.

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.

AMT 520 Airline Pricing and Yield Management. (3)
selected semesters
Airline economics at the operating level; historical and current operational strategies; demand, traffic, price, yield, revenues, and costs. Prerequisite: admission to MS in Technology program.

AMT 521 Air Transportation Regulation. (3)
selected semesters
Reviews evolutionary history of government regulations. Explores alternatives for economic, safety, social, and administrative regulatory reform in air transportation. Prerequisite: AMT 444 or 489 (or its equivalent).

AMT 522 Aviation Law. (3)
selected semesters
Examines the U.S. legal system with a focus on the aviation perspective, administrative agencies, FAA enforcement, and case law. Prerequisite: admission to MS in Technology program.

AMT 523 Aviation Systems Management. (3)
selected semesters
Systems theory applied to intermodal transportation networks. Survey of air and ground transportation infrastructure, institutional frameworks, and intermediaries promoting connections between modes. Prerequisite: AMT 444 or 489 (or its equivalent).

AMT 524 Airport Management and Operations. (3)
selected semesters
Overview of planning, funding, and development of airport facilities; legal and ethical considerations associated with airport management operations. Prerequisite: admission to MS in Technology program.

AMT 525 Airport Planning and Design. (3)
selected semesters
Completion of various phases of airport master planning process. Provides guidance for logical and timely development of airports. Project work groups assigned. Prerequisite: AMT 444 or 489 (or its equivalent).

AMT 526 Aviation Labor Relations. (3)
selected semesters
Investigates labor-management relations in the aviation industry, including laws, unionism, collective bargaining, public sector relationships, grievance procedures, and conflict. Prerequisite: admission to MS in Technology program.

AMT 527 Airline Management Strategies. (3)
selected semesters
Since deregulation, airlines have undergone profound changes through mergers, consolidation, and acquisition. In-depth look at airline management strategies for the 21st century. Prerequisite: AMT 444 or 489 (or its equivalent).

AMT 528 International Aviation. (3)
selected semesters
Major issues of international aviation, historical review of institutional framework. Bilateral route agreements, freedom versus sovereignty, current legal and political arrangements. Prerequisite: AMT 444 or 489 (or its equivalent).

AMT 529 Fixed-Base Operations Management. (3)
selected semesters
Examines FBO role in the national aviation system. Organization of flight line operations, aircraft maintenance, and administration for multiple aircraft types. Prerequisite: AMT 444 or 489 (or its equivalent).

AMT 532 Managing Diversity in Aviation. (3)
selected semesters
Examines group identity and cognitive styles, cross-cultural issues, language and diversity, and effects of aviation culture on management of diversity. Lecture, discussion. Prerequisite: admission to MS in Technology program.

AMT 541 Aviation Physiology. (3)
selected semesters
Surveys human physiology and human performance principles related to modern aircraft and aircraft systems operating in multiple environments. Prerequisite: AMT 410 (or its equivalent).

AMT 542 Human Factors in Automation. (3)
selected semesters
Examines human factors issues associated with automation. Includes impact of automation design, workload, stress, and system complexity on human operators. Prerequisite: admission to MS in Technology program.

AMT 545 Human Factors in Aviation. (3)
selected semesters
Overview of human role in aviation. Issues, problems of unsafe acts and attitudes in human behavior. Human engineering capabilities and limitations. Prerequisite: AMT 410 (or its equivalent).

AMT 546 Crew Resource Management/Line-Oriented Flight Training. (3)
spring
Evaluates in-depth, multicrew coordination issues for commercial aviation pilots. Stresses importance of critical thinking, decision making, integrated resource utilization. Prerequisite: AMT 410 (or its equivalent).

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

AMT 580 Practicum. (1–12)
selected semesters

AMT 584 Internship. (1–12)
selected semesters

AMT 590 Reading and Conference. (1–12)
selected semesters

AMT 591 Seminar. (1–12)
selected semesters
Topics may include the following:
- Transportation Systems Pro-Seminar

AMT 592 Research. (1–12)
selected semesters

AMT 593 Applied Project. (1–12)
selected semesters

AMT 595 Continuing Registration. (1)
selected semesters

AMT 598 Special Topics. (1–4)
selected semesters
Topics may include the following:
- Airport Systems

AMT 599 Thesis. (1–12)
selected semesters

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 56.

Department of Electronics and Computer Engineering Technology

The faculty in the Department of Electronics and Computer Engineering Technology offer a graduate program leading to the MSTech. Three concentrations are available: electronics systems engineering technology, instrumentation and measurement technology, and microelectronics engineering technology. The instrumentation and measurement technology concentration is offered in conjunction with the Department of Mechanical and Manufacturing Engineering Technology. A concentration in computer systems is offered by the Division of Computing Studies.

Admission and Proficiency Requirements. For general admission requirements, see "Admission to the Division of Graduate Studies," page 58, and "Technology," page 358. Admission and proficiency requirements and course work may be obtained from the department or from the department Web site at www.east.asu.edu/ctas/ecet.

Program of Study. The minimum requirements for the MSTech degree offered by the Department of Electronics and Computer Engineering Technology are as follows:

Thesis Option

Concentration	15–18
Supporting area	6–9

Research Methods Courses

EET 500 Research/Writing	2
EET 591 Graduate Seminar	1
EET 592 Research or CET 592 Research (3)	3
EET 599 Thesis or CET 599 Thesis (3)	3
Total minimum semester hours required	33

A minimum of 20 semester hours must be 500-level courses. At least nine hours of 500-level course work must be included in the concentration. Students may take up to 12 semester hours of 400-level course work to broaden their technical knowledge within the technical concentration or the supporting area. Students are required to complete EET 592 or CET 592 (three semester hours) and EET 599 or CET 599 (three semester hours), write a thesis, and present an oral defense.

Applied Project Option

Concentration	15–18
Supporting area	9–12

Research Methods Courses

EET 500 Research/Writing	2
EET 591 Graduate Seminar	1
EET 593 Applied Project or CET 593 Applied Project (3)	3
Total minimum semester hours required	33

A minimum of 20 semester hours must be 500-level courses. At least nine hours of 500-level course work must be included in the technical concentration. A maximum of three semester hours of applied project (EET 593) may be applied toward the 20 semester hour 500-level minimum. The applied project requires a supporting report; the project and report are defended in a final oral examination. All course work applied toward the minimum 33 semester hour total must be at the 400 level or higher.

All course work outside the Department of Electronics and Computer Engineering Technology must be preapproved. Completion of deficiencies or prerequisites may be required before admission to the MSTech degree program.

For more information concerning the MSTech degree, see "Technology," page 358.

RESEARCH ACTIVITY

Research activities in the Department of Electronics and Computer Engineering Technology include systems, circuit applications, and hardware design. Teaching and research are conducted in microelectronics fabrication, utilizing the clean-room facilities of the College of Technology and Applied Sciences Teaching Factory. Various aspects of computer systems are under investigation within the department, such as networking, internet activities, distributed Web-based software applications, and embedded systems. Electronic systems and telecommunications are also topics of research by department faculty and graduate students. MSTech degree candidates will find a broad range of

research that can lead to an applied project or thesis. For more information on research areas and laboratories, access the department's Web site at www.east.asu.edu/ctas/ecet.

Faculty research interests are concentrated in, but not limited to, the following general areas and topics.

Computers and Digital Systems. Digital systems design and applications; digital switching circuits; microcomputer hardware and interfacing; computer networks; digital testing; computer process control hardware, techniques, and applications; and computer architecture.

Software Systems and Distributed Applications. Studies emphasizing software design and architecture for distributed and Web-based applications; embedded and networked systems; software engineering tools and methods supporting system analysis, project management, and software testing; software systems for limited, wireless, and network enabled devices; reconfigurable Web services and client-server software applications; databases and their application in distributed and Web-based systems.

Microelectronics. Solid-state device fabrication, testing, and design; monolithic bipolar and MOS device fabrication and manufacturing techniques; vacuum vapor deposition and sputtering techniques and applications; new photolithography processes; device and system packaging.

Systems Control and Instrumentation. Electrical power equipment and systems, insulator testing, control and distribution; direct solar energy conversion; analog and digital process control components, instrumentation, systems, and process applications; electronic measurements and instrumentation circuits, systems, and applications; automatic test systems, test programming, and failure tolerant design; computer-aided design; analog and digital simulation.

COMPUTER ENGINEERING TECHNOLOGY (CET)

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.

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.

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

CET 501 Digital Signal Processing Applications. (3)
fall
Applies DSP techniques to the design and analysis of digital filters. Solution of filtering problems using computer techniques. Cross-listed as EET 501. Credit is allowed for only CET 501 or EET 501. Prerequisite: EET 401 or instructor approval.

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 56.

ELECTRONICS ENGINEERING TECHNOLOGY (EET)

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.

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).

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

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

EET 410 Electronic Circuits II. (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.

EET 422 Electronic Switching Circuits. (4)
once a year
Analysis and design of electronic circuits operating in a switching mode. Waveshaping, timing, and logic. Computer simulation. Lecture, lab. Prerequisites: CET 350; EET 301, 310.

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

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

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

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

EET 501 Digital Signal Processing Applications. (3)
fall
Applies DSP techniques to the design and analysis of digital filters. Solution of filtering problems using computer techniques. Cross-listed as CET 501. Credit is allowed for only CET 501 or EET 501. Prerequisite: EET 401 or instructor approval.

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

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

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

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

EET 560 Industrial Electronics and Applications. (3)
spring
Analysis, design, and application of special electronic devices and systems to industrial control, power, communications, and processes. Prerequisites: CET 350; EET 301, 310, 407.

EET 578 Digital Filter Hardware Design. (3)
spring
Hardware design of FIR and IIR filters, including adaptive filters, based on DSP chips. Develop new applications using DSP microprocessor systems. Prerequisites: CET 354; EET 401.

EET 579 Digital Image Communication. (3)
spring
Image capture, transform, compression, storage, and transmission. Provides computer environment (software and hardware) to emphasize the practical aspect. Prerequisite: EET 401 or instructor approval.

EET 580 Practicum. (1–3)
selected semesters

EET 584 Internship. (1–3)
selected semesters

EET 590 Reading and Conference. (1–3)
selected semesters

EET 591 Graduate Seminar. (1–3)
selected semesters

EET 592 Research. (1–3)
selected semesters

EET 593 Applied Project. (1–3)
selected semesters

EET 594 Conference and Workshop. (1–3)
selected semesters

EET 595 Continuing Registration. (1)
selected semesters

EET 598 Special Topics. (1–4)
selected semesters

EET 599 Thesis. (1–3)
selected semesters

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 56.

MICROELECTRONICS ENGINEERING TECHNOLOGY (UET)

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.

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.

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).

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.

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.

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.

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.

UET 432 Semiconductor Packaging and Heat Transfer. (3)
spring
Packaging theory and techniques; hermetic and plastic assembly; thermal management; electrical characteristics and reliability. Prerequisites: ETC 340 and UET 331 (or their equivalents).

UET 437 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.

UET 485 Digital Testing Techniques. (3)
once a year
Hardware/software aspects of digital testing technology; systems, board, and logic testing and equipment. Lecture, lab. Prerequisites: CET 350; EET 310.

UET 511 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 511 or 411. Corequisite: UET 417.

UET 513 VLSI Circuit Design and Layout. (3)
fall
Techniques and practice for the design and layout of very large-scale integrated (VLSI) circuits. Emphasizes "system on silicon" using tools for computer-aided design layout. Seminar. Prerequisite: UET 416.

UET 516 Dopant Control Technology. (3)
spring
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 516 or 416. Prerequisite: UET 331 (or its equivalent). Corequisite: UET 417.

UET 518 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. Credit is allowed for only UET 518 or 418. Prerequisite: UET 305 (or its equivalent). Pre- or corequisite: UET 417.

UET 521 Device Physics. (3)
fall
Band structure of solids, electron hole-pairs, mobility, lifetime, fermi-level, pn junctions, diodes, and bipolar and MOS transistors. Fee. Prerequisite: graduate standing in the department.

UET 524 Pattern Transfer Technology. (3)
spring
Maskmaking, lithography, and etch processes for integrated circuit fabrication. Lecture, Web support. Prerequisite: UET 331 (or its equivalent). Corequisite: UET 417.

UET 532 IC Packaging. (3)
spring
IC packaging theory and techniques; assembly techniques, material issues; thermal management; electrical performance and reliability. Integrated lecture/lab. Prerequisites: ETC 340 and UET 331 (or their equivalents).

UET 580 Practicum. (1–3)
selected semesters

East campus, the university's polytechnic focal point, maintains facilities at the leading edge of technology. Tim Trumble photo

UET 584 Internship. (1–3)
selected semesters

UET 590 Reading and Conference. (1–3)
selected semesters

UET 591 Seminar. (1–3)
selected semesters

UET 592 Research. (1–3)
selected semesters

UET 593 Applied Project. (1–3)
selected semesters

UET 594 Conference and Workshop. (1–3)
selected semesters

UET 595 Continuing Registration. (1)
selected semesters

UET 598 Special Topics. (1–4)
selected semesters

UET 599 Thesis. (1–3)
selected semesters

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 56.

Department of Information and Management Technology

The faculty in the Department of Information and Management Technology through the College of Technology and Applied Sciences at the East campus offer the MSTech degree. The student may select one of five technical concentrations: environmental technology management, fire service administration, global technology and development, information technology, or management of technology.

Information Technology. The information technology concentration provides students with a seamless graphic user interface from traditional printing and publishing applications to digital/printing/photography/multimedia, 3-D modeling, animation, database management, and Internet/Intranet Web development. Computer hardware/software configurations, information protocols, and networks provide students with an applications-level working knowledge of the different facets of the graphic information industry.

Environmental Technology Management. The environmental technology management concentration for the MSTech degree provides three areas of study: environmental management, emergency management, and international environmental management. Classes are scheduled to minimize disruption of work schedules by meeting six times a semester on alternating Fridays and Saturdays. A Web-based distance learning format is also available.

For more information, access the program Web site at etmonline.asu.edu.

Fire Service Administration. The fire service administration concentration is the advanced study of fire administration and leadership concepts. Students learn concepts and develop skills needed to be effective fire administrators.

This program is designed to build a bridge between grounded theory and applied practice. Students completing this program are able to perform the functions of a fire chief in any size public sector fire department, administer fire-related programs in the private sector, and conduct meaningful research applicable to fire service programs. The technical concentration is 21 semester hours and includes an applied research project. Students select from the list of technical classes or related support electives to complete the balance of the 33 required hours. Course work in the related area of support cannot exceed six semester hours.

Global Technology and Development. The global technology and development (GTD) concentration is an interdisciplinary program offered by the IMT faculty. This concentration gives students a comprehensive understanding of systems of technology, how they interface, and their role in global economic, political, and social development and change. The GTD concentration integrates the study of economic, social, and political development with technology course work to explore issues critical to 21st-century globalization and the role and impact of technological innovations on societies around the world. Students completing the GTD concentration gain the knowledge and skills to become "technology interpreters" for careers in technology-related public policy, government service, international development, and international management.

The GTD concentration consists of two seminars in global technology and development, and technology and the international political system, and one core course (chosen from several that are offered) in each of the four GTD technology content areas: telecommunications, transportation, commerce, and sustainable development. Students are able to select elective courses from a wide range of topics in social science and/or technology to create their own individualized specialization. An emphasis is placed on the acquisition of solid research skills with a required sequence in applied research methodologies and tools.

Management of Technology. The management of technology concentration provides the necessary content and technical knowledge to improve management functions in industry, manufacturing, and public service organizations. The curriculum addresses topics to include data analysis, ethical issues, project management, organizational effectiveness, personnel development, project management, quality assurance, and technological advancements that impact a global marketplace.

Admission. Applicants are expected to satisfy all requirements for admission to the Division of Graduate Studies. Industrial experience beyond completion of a baccalaureate degree is strongly recommended. Applicants who have deficiencies or who do not meet the prerequisites may be required to complete them before being admitted to the degree program.

Applicants must submit the following materials for admission review:

1. an online application for admission to the Division of Graduate Studies and official transcripts of all undergraduate and graduate study;
2. a professional résumé;
3. a statement describing academic and professional goals, specifying the focus of study desired in the MS Tech.; and
4. three letters of recommendation required in cases where minimum Division of Graduate Studies requirements are not satisfied.

All applicants whose native language is not English must submit a score from the Test of English as a Foreign Language (TOEFL). Expected minimum scores are 550 on the paper test or a score of 213 on the computer-based TOEFL.

Program of Study. All candidates for the MSTech degree program are required to complete a minimum of 33 semester hours of graduate credit. Additional courses may be assigned by the faculty supervisory committee depending on the background of the candidate.

Thesis Option

Technical area of emphasis	18
Supporting area	9
Research course	3
Thesis	3
Total	33

Applied Project Option

Technical area of emphasis	18
Supporting area	9
Research course	3
Applied project	3
Total	33

Final Examination. Either an applied project or thesis is required. Upon completion of the approved course of study or during the last semester, an oral defense of the applied project or thesis is required.

Master's degree candidates are required to complete either a six-semester-hour research block for the applied project option (that includes ITM 549 Research Techniques and Applications and IMC 593 Applied Project) or six hours of 592 Research and three hours of 599 Thesis for the thesis option. The program of study is designed for flexibility, permitting the student to select a combination of courses in a technical area and supporting area to meet individual goals.

For more information concerning the MSTech degree, see "Technology," page 358.

RESEARCH ACTIVITY

Research interests of faculty in the Department of Information and Management Technology include digital imaging, digital publishing, internet development/e-commerce, information databases, multimedia, animation, 3-D modeling, perishability studies of technology, hazardous materials and waste management, environmental regulations, remediation processes, operations management, quality assurance, industrial training, public policy for fire service, emergency management, fire prevention, and incident command.

ENVIRONMENTAL TECHNOLOGY MANAGEMENT (ETM)

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.

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

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.

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

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

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

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

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.

ETM 501 Principles of Hazardous Materials and Waste Management. (3)
selected semesters
Foundation for courses in curriculum. Topics include definitions of toxic and hazardous substances and wastes, RCRA classification, and OSHA criteria. Lecture, full or partial Internet. Pre- or corequisite: CHM 101.

ETM 502 Regulatory Framework for Toxic and Hazardous Substances. (3)
fall
Examines federal, state, and local regulations for hazardous materials and wastes. Includes history and trends in regulatory development. Prerequisite: ETM 501.

ETM 503 Principles of Toxicology. (3)
selected semesters
Interaction of chemicals with life and environment. Mechanisms of toxic action, dose-response relationships, toxicity testing models, predictive toxicology, and epidemiology. Lecture, full or partial Internet. Prerequisite: CHM 231.

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

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

ETM 506 Chemistry of Hazardous Materials. (3)
selected semesters
Chemistry and toxicology of hazardous chemicals. Topics include proper handling, storage, transportation, and disposal. Lecture, full or partial Internet. Prerequisite: CHM 231.

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

ETM 520 Sustainability and Sustainable Development. (3)
selected semesters
Explores broad field of environmental sustainability with U.S. and international coverage of "green" living practices. Lecture, full or partial Internet.

ETM 522 Air Pollution and Toxic Chemicals. (3)
selected semesters
Examines issues in the measurement analysis and control of toxic chemicals in air pollution. Lecture, full or partial Internet. Prerequisite: CHM 101.

ETM 523 Soils and Groundwater Contamination. (3)
selected semesters
Theoretical and practical hydrogeology as it applies to cleaning up contamination. Investigative techniques, monitoring, risk assumptions, and assessment methodology. Lecture, full or partial Internet. Prerequisite: CHM 101. Corequisite: CHM 231.

ETM 524 Integrated Emergency Management. (3)
selected semesters
Theory and practice of comprehensive emergency management. Explores scope and function of Department of Homeland Security. Prerequisites: CHM 101; MAT 170.

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

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

ETM 527 Environmental/Resources Regulations Concepts. (3)
spring
Develops environmental regulations from common law to statutory requirements. Emphasizes Superfund, hazardous materials, toxics, and liability contracts. Pre- or corequisite: ETM 501.

ETM 528 International Environmental Management. (3)
selected semesters
Studies environmental issues and laws outside the U.S., impact of free trade, and multinational corporations. Lecture, full or partial Internet.

ETM 540 International Environmental Law and Policy. (3)
selected semesters
Studies international environmental agreements, enforcement mechanisms, and the role of NGOs and international organizations. Lecture, full or partial Internet.

ETM 560 Terrorism and Weapons of Mass Destruction. (3)
selected semesters
Historical evolution of terrorism and weapons of mass destruction. Analyzes current theories and mitigation, preparedness, and response tactics. Prerequisite: MAT 170.

ETM 561 Homeland Security. (3)
selected semesters
Presents skills necessary to develop policies, strategies, programs and organizational structure of an all hazards/all risk homeland security program. Credit is allowed for only ETM 561 or 461. Lecture, case studies. Prerequisite: junior standing or instructor approval.

ETM 567 Information Technology in Emergency Management. (3)
selected semesters
Provides theory and application of computer-based programs in emergency management and the use of various emergency modeling programs. Prerequisites: CHM 101; MAT 170.

ETM 592 Research. (1–12)
selected semesters

ETM 598 Special Topics. (1–4)
spring
Topics may include the following:
- Advanced Bioremediation. (3)
  Management and policy issues related to bioremediation of minetailing and animal waste and replacement of chemical control with biological methods. Lecture, case studies.

ETM 599 Thesis (1–12)
selected semesters

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 56.

GRAPHIC INFORMATION TECHNOLOGY (GIT)

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.

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.

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.

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.

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).

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.

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 414.

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.

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

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

GIT 441 Graphic Information Systems. (3)
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).

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.

GIT 510 Computer Graphics Programming: Design, Customization, and Development. (3)
selected semesters
Advanced design, development, and documentation of graphic application programs. Integrated lecture/lab.

GIT 512 Multimedia-Based Education and Training. (3)
fall
Creative design, planning, development, documentation, and production of technology-based learning and multimedia-based education and training materials and programs. Integrated lecture/lab. Prerequisite: GIT 412.

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

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

GIT 590 Reading and Conference. (1–12)
selected semesters

GIT 598 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 56.

GLOBAL TECHNOLOGY AND DEVELOPMENT (GTD)

GTD 501 Global Technology and Development. (3)
selected semesters
Major theories of economic, political, and social development, with particular emphasis on the impact of current technologies and globalization. Lecture, hybrid, seminar. Prerequisite: admission to MS in Technology degree with a concentration in global technology and development or instructor approval.

GTD 503 Technology and the International Political System. (3)
selected semesters
Historical development of international political system, with emphasis on role of technology. Lecture, hybrid, seminar. Prerequisite: GTD admission or instructor approval.

GTD 505 Research Design in Technology and Development. (2)
selected semesters
Emphasizes techniques of primary data collection, effective uses of secondary sources, for qualitative and quantitative applications. Lecture, hybrid, online. Prerequisite: admission to MS in Technology degree with a concentration in global technology and development or instructor approval.

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 56.

FIRE SERVICE ADMINISTRATION (FSA)

FSA 500 Research Methods. (1–12)
selected semesters
Topics may include the following:
- Fire Administration. (3)
  Relationship of fire administration and the role of executive fire administrator in administration of complex issues in a dynamic environment.

FSA 502 Managing Change in the Fire Service. (3)
selected semesters
Dynamics of organizational change and the effect change has on the delivery of fire services to the community.

FSA 503 Fire Service and the Community. (3)
selected semesters
Theoretical concepts of public service to build an understanding of how the fire service fits within the community.

FSA 510 Fire Department Budgeting and Finance. (3)
selected semesters
Functions of budgeting and finance in fire departments within the context of the public sector.

FSA 522 Leadership in the Fire Service. (3)
selected semesters
Leadership theories analyzed in a variety of contexts within public and private organizations, then applied to the leadership challenges in the fire service.

FSA 530 Public Policy in the Fire Service. (3)
selected semesters
Public policy and the fire services' role in the making of public policy in the community.

FSA 540 Applied Research Methods in the Fire Service. (3)
selected semesters
Research methods applicable to problems that arise in the fire service, including assessments of programs and customer service research.

FSA 550 Fire Service Program Management. (3)
selected semesters
Functions of developing and managing fire service programs. Designed for advanced students of fire service administration.

FSA 551 Fire Prevention and Public Fire Education. (3)
selected semesters
Managing fire prevention organizations and administering fire prevention programs in a contemporary society.

FSA 552 Emergency Medical Services Administration. (3)
selected semesters
Complex issues of administering an Emergency Medical Services (EMS) division in a fire department.

FSA 553 Special Operations in the Fire Service. (3)
selected semesters
Focuses on the variety of special emergency services operations provided by contemporary fire departments.

FSA 554 Emergency Fire Operations Administration. (3)
selected semesters
Delivery of emergency services to a community by a contemporary fire department.

FSA 580 Practicum. (1–12)
selected semesters
Topics may include the following:
- Fire Service Practicum. (3)
  Structured practical fire service research experience that is supervised by an approved fire service professional or faculty member.

FSA 598 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 56.

FIRE SERVICE MANAGEMENT (FSM)

FSM 598 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 56.

INFORMATION AND MANAGEMENT CORE (IMC)

IMC 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 111; IMC 346; ITM 344.

IMC 584 Internship. (1–3)
selected semesters

IMC 590 Reading and Conference. (1–12)
selected semesters

IMC 592 Research. (1–12)
selected semesters

IMC 593 Applied Project. (1–12)
fall and spring

IMC 595 Continuing Registration. (1)
selected semesters

IMC 599 Thesis. (1–12)
fall and spring

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 56.

INDUSTRIAL TECHNOLOGY MANAGEMENT (ITM)

ITM 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.

ITM 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: IMC 346 (or its equivalent).

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

ITM 440 Introduction to International Business. (3)
spring
International business principles and operations, including partnerships, trade agreements, currency issues, international sales, and cultural differences between countries. Prerequisite: IMC 346.

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

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

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

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

ITM 455 Industrial Marketing Concepts. (3)
selected semesters
Customer and sales strategies for industrial organizations, including current practice and future planning. Prerequisites: ECN 111; IMC 346; junior standing.

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

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

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

ITM 502 Financial Management. (3)
selected semesters
Examines corporate financial and managerial accounting systems, budgeting, and financial policy, using microcomputers to analyze, forecast, and report information.

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

ITM 504 Law and Ethics for Technical Professionals. (3)
selected semesters
Analyzes legal and ethical framework for making managerial decisions in the corporate environment of engineering- and technology-related industries.

ITM 520 Strategic Management of Technology. (3)
selected semesters
Analyzes entrepreneurial dynamics and technology development, methods of research and development management, new technology implementation, and start-up organization. Prerequisites: ITM 480 (or its equivalent); instructor approval.

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

ITM 548 Statistical Methods for Research. (3)
selected semesters
Multivariate statistical techniques to analyze research data. Uses statistical software and applications. Prerequisite: STP 420 (or its equivalent).

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

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

ITM 552 Global Management Philosophies. (3)
selected semesters
Analyzes and compares significant supervision philosophies developed in various industrial nations and their potential application in the United States.

ITM 560 Managerial Decision Making. (3)
fall
Analyzes common decision-making biases and techniques to overcome them. Uses both subjective quantitative decision tools and computerized decision aids.

ITM 570 Advanced Project Management. (3)
spring
Planning, organizing, coordinating, and controlling staff and project groups to accomplish the project objective.

ITM 593 Applied Project. (1–12)
selected semesters

ITM 598 Special Topics. (1–4)
selected semesters
Topics may include the following:
- Quantitative Research Analysis

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 56.

Department of Mechanical and Manufacturing Engineering Technology

The faculty in the Department of Mechanical and Manufacturing Engineering Technology in the College of Technology and Applied Sciences, the East campus, offer the MSTech degree. A minimum of 33 semester hours of approved courses is required. Both a thesis and applied project option are available. The flexible program permits the student to select a combination of courses in the relevant concentration and supporting area to meet individual career goals in technology or to provide the foundation for further advanced study. A final oral exam is required for both options.

The department provides the student with a number of program of study options that presuppose a sound technical undergraduate degree. The options are designed to provide graduates with technical and professional skills that will facilitate preparation for, and advancement in, leadership positions in industry, education, government, and military. Laboratories and classrooms are well equipped, and the faculty members teaching the classes have relevant teaching, research, industry, and training experience and background. Areas of concentrations include aeronautical engineering technology, instrumentation and measurement technology, manufacturing engineering technology, and mechanical engineering technology. The instrumentation and measurement technology concentration is offered jointly with the Department of Electronics and Computer Engineering Technology.

The student selects courses to meet the emphasis area requirement of 18 semester hours. Careful course selection in coordination with a faculty advisor and/or advisory committee is an essential aspect of building a focused program for the student. The selection process also facilitates the potential for expanding the depth and breadth of education the student receives in related areas. The supporting area (six to nine semester hours) may be selected from outside the department upon approval from the supervisory committee. The thesis option includes six hours of research credits spread over at least two semesters.

Admission. Applicants are expected to satisfy all requirements for admission to the Division of Graduate Studies. Industrial experience beyond completion of a baccalaureate degree is strongly recommended. Applicants with deficiencies or those not meeting the prerequisites may be required to complete them before being admitted to the degree program. Submission of a recent GRE exam score is not required but is recommended for international students. A statement of purpose and current résumé should also be submitted to the department.

Program of Study. All candidates for the MSTech degree program are required to complete a minimum of 33 semester hours of graduate credit as follows:

Thesis Option

Technical area of emphasis	18
Supporting area	6

Research writing course/graduate seminar	3
AET 592 Research or MET 592 Research (3)	3
AET 599 Thesis or MET 599 Thesis (3)	3
Total	33

Applied Project Option

Technical area of emphasis	18
Supporting area	9
Research writing course/graduate seminar	3
Applied project	3
Total	33

Additional courses may be assigned by the supervisory committee depending on the background of the candidate. The program is designed for flexibility, permitting the student to select a combination of courses in a technical area and supporting area to meet individual goals.

RESEARCH ACTIVITY

Department faculty are engaged in both theoretical and applied research projects, involving undergraduate and graduate students in manufacturing, aeronautical- and mechanical-related topic areas. Graduate students employed in local industry are encouraged to develop research topics that address problems of interest to their employers.

Current research interests of the faculty include manufacturing modeling and simulation, "smart" materials, especially composite materials, hydrogen power and fuel cells, optimization of turbine engines, machinability and manufacturing processes, manufacturing and program management, manufacturing cost economics, automation, and design, and mechanics education.

Applied research projects are carried out in a number of well-equipped laboratories and facilities: computer-aided design and computer-aided manufacturing laboratory, CNC-machining center laboratory, composite materials laboratory, energy conversion and combustion laboratory, automation laboratory, welding and casting laboratory, materials inspection and metrology laboratory, and metallurgy/materials testing laboratory.

For more information on research areas and laboratories, access the department Web site at www.east.asu.edu/ctas/mmet.

AERONAUTICAL ENGINEERING TECHNOLOGY (AET)

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

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

AET 420 Applied Aerodynamics and Wind Tunnel Testing. (3)
fall
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.

AET 432 Applied Heat Transfer. (3)
fall
Heat transfer by conduction, convection, and radiation. Applies heat transfer to engineering design problems. Prerequisite: ETC 340. Pre- or corequisite: MET 434 or instructor approval.

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

AET 500 Research Methods. (1–12)
selected semesters

AET 524 Application of Heat Transfer. (3)
fall
Energy conservation, steady-state and transient conduction, convection transfer, free and forced convection Reynolds analogy, blackbody and environmental radiation. Prerequisite: MET 434 or instructor approval.

AET 525 Advanced Propulsion. (3)
fall
Mechanics and thermodynamics of propulsion systems. Solid, liquid propellant rocket design performance. Electrical nuclear propulsion systems. Space missions. Prerequisites: both AET 415 and 420 (or MET 434) or only instructor approval.

AET 560 Numerical Methods in Engineering Technology. (3)
selected semesters
Analyzes problems in physical sciences, models physical problems, perturbation techniques, curvefitting, data analysis, numerical solutions, ordinary and partial differential equations.

AET 580 Practicum. (1–12)
selected semesters

AET 583 Field Work. (1–12)
selected semesters

AET 584 Internship. (1–12)
selected semesters

AET 590 Reading and Conference. (1–12)
selected semesters

AET 591 Seminar. (1–12)
selected semesters

AET 592 Research. (1–12)
selected semesters

AET 593 Applied Project. (1–12)
selected semesters

AET 594 Conference and Workshop. (1–12)
selected semesters

AET 595 Continuing Registration. (1)
selected semesters

AET 598 Special Topics. (1–4)
selected semesters

AET 599 Thesis. (1–12)
selected semesters

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 56.

MECHANICAL AND MANUFACTURING ENGINEERING TECHNOLOGY (MET)

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.

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

MET 433 Thermal Power Systems. (4)
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.

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

MET 435 Alternate Energy Sources. (3)
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.

MET 436 Turbomachinery Design. (3)
selected semesters
Applies thermodynamics and fluid mechanics to the analysis of machinery design and power cycle performance predictions. Prerequisites: ETC 340; MET 434.

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.

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

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

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

MET 452 Implementation of Robots in Manufacturing. (3)
selected semesters
Robotic workcell design, including end effectors, parts presenters, and optimum material flow. Prerequisite: MET 451 or instructor approval.

MET 460 Manufacturing 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. Lecture, lab. Prerequisites: MET 331, 341; senior standing.

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

MET 500 Research Methods. (1–12)
selected semesters

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

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

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

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

MET 509 Applied Engineering Economics. (3)
spring
Fundamentals of engineering economics in a practical, industry-based approach. Includes effects of depreciation, taxes, inflation, and replacement analysis. Lecture, computer lab experiences.

MET 510 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 510 or 410.

MET 512 Introduction to Robotics. (3)
selected semesters
Introduces industrial robots. Topics include: robot workspace, trajectory generation, robot actuators and sensors, design of end effectors, and economic justification. Application case studies. Prerequisite: instructor approval.

MET 513 Advanced Automation. (3)
fall
Analysis and design of hard and flexible automation systems. Particular attention to material-handling technology. Prerequisite: instructor approval.

MET 514 CNC Computer Programming. (3)
fall
Theory and application of N/C languages using CAM software and CNC machine tools. Lecture, lab. Prerequisite: instructor approval.

MET 515 Manufacturing Simulation. (3)
spring
Computer simulation of manufacturing operations. Discrete event simulation models range from individual processes to whole factories. Lecture, computer lab experiences.

MET 516 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 or instructor approval.

MET 518 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 518 or 418. Prerequisite: instructor approval.

MET 571 Waste Minimization and Waste Prevention. (3)
selected semesters
Life cycle analysis, selection of environmentally compatible materials, design of waste minimization equipment and operation, economics of waste minimization and prevention. Prerequisite: ETC 340 or instructor approval.

MET 580 Practicum. (1–12)
selected semesters

MET 584 Internship. (1–12)
selected semesters

MET 590 Reading and Conference. (1–12)
selected semesters

MET 591 Seminar. (1–12)
selected semesters

MET 592 Research. (1–12)
selected semesters

MET 593 Applied Project. (1–12)
selected semesters

MET 594 Conference and Workshop. (1–12)
selected semesters

MET 595 Continuing Registration. (1)
selected semesters

MET 598 Special Topics. (1–4)
selected semesters

MET 599 Thesis. (1–12)
selected semesters

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see “Omnibus Courses,” page 56.