

## Computer Engineering Technology

College of Science, Engineering & Technology

Department of Electrical and Computer Engineering and Technology

137 Trafton Science Center S • 507-389-5747

Web site: [www.cset.mnsu.edu/scet](http://www.cset.mnsu.edu/scet)

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Computer Engineering Technology is a technological field requiring the application of scientific and engineering knowledge and methods, combined with technical skills, in support of computer activities. A computer engineering technologist is a person who is knowledgeable in computer hardware and software theory and design and who can apply them to a variety of industrial and consumer problems. Computers, controls/automation, robotics, instrumentation, and communications are just a few fields open to computer engineering technologists.

The program strives to prepare students for successful entry into the technical workforce. This means that the curriculum prepares students to:

1. Apply knowledge of mathematics, science, and computer engineering to problems.
2. Design and construct experiments and analyze and interpret the resulting data.
3. Design systems, components, or processes to meet specified needs.
4. Function effectively in teams.
5. Identify, formulate, and solve problems in computer engineering technology.
6. Understand their professional and ethical responsibilities.
7. Communicate effectively.

Admission to Major is granted by the department. Minimum program admission requirements are:

- a minimum of 32 earned semester credit hours.

- a minimum cumulative GPA of 2.00 (C).

Contact the department for application procedures.

Students who do not have the required background for MATH 115 may have to take additional preparatory coursework as well. Consult with your major adviser to plan your general education and major requirements.

All students must complete a minimum of 12 semester credits of mathematics starting with Precalculus math and a minimum of 24 semester credits of mathematics and science courses.

### COMPUTER ENGINEERING TECHNOLOGY BS

It is strongly recommended that all CET students enroll in EET 101 Introduction to EET/CET in their freshman year.

Required for Major (Communication, Mathematics and Science, 36 credits):

ENG	101	Composition (4)
ENG	271	Technical Communication (4)
MATH	115	Precalculus Mathematics (4)
MATH	121	Calculus I (4)
MATH	127	Calculus II for Engineering Technology: Integration (2)
MATH	180	Math for Computer Science (4)
PHYS	211	Principles of Physics I (4)
PHYS	212	Principles of Physics II (4)
SPEE	102	Public Speaking (3)
Choose one of the following:		
STAT	154	Elementary Statistics (3)
MATH	354	Concepts of Probability and Statistics (3)
CHEM	104	Introduction to Chemistry (3)

Required for Major (COMS, 20 credits):

COMS	110	Foundation of Computer Science (4)
COMS	211	Fundamentals of Computer Science I (4)
COMS	212	Fundamentals of Computer Science II (4)
COMS	340	Database Systems Management I (4)
COMS	380	Systems Analysis and Design (4)

Required for Major (EET, 46 credits):

EET	113	DC Circuits (3)
EET	114	AC Circuits (3)
EET	221	Electronic CAD (3)
EET	222	Electronics I (4)
EET	223	Electronics II (4)
EET	225	Digital Principles (3)
EET	241	Electronic Shop Practices (2)
EET	400	Network Analysis (3)
EET	454	Microprocessors I (4)
EET	456	Communications I (4)
EET	480	Automatic Controls (3)
EET	484	Microprocessors II (4)
EET	488	Senior Project Design I (1)
EET	489	Senior Project Design II (2)
EET	497*	Internship (3)

\* You may substitute one EET advanced elective for internship. Permission required.

Required Minor: None.

### NETWORKING EMPHASIS

Required for Emphasis (Communication, Mathematics, and Science, 36 credits):

CHEM	104	Introduction to Chemistry (3)
ENG	101	Composition (4)
ENG	271	Technical Communication (4)
MATH	115	Precalculus Mathematics (4)
MATH	121	Calculus I (4)
MATH	127	Calculus II for Engineering Technology: Integration (2)
MATH	180	Math for Computer Science (4)
PHYS	211	Principles of Physics I (4)
PHYS	212	Principles of Physics II (4)
SPEE	102	Public Speaking (3)

Required for Emphasis (COMS, 22 credits):

COMS	110	Foundation of Computer Science (4)
COMS	171	Introduction to C++ Programming (2)
COMS	211	Fundamentals of Computer Science I (4)
COMS	212	Fundamentals of Computer Science II (4)
COMS	340	Database Systems Management I (4)
COMS	380	Systems Analysis and Design (4)

Required for Emphasis (EET, 48 credits):

EET	113	D C Circuits (3)
EET	114	A C Circuits (3)
EET	221	Electronic CAD (3)
EET	222	Electronics I (4)
EET	225	Digital Principles (3)
EET	230	Microcomputer Technology (4)
EET	241	Electronic Shop Practices (2)
EET	430	Computer Networking I (4)
EET	431	Computer Networking II (4)
EET	454	Microprocessors I (4)
EET	456	Communications I (4)
EET	484	Microprocessors II (4)
EET	488	Senior Project Design I (1)
EET	489	Senior Project Design II (2)
EET	497*	Internship (3)

\* You may substitute one EET advanced elective for internship. Permission required.

Required Minor: None

## POLICIES/INFORMATION

**GPA Policy.** Students graduating with a degree in Computer Engineering Technology must have (1) completed a minimum of 20 semester credit hours of upper division EET and COMS at MSU, (2) have a cumulative GPA of 2.0 or better on all upper division EET and COMS courses, and (3) have completed their senior design sequence at MSU.

**P/N Grading Policy.** A student who majors in CET must elect the grade option for all required courses including general education courses listed by number even if offered by another department.

If the credits earned for composition, technical writing and speech courses equal less than 9 credits, either an advanced speech course or a course in English language literature must be selected as a general elective.

Transfer of credit to the CET major is subject to policies described in this bulletin for all students transferring to MSU and to the following department policies:

1. All transfer students must take EET 221 if not proficient with current MSU software.
2. For courses taken at technical colleges/vocational technical schools and pertinent courses taken in the military the student may receive up to 8 credits upon review of course materials, grades and written approval by the program coordinator. These credits may be used for EET 112, 113, and 114. The student may also attempt to test out of EET 114, 222, 223 and 225.
3. For courses taken at community colleges and four-year colleges, up to 25 credits may be accepted if the transcript is from an ABET-accredited program. If the program is not accredited by ABET, up to 20 credits may be accepted. Grades of transfer credits must be C or better to be acceptable for substitution for required courses.

Petition to evaluate transfer credits must occur no later than the first semester the student is enrolled at Minnesota State University, Mankato.

Testing for course credit will be available via prior application made with the program coordinator. Students may not apply for credit by examination for an EET course in which they were previously enrolled at MSU or for any EET course above EET 225.

## COURSE DESCRIPTIONS

### Computer Science

#### COMS 110 (4) Foundation of Computer Science

This course provides a comprehensive introduction to the foundations of computer science. The topics covered include algorithms, pseudocode, computer theory, computer hardware, computer software, and the related social issues. Lab work develops familiarity with both hardware and software. The course is intended to provide knowledge and skills applicable to all disciplines while providing a broad introduction to the field of computer science.

Pre: MATH 112 (College Algebra) F, S  
GE-13

#### COMS 171 (2) Introduction to C++ Programming

This course provides an introduction to programming using C++. Emphasis on structured programming concepts, with a brief discussion of object-oriented programming. Control structures, expressions, input/output, arrays, and functions.

F, S

#### COMS 211 (4) Fundamentals of Computer Science I

This is the first course in a two-course sequence for students who are planning to major or minor in computer science. The course emphasizes concepts needed for continuing study in computer science, the use of abstraction in program design, and advanced problem-solving skills. Programming in a high-level language is a focal point of the course.

Pre: A grade of A or B in COMS 110. Coreq.: MATH 121 (Calculus I) F, S

#### COMS 212 (4) Fundamentals of Computer Science II

This course is a continuation of 211. The course introduces students to object-oriented concepts and programming techniques. It also covers essential data

structures such as linked lists, stacks, and queues, and trees. The student will be expected to produce larger applications, utilizing multiple compilation units.

Pre: COMS 211 F, S

#### COMS 380 (4) Systems Analysis & Design

This course explores both structured as well as object oriented systems analysis and design. Use of upper and lower CASE tools are employed in the analysis, design and implementation of a team oriented term project.

Pre: COMS 212 F, S

Pre: COMS 260 or 320 S

#### COMS 480 (4) Software Engineering

This is a course in software engineering that introduces the student to all important aspects of the discipline. The main purpose of this course is to simulate the engineering of a software product, from gathering requirements through implementation and maintenance. The course emphasizes a traditional development methodology. Students will be introduced to Visual Basic and Microsoft Project, but the emphasis of the course will be on principles of software engineering including project planning, requirements gathering, size and cost estimation, analysis, design, coding, testing, and implementation.

Pre: COMS 380 F, S

### Electronic Engineering Technology

#### EET 101 (1) Introduction to EET/CET

Creative problem solving. Group projects working with simple robots which provide the student with: an introduction to electronic schematics and parts; an introduction to computer hardware and software; and, an introduction to robotics.

F

#### EET 112 (3) Elementary Electronics

Hands-on experiences in elementary electronics to easily and quickly develop basic knowledge of electronics related to simple analog and digital circuit and components. A self paced format with an open laboratory is used.

F, S

GE-3

#### EET 113 (3) DC Circuits

A study of DC electrical circuits, Kirchhoff's laws, series and parallel circuits, inductors, capacitors, circuit response to RL, RC and RLC circuits. Thevenin's equivalent circuit theorem, and other network analysis theorems. Use of dependent sources in DC circuits.

Pre: MATH 115, or concurrent F, S

#### EET 114 (3) AC Circuits

A study of AC circuits, power, phasors, series and parallel AC networks, and network analysis theorems. Ohm's Laws and Kirchhoff's Laws for AC circuits. Use of dependent sources in AC circuits.

Pre: EET 113 and MATH 115 F, S

#### EET 115 (3) Understanding Computers

A self-paced, interactive, multi-media course, for nonengineering students, exploring the basics of computer hardware. The course will cover concepts behind computer design and operation, including issues such as the need for RAM, hard drive, memory, ROM, etc.

F, S

GE-13

#### EET 116 (3) Communications-Past, Present & Future

This is an introductory course in the use of technology for communication. During the semester students will study the evolution of communications technology from early days to the present. This course will cover wireless, analog, and digital techniques including telephony, the internet, and mobile formats. The student will study theory and principles involved in the different types of communications. Modern techniques in digital communications will be discussed

and demonstrated through simulation. A consumer example of digital communication will be given.

Variable  
GE-13

#### EET 117 (3) Introduction to Digital Electronics

Hands-on experiences in the use of digital integrated circuits and logic families. Students will study logic gates, number systems, flip flops, latches, registers, computer arithmetic and memory. A self paced format with an open laboratory format.

Variable

#### EET 125 (3) Perspective on Technology

Historical, cultural, ethical, philosophical, developmental, and creative aspects of engineering and technology as a discipline are explored. The course also examines concepts and events leading to important innovations of recent times; microwave ovens, FAX machines, personal computers, traffic signals, and video games. Available for general education and cultural diversity offered as self-paced on line format.

F

GE-8CD-Related

#### EET 221 (3) Electronic CAD

Drafting Principles involving use of computer electronic CAD software in laying out block diagrams, schematic diagrams, production drawings, graphical presentation of data, and printed circuit board layout and construction.

F

#### EET 222 (4) Electronics I

An introduction to semiconductor theory and circuits: includes characteristics curves, biasing techniques and small signal analysis of FETs and MOSFETs, feedback concept, BJT and FETs frequency response.

Pre: EET 114 or concurrent

#### EET 223 (4) Electronics II

An introduction to differential amplifier, linear and nonlinear operational amplifiers, power amplifiers, linear digital ICs, oscillators, power supplies, D/A, A/D conversion, four layered devices and their applications.

Pre: EET 222 S

#### EET 225 (3) Digital Principles

A study of number systems, Boolean algebra, switching function minimization techniques, binary arithmetic, small scale and medium scale logic chips, programmable logic devices, latches, flip-flops, registers and counters, and sequential circuit design.

S

#### EET 230 (4) Microcomputer Technology

An introduction to the installation, configuration, upgrading, troubleshooting and repair of microcomputers. Basic knowledge of desktop systems, basic networking concepts and printers will be introduced. Safety and common preventive maintenance procedures will be covered.

Pre: EET 113 or permission of instructor S

#### EET 241 (2) Electronic Shop Practices

An introduction to tools, equipment, materials, and techniques used in fabrication of electronic projects and printed circuit boards.

Pre: EET 222 and 221 S

#### EET 298 (1-4) Topics

Varied topics in Electronic and Computer Engineering Technology. May be repeated as topics change.

Prerequisite: to be determined by course topic

#### EET 355 (3) Electrical Power Systems

Electrical power and magnetic circuit concepts, transformers, generators and motors (DC, synchronous, induction), special purpose motors, power-electronic motor drivers, prime movers/alternatives, generation, transmission/distribution, system stability/protection.

Pre: EET 114 F

#### EET 393 (1-4) Practicum

Elective credit for approved experience in off-campus work related to EET major. Permission required. F, S

#### EET 400 (3) Network Analysis

A course in network analysis that stresses time, frequency and Laplace transform domain techniques.

Pre: EET 114 and MATH 127 S

#### EET 425 (3) Advanced Digital Design

A study of multiple-output switching functions optimization, flip-flops, registers and counters, programmable logic devices, synchronous sequential circuit design and synthesis, pulse mode and fundamental model sequential circuit design, test methods, and test vector generation.

Pre: EET 225 Variable

#### EET 430 (4) Computer Networking I

An introduction to the basic foundations of computer networking. The course will encompass telecommunications, local area networks, wide area networks and wireless communication. Topics covered include OSI model, the TCP/IP MODEL, different network topologies and associated hardware, error detection and correction, protocols, and security.

Pre: EET 230 and COMS 112 or consent of instructor. F

#### EET 431 (4) Computer Networking II

A continuation of EET 430. Router configurations, advanced LAN topologies, network configurations, protocols, and switching designs. Network troubleshooting and threaded case studies.

Pre: EET 430 S

#### EET 452 (3) Operational Amplifier Applications

Operational amplifier circuits utilized in filters, sensors, comparators, voltage regulators, device testing, measurement systems, multipliers, phase-locked loops, and A/D converters. Differential amplifier basics. Linear integrated circuit processing.

Pre: EET 223 and MATH 121 F

#### EET 454 (4) Microprocessors I

A study of microcomputer hardware and software fundamentals, the instruction set and the addressing modes of a microprocessor/microcontroller, assembly programming, basic I/O concepts, parallel I/O methods, asynchronous serial I/O methods, synchronous serial I/O methods, A/D conversion, and timer applications.

Pre: EET 225 S

#### EET 455 (3) Advanced Power Electronics

The half-wave rectifier with power loads, power semiconductor switches, thyristor states, controlled rectifiers, commutating circuits, AC voltage controllers (poly and single phase), motor controllers, DC-DC converters, and inverters.

Pre: EET 223 and 355 Variable

#### EET 456 (4) Communications I

Communications principles and systems. Practical engineering aspects involved in modulation-demodulation, receivers, transmitters and filters. Also included are radiation and antennas, guided waves, microwaves, and microwave systems.

Pre: EET 222 or Consent S

#### EET 458 (1) Advanced Instrumentation

Experiences with electronic equipment and instrumentation including maintenance, repair, calibration, safety and component identification.

Pre: 25 hours of EET courses, or consent S

#### EET 480 (3) Automatic Controls

Servomechanism analysis under transient and steady state conditions. Negative and positive feedback. Laplace transform analysis of feedback systems. Frequency response. System stability analysis using Bode plots and Root locus. Lead/lag and velocity compensation. Analog computers. Microprocessor control and the analog/digital interface.

Pre: EET 400 F

#### EET 484 (4) Microprocessors II

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## COMPUTER ENGINEERING TECHNOLOGY

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A study of a high performance microprocessor architecture. Applications of a microprocessor for monitoring and controlling systems will be studied. Optimal utilization of a microprocessors resources will be stressed. PC programming in assembly and a high level language.

Pre: EET 454 or consent of instructor F

### EET 486 (3) Communications II

An overview of a communication system. Phase Shift Keying, Amplitude Shift Keying and Frequency Shift Keying. Coherent and non-coherent detection. Maximum likelihood receiver and Matched filter. Noise power, Noise figure, and Noise Temperature. Error performance in presence of noise. Linear block codes, cyclic codes and convolution codes. Spread Spectrum Techniques.

Pre: EET 456 Variable

### EET 487 (3) RF Systems Technology

Overview of wireless communication and control systems. Characterization and measurement of RF networks. Transmission lines. Antennas. Radio wave propagation. Fading. Smith Chart. RF transistor amplifiers, oscillators and mixer/modulator circuits. Klystrons, magnetrons and TWTs. Spread spectrum techniques. SAW matched filters.

Pre: EET 456 Variable

### EET 488 (1) Senior Project Design I

A group design project performed in consultation with the instructor. Phase I includes the acceptance of the proposal, defining, and limiting the project objectives, initial source contacts and procurement of materials.

Pre: EET 241, four 400-level EET courses or Consent of Instructor F, S

### EET 489 (2) Senior Project Design II

Phase II includes completion of the project with evidence of extensive laboratory performance. A final oral report to the class and a standard formal written report are required.

Pre: EET 488 F, S

### EET 491 (1-4) In-Service

### EET 492 (4) Integrated Circuit Technology

Semiconductor industry and overview of integrated circuit manufacturing, integrated circuit types, crystal growth and wafer manufacturing, physics of semiconductor materials, detail of major IC fabrication steps, process yield, semiconductor devices and integrated circuit formation, packaging, and semiconductor measurements, introduction to layout tools.

Pre: EET 223 S

### EET 497 (1-6) Internship

Should be taken at end of junior year.

Permission required. Pre: 40 hrs EET credits or written permission from program coordinator. F, S

### EET 498 (1-4) Topics

Varied topics in Electronic and Computer Engineering Technology. May be repeated as topics change.

Prerequisite: to be determined by course topic

### EET 499 (1-4) Individual Study

F, S