

## ELECTRONIC ENGINEERING TECHNOLOGY

### Electronic Engineering Technology

College of Science, Engineering & Technology  
Department of Electrical & Computer Engineering and Technology  
137 Trafton Science Center S • 507-389-5747  
Web site: [www.cset.mnsu.edu/ecst](http://www.cset.mnsu.edu/ecst)

Chair: Bill Hudson, Ph.D.

Program Coordinator: Gale Allen, Ph.D.

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Electronic Engineering Technology is a technological field requiring the application of scientific and engineering knowledge and methods, combined with technical skills, in support of engineering activities. An electronic engineering technologist is a person who is knowledgeable in electronics theory and design and who understands state-of-the-art practices in digital and analog circuits and systems. Computers, controls/ automation, robotics, instrumentation, and communications are just a few fields open to engineering technologists.

Overall the program strives to prepare students for entry into the technical workforce with well developed skills. In particular, the department strives to ensure that its graduates have an ability to:

1. Apply knowledge of science, mathematics, and engineering
2. Design, and conduct experiments as well as analyze and interpret data
3. Design a system, component, or process to meet specified needs
4. Function effectively in teams
5. Identify, formulate, and solve engineering problems
6. Have an understanding of professional and ethical responsibilities
7. Communicate effectively

This program is accredited by the Technology Accreditation Commission (TAC) of the Accreditation Board for Engineering and Technology (ABET).

Accreditation. The Electronic Engineering Technology program is accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET), 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, Telephone: 410-347-7700.

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.

#### ELECTRONIC ENGINEERING TECHNOLOGY BS

It is strongly recommended that all EET students enroll in EET 101 Introduction to EET/CET (1) during their freshman year.

Students who do not have the required background for MATH 115 may have to take additional preparatory coursework as well. Consult with your major advisor 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 combined mathematics and science courses.

Required General Education (15 credits):

ENG	101	Composition (4)
SPEE	102	Public Speaking (3)
MATH	115	Precalculus Mathematics (4)
PHYS	211	Principles of Physics I (4)

Required Support Courses (19 credits):

COMS	110	Foundation of Computer Science (4)
COMS	211	Fundamentals of Computer Science I (4)
MATH	121	Calculus I (4)
MET	427	Quality Management Systems (3)

Choose one of the following:

COMS	212	Fundamentals of Computer Science II (4)
COMS	230	Intelligent Systems (4)
COMS	271	C++ Programming (4)
COMS	380	Systems Analysis and Design (4)

Required for Major (Communication, Mathematics and Science, 16 credits):

ENG	271	Technical Communication (4)
MATH	127	Calculus II for Engineering Technology: Integration (2)
PHYS	212	Principles of Physics II (4)
CHEM	104	Introduction to Chemistry (3)

Choose one of the following:

STAT	154	Elementary Statistics (3)
MATH	354	Concepts of Probability and Statistics (3)

Required Core for Major (EET, 55 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	355	Electrical Power Systems (3)
EET	400	Network Analysis (3)
EET	452	Operational Amplifier Applications (3)
EET	454	Microprocessors I (4)
EET	456	Communications I (4)
EET	458	Advanced Instrumentation (1)
EET	480	Automatic Controls (3)
EET	488	Senior Project Design I (1)
EET	489	Senior Project Design II (2)
EET	497*	Internship (3)

Choose a minimum of 6 credits from the following courses:

EET	425	EET	430	EET	455	EET	484	EET	486
EET	487	EET	492						

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

Required Minor: None.

#### ELECTRONIC ENGINEERING TECHNOLOGY MINOR

Required for Minor (Core, 13 credits):

EET	112	Elementary Electronics (3)
EET	113	DC Circuits (3)
EET	114	AC Circuits (3)
EET	222	Electronics I (4)

Required for Minor (Elective Options, 7-8 credits):

##### DIGITAL OPTION

EET	225	Digital Principles (3)
EET	454	Microprocessors I (4)

##### ELECTRONICS OPTION

EET	223	Electronics II (4)
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Choose one of the following:

EET	452	Operational Amplifier Applications (3)
EET	455	Advanced Power Electronics (3)
EET	492	Integrated Circuit Technology (4)

##### NETWORKING OPTION

EET	230	Microcomputer Technology (4)
EET	430	Computer Networking I (4)

##### COMMUNICATIONS OPTION

EET	223	Electronics II (4)
EET	456	Communications I (4)

##### POWER OPTION

EET	223	Electronics II (4)
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## POLICIES/INFORMATION

**Graduation Policy.** Students graduating with a degree in Electronic Engineering Technology must have: 1) completed a minimum of 20 semester credit hours of upper division EET courses; 2) have a cumulative GPA of 2.0 or higher for all Minnesota State Mankato EET coursework; and 3) have completed their senior design sequence at Minnesota State Mankato.

**P/N Grading Policy.** A student who majors or minors in EET 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.

In addition to the transfer of credit policy described in this bulletin for students transferring to Minnesota State Mankato from other schools, the electronic engineering program has additional policies:

1. All transfer student must take EET 221.
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. The credit can be used for EET 112, 113 and 114. The student may also attempt to test out of EET 114, 222, 225 and 223.
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 in or declared a major housed in the Department of Electrical and Computer Engineering Technology.

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 Minnesota State Mankato or for any EET course above EET 225.

## COURSE DESCRIPTIONS

## 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 &amp; 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-6, 8 CD-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 F

## 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

## ELECTRONIC ENGINEERING TECHNOLOGY

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

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