

# ELECTRICAL/ELECTRONIC ENGINEERING TECHNOLOGY (EET)

## EET-1015 Introduction to Computer Maintenance and Repair 3 Credits

Introduction to the field of personal computer maintenance and repair. Overview of hardware and software components associated with personal computer systems. Survey of techniques and methods used by technicians to maintain, repair, troubleshoot and upgrade personal computers. Coverage of both interpersonal as well as technical abilities necessary for success in this industry. Survey of the history and evolution of the personal computer.

*Lecture: 3 hours*

*Prerequisite(s): IT-1090 Computer Applications or concurrent enrollment.*

## EET-1035 Operating Systems and Software for PC Technicians 4 Credits

Hands-on course provides both theoretical and practical training with computer operating system setup, maintenance, upgrading, troubleshooting and support. Lab activities provide direct experience with techniques and tools used to install, configure, operate, secure and troubleshoot operating system software in desktop and mobile devices. Fundamental career training for computer service technicians.

*Lecture: 3 hours. Laboratory: 2 hours*

*Prerequisite(s): EET-1015 Introduction to Computer Maintenance and Repair, or concurrent enrollment.*

## EET-1055 Computer Hardware Support 4 Credits

Assemble computer components, install, configure and maintain devices and PCs, properly and safely diagnose, resolve and document common hardware issues while applying troubleshooting skills. Focuses on providing appropriate customer support. Designed in conjunction with industry standard training and certification guidelines.

*Lecture: 3 hours. Laboratory: 2 hours*

*Prerequisite(s): EET-1015 Introduction to Computer Maintenance and Repair.*

## EET-1081 Computer User Support 1 Credit

Overview of techniques and skills necessary for career opportunities in computer user support fields, with particular emphasis on process of microcomputer service and repair. Coverage of both interpersonal and technical abilities necessary for success in this industry. Problem-solving strategies for common user support issues, customer service skills, help desk operation, documentation requirements and information resources for user support.

*Lecture: 1 hours*

*Prerequisite(s): Recommend IT-1010 Introduction to Microcomputer Applications or proficiency in Windows and MSOffice.*

## EET-1100 Introduction to Robotics 2 Credits

Introduction to direct current circuits and supporting mathematics, binary and hexadecimal numbering systems, and learning a programming language that is constrained to an embedded training platform.

*Lecture: 1 hour. Laboratory: 2 hours*

*Prerequisite(s): None.*

## EET-1130 Basic Audio Electronics 3 Credits

Basic DC and AC circuits, amplifier theory, audio distortion, electronic test equipment operation and soldering techniques. Designed for non-EET majors.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): MATH-1190 Algebraic and Quantitative Reasoning or higher level math, or departmental approval.*

## EET-1140 Productivity Tools for Engineering 2 Credits

Productivity Tools for Engineering exposes students to word processing, spread sheets and CAD (Computer Aided Design) programs directed at the electronic engineering technology environment.

*Laboratory: 4 hours*

*Prerequisite(s): ENG-1010 College Composition I; and eligibility for MATH-0965 Intermediate Algebra; or departmental approval.*

## EET-1150 Basic Robotics with Math 2 Credits

The course provides an introduction to embedded control principals using C programming with an emphasis on mathematics.

*Lecture: 1 hour. Laboratory: 2 hours*

*Prerequisite(s): None.*

## EET-1161 Direct Current Circuits 3 Credits

Introduction to direct current circuits that includes engineering notation, the meaning of voltage, current, resistance (including color code), electrical units, power dissipation, the American Wire Gauge (AWG) table, Ohm's Law, Kirchoff's Voltage Law (KVL), Kirchoff's Current Law (KCL), series circuits, parallel circuits, series/parallel circuits, component troubleshooting, resistor-capacitor (RC) and resistor-inductor (RL) circuits (charge, discharge and time constants). Circuit theorems include Thevenin and Norton equivalent circuits, mesh and nodal analysis.

*Lecture: 2 hours. Laboratory: 3 hours*

*Prerequisite(s): MATH-0955 Beginning Algebra, or concurrent enrollment; qualified Math placement; or departmental approval.*

*OAN Approved: Transfer Assurance Guide OET001 and Career Technical Assurance Guide CTEET001.*

## EET-1180 Surface Mount Soldering 1 Credit

Develop skills using surface mount technology (SMT), through hole technology (THT), and connectors using soldering equipment and techniques to facilitate design, construction and rework of circuit boards.

*Laboratory: 2 hours*

*Prerequisite(s): None.*

## EET-1185 Single Board Computers and Applications 3 Credits

An introductory course on Single Board Computers (SBC) with an emphasis on embedded applications. Topics include standard interface devices like keyboards, High-Definition Multimedia Interface (HDMI), Universal Serial Bus (USB), General Purpose Input and Output (GPIO) ports, conventional serial communications. Communicating with external sensors, like Global Positioning System (GPS), infrared transmission and detection, accelerometers, etc., are discussed from the aspect of programming. Lab work includes use of circuit simulation software.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): EET-1100 Introduction to Robotics or EET-1150 Basic Robotics with Math or departmental approval.*

### **EET-1190 Printed Circuit Layout**

#### **2 Credits**

Examines use of contemporary program(s) to lay out printed circuit board in single and multiple layers. Design rules, current return paths, cross talk, creation of custom parts and other details are explored.

*Lecture: 1 hour. Laboratory: 2 hours*

*Prerequisite(s): EET-1161 Direct Current Circuits or concurrent enrollment.*

### **EET-1195 Unmanned Aerial Vehicles**

#### **3 Credits**

Addresses the emerging market for unmanned aerial vehicle (drones), their ethical use, safety issues, legal issues, electrical and mechanical components, on-board control systems, software and remote control.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): EET-1100 Introduction to Robotics or EET-1150 Basic Robotics with Math or departmental approval.*

### **EET-1210 AC Electric Circuits**

#### **3 Credits**

Fundamentals of alternating current (AC) circuits involving resistance, capacitance, and inductance. Sinusoidal voltage, current power, phase, resonance, and frequency response of basic circuit elements in series, parallel, and series-parallel circuits, pulsed circuit analysis. Circuit analysis using network theorems may include Kirchhoff's laws, Mesh, Nodal, and Bridge Network analysis, Superposition, Thevenin's, Norton's and Maximum Power Transfer theorems. Decibels, filters, Bode plots, Fourier series, and system analysis are studied. Computer simulation and practical laboratory experiments using AC instrumentation for measuring series-parallel networks to observe and verify theory and concepts presented in lecture.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): EET-1161 Direct Current Circuits; and EET-1180 Surface Mount Soldering, or concurrent enrollment; and MATH-0965 Intermediate Algebra or concurrent enrollment, or qualified Math placement; or departmental approval.*

*OAN Approved: Transfer Assurance Guide OET003.*

### **EET-1220 Circuits and Electronics for Automation**

#### **3 Credits**

This course is designed for non-EET majors and provides a basic understanding of electricity and electronics as applied to manufacturing settings. Foundational topics include electrical safety, basic circuit fundamentals, electronic components, transformers, and machinery basics necessary for an understanding of modern automation systems used in industry.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): MATH-0955 Beginning Algebra or concurrent enrollment; or departmental approval.*

### **EET-1241 Digital Fundamentals**

#### **3 Credits**

Introductory course to digital circuits. Logic and arithmetic operations are studied, designed and tested in a laboratory environment using discrete integrated circuit gates and programmable logic devices (PLD). Base 2 (binary) and base 16 (hexadecimal) number systems are used in conjunction with Boolean algebra and other theorems. Foundation for continued study of microprocessors/microcontrollers.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): EET-1161 Direct Current Circuits, or concurrent enrollment; or departmental approval.*

*OAN Approved: Transfer Assurance Guide OET002 and Career Technical Assurance Guide CTEET002.*

### **EET-1250 FAA Drone Certification Test Preparation**

#### **3 Credits**

This course prepares students for the Federal Aviation Administration's (FAA) drone certification test.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): None.*

### **EET-1303 Cisco I**

#### **3 Credits**

Introduction to the architectures, models, protocols, Ethernet fundamentals and networking elements that connect users, devices, applications and data through the internet and across modern computer networks. Topics include basic configurations for routers and switches to build simple local area networks (LANs) that integrate IP addressing schemes and foundational network security.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): ITNT-2300 Networking Fundamentals. CTAN Approved: Career Technical Assurance Guide CTIT017 and Industry-Recognized Transfer Assurance Guide ITITN017.*

### **EET-1600 Industrial Routers, Switches, and Operating Systems for Smart Manufacturing**

#### **2 Credits**

Provides a basic understanding of networking fundamentals in manufacturing, Topics include connectivity, LAN and WAN, OSI model, subnetting, and addressing, identifying router and switch models, accessories, cabling, and interfaces between machinery and other equipment in the industrial setting.

*Lecture: 1 hour. Laboratory: 2 hours*

*Prerequisite(s): MATH-0955 Beginning Algebra or concurrent enrollment; or departmental approval.*

### **EET-1620 Industrial Protocols and Machine Connectivity for Smart Manufacturing**

#### **3 Credits**

Implement and troubleshoot the most common industry-standard protocols for machine connectivity and wireless and security technologies in today's converged industrial networks. The focus will be on achieving competency and the skills needed to configure, maintain, and troubleshoot industry-standard network protocols.

*Lecture: 1 hour. Laboratory: 4 hours*

*Prerequisite(s): EET-1600 Industrial Routers, Switches, and Operating Systems for Manufacturing; or departmental approval.*

### **EET-1814 Special Topics: FAA Drone Certification Preparation**

#### **3 Credits**

The Federal Aviation Administration (FAA) requires passing a certification test to operate drones in certain restricted areas. This course prepares students for the certification test.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): None.*

**EET-1820 Independent Study/Research in Electrical/Electronic Engineering Technology**  
**1-3 Credits**

Directed individual study. Study/research title and specific content arranged between instructor and student (see Credit Schedule of classes for current offerings). May be repeated for a maximum of six credits of different topics.

*Lecture: 1-3 hours*

*Prerequisite(s): Departmental approval, and instructor approval, and ENG-0990 Language Fundamentals II or appropriate score on English Placement Test.*

**EET-182S Independent Study/Research Lab in Electrical/Electronic Engineering Technology**  
**1,3 Credit**

Independent two-hour lab per credit. Directed individual study. Study/research title and specific content arranged between instructor and student (see Credit Schedule of classes for current offerings). May be repeated for a maximum of six credits of different topics.

*Laboratory: 2-6 hours*

*Prerequisite(s): Departmental approval, and instructor approval, and ENG-0995 Applied College Literacies, or appropriate score on English Placement Test. Note: ENG-0990 Language Fundamentals II taken prior to Fall 2021 will also meet prerequisite requirements.*

**EET-1910 Directed Practice Electrical Utility Technology I**  
**4 Credits**

Supervised practical applications of electrical substation worker job duties in a setting under direct supervision of FirstEnergy personnel. Emphasis on safety practices and regulations, using substation vehicles and equipment, and procedures and tasks related to use and maintenance of an electrical substation.

*Other Required Hours: Directed Practice: 20 hours per week (300 hours per semester).*

*Prerequisite(s): EET-1161 Direct Current Circuits, and departmental approval: admission to the Electric Utility Technology program.*

**EET-1915 Directed Practice Substation Utility Technology I**  
**4 Credits**

Supervised practical applications of electrical substation worker job duties in a setting under direct supervision of FirstEnergy personnel. Emphasis on safety practices and regulations, using substation vehicles and equipment, and procedures and tasks related to use and maintenance of an electrical substation

*Other Required Hours: Directed Practice: 20 hours per week (300 hours per semester)*

*Prerequisite(s): Concurrent enrollment in ISET-1410 Applied Electricity I, and departmental approval: admission to Electrical Utility Technology Program.*

**EET-1920 Directed Practice Electrical Utility Technology II**  
**4 Credits**

Supervised practical applications of electrical overhead line worker job duties in a setting under personal supervision of FirstEnergy personnel. Emphasis on skills required to perform work on secondary voltage circuits. Emphasis on the installation of services, street lighting, and secondary circuits, bucket truck familiarization and bucket rescue.

Overview of distribution electrical systems, and Occupational Safety and Health Administration (OSHA) rules. Safety topics include: Work Zone Traffic Control; Minimum Approach Distances; Rubber Protective Equipment; and Knowledge of UD Excavation/Trenching/Shoring.

*Other Required Hours: Directed Practice: 20 hours per week (300 hours per semester).*

*Prerequisite(s): EET-1910 Directed Practice Electric Utility Technology I, and EET-1210 AC Electric Circuits, or concurrent enrollment; or departmental approval.*

**EET-1925 Directed Practice Substation Utility Technology II**  
**4 Credits**

Second in a four part series providing the student with a broader skill set as well as enhanced knowledge and skill level necessary to safely assist in the performance of routine repairs on distribution and power transformers, bushings, circuit breakers, disconnect switches, control equipment and other de-energized electrical equipment used in the distribution of electrical energy.

*Other Required Hours: Directed Practice: 20 hours per week (300 hours per semester)*

*Prerequisite(s): EET-1915 Directed Practice Substation Utility Technology I, and concurrent enrollment in ISET-1420 Applied Electricity II.*

**EET-2112 Industrial Electronics**  
**3 Credits**

Construction, theory of operation, performance characteristics relative to the application of DC motors, AC Single phase motors, AC single phase transformers, AC three phase transformers, AC three phase motors, specification and characteristics of power switching devices like triacs and silicon controlled rectifiers, Metal Oxide Semiconductor Field Effect Transistors (MOSFETS), power factor, opto-isolators, power supplies, linear and switch-mode regulators, Pulse Width Modulation (PWM), ground fault circuit interrupters (GFCI), relays, and safety.

*Lecture: 2 hours. Laboratory: 3 hours*

*Prerequisite(s): EET-1210 AC Electric Circuits.*

**EET-2120 Electronics I**  
**3 Credits**

Course includes the most common solid-state devices used in electronic circuits: silicon and germanium diodes, zener diodes, Light Emitting Diodes (LEDs) Bipolar Junction Transistors (BJTs), and Field Effect Transistors (FETS). Graphical and analytical DC and AC analysis of various electronic circuits used. Computer circuit analysis program MultiSim used to predict DC voltages and currents and frequency response of different circuits. Laboratory experiments reinforce topics studied in lecture.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): EET-1210 AC Electric Circuits; or departmental approval.*

*OAN Approved: Transfer Assurance Guide OET005*

### **EET-2131 Digital Communication Fundamentals**

#### **3 Credits**

A continuation of the Signal Analysis course that expands on elementary digital modulation techniques, types of binary signals, speech coding, signal analysis and network theory. Topics include sampling, coding, bandwidth for baseband digital signals, data communications protocol including TCP/IP and error correction/detection techniques.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): EET-2170 Signal Analysis, or concurrent enrollment.*

### **EET-2160 Surface Mount Soldering**

#### **1 Credit**

Surface mount soldering uses surface mount soldering equipment and techniques to facilitate design, construction and rework of circuit boards.

*Laboratory: 2 hours*

*Prerequisite(s): EET-2170 Signal Analysis, or departmental approval: prior work experience.*

### **EET-2170 Signal Analysis**

#### **3 Credits**

Introduces bandwidth, frequency response, noise, modulation, spectrum analysis and distortion and how they apply to design, troubleshooting and circuit operation of audio and radio frequency circuits.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): EET-1210 AC Electric Circuits.*

### **EET-2220 Electronics II**

#### **3 Credits**

Continuation of electronic circuits. Includes study of operational amplifiers, instrumentation amplifiers, voltage comparators, active and passive filter circuits that includes the complex plane, switched capacitor filters and Analog-to-Digital and Digital-to-Analog converters.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): EET-2120 Electronics I.*

### **EET-2231 Wired and Wireless Communication**

#### **3 Credits**

Final course in electronic communications series. Provides an in-depth study of fiber optic, microwave, broadband, wired, and cellular communication systems.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): EET-2131 Digital Communication Fundamentals.*

### **EET-2242 C and ASM Programming with Embedded Applications**

#### **3 Credits**

Introduces microprocessor and microcontroller internal and external hardware components. Assembly language (ASM) programming is introduced to illustrate the internal working of a microcontroller. C programming language is used for embedded and non-embedded environments.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): EET-1241 Digital Fundamentals, or departmental approval.*

*OAN Approved: Transfer Assurance Guide OET004*

### **EET-2250 Industrial Electronics II**

#### **3 Credits**

Overview of common industrial power control circuits and devices including thyristors, unijunction transistors, relays and transient suppression devices. Introduction to relay logic and operation, and programming of programmable controller.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): EET-2220 Electronics II or concurrent enrollment.*

### **EET-2290 Electrical Design Project**

#### **2 Credits**

Capstone course for Electrical-Electronic Engineering program. Designed to allow students opportunity to demonstrate and apply capabilities and skills acquired during their previous engineering technology coursework. Students will choose an approved electronic project compatible with their interest and background. Project will include research, documentation, construction and testing, and conclude with a report and presentation of results.

*Lecture: 1 hour. Laboratory: 3 hours*

*Prerequisite(s): EET-2242 C and ASM Programming with Embedded Applications.*

### **EET-2303 Cisco II**

#### **3 Credits**

Covers the architecture, components, and operations of routers and switches in small networks. Introduces wireless local area networks (WLAN) and security concepts. Students learn how to configure and troubleshoot routers and switches for advanced functionality using security best practices and resolve common issues with protocols in both IPv4 and IPv6 networks.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): EET-1303 Cisco I, or departmental approval: equivalent experience. CTAN Approved: Career Technical Assurance Guide CTIT018 and Industry-Recognized Transfer Assurance Guide ITITN018.*

### **EET-2313 Cisco III**

#### **3 Credits**

Covers the architecture, components, operations, and security to scale for large, complex networks, including wide area network (WAN) technologies. Emphasis on network security concepts and network virtualization and automation.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): EET-2303 Cisco II. CTAN Approved: Career Technical Assurance Guide CTIT019 and Industry-Recognized Transfer Assurance Guide ITITN019.*

### **EET-2400 Biomedical Instrumentation I**

#### **3 Credits**

First course in the Biomedical Engineering Technology Instrumentation sequence. Study of general hospital equipment such as safety analyzers, medtesters, ECGs, patient monitors, simulators, and centrifuges.

Determine performance of equipment and verify that the equipment performs to specifications using simulators and analyzers. Equipment is evaluated using preventative maintenance procedures and operating procedures found in the equipment manuals.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): EET-2120 Electronics I or concurrent enrollment.*

### **EET-2410 Biomedical Instrumentation II**

#### **3 Credits**

Continuation of biomedical program. Study of general hospital equipment such as Safety Analyzers, Medtesters, IV Pumps, Defibrillators, Electrical Surgery Units, and Ventilators. Determine performance of equipment and verify that the equipment performs to specifications using simulators and analyzers. Equipment is evaluated using preventative maintenance procedures and operating procedures found in the equipment manuals.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): EET-2400 Biomedical Instrumentation I, and EET-2220 Electronics II or concurrent enrollment.*

**EET-2490 Biomedical Design Project**  
**2 Credits**

Capstone course for Biomedical Engineering program. Designed to allow students to demonstrate and apply capabilities and skills acquired during their previous engineering technology coursework. Students are provided with a biomedical project compatible with their interest and background. Project includes research, documentation, construction and testing, and concludes with a report and presentation of results.

*Lecture: 1 hour. Laboratory: 3 hours*

*Prerequisite(s): EET-2220 Electronics II or concurrent enrollment, and EET-2410 Biomedical Instrumentation II or concurrent enrollment.*

**EET-2500 Instrumentation and Control**  
**3 Credits**

Concepts and practice in measurement and control of mechanical process variables in industry. Introduction to methods of instrumentation, characteristics of instruments, sensors, data acquisition and presentation, measurement and analysis of basic dimensions, force, motion, pressure, temperature, fluid flow and fluid viscosity.

*Lecture: 2 hours. Laboratory: 3 hours*

*Prerequisite(s): EET-1220 Circuits and Electronics; or EET-2120 Electronics I; or departmental approval.*

**EET-2520 Programmable Logic Controllers**  
**3 Credits**

Introduction to programmable logic controller terminology, architecture, input/output modules and memory. Relay schematics and ladder logic diagrams and programming of programmable logic controllers are covered and reinforced in practical laboratory experiments. Sensing devices as limit switches, on/off electrical devices, temperature switches, timing and counting devices as well as event-driven and time-driven sequences are also included.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): EET-1220 Circuits and Electronics; or EET-1210 AC Electric Circuits and EET-1241 Digital Circuits/Microprocessors I.*

*OAN Approved: Transfer Assurance Guide OET022. CTAN Approved: Career Technical Assurance Guide CTEET003 and Industry-Recognized Transfer Assurance Guide ITEET022.*

**EET-2591 Communications Design Project**  
**2 Credits**

Capstone course for the Digital Communications concentration in the Electronic Engineering Technology program. Designed to allow students to demonstrate and apply capabilities and skills acquired during previous engineering technology coursework. Students choose approved communications project compatible with their interest and background or can use a default project. Project includes research, documentation, construction and testing, and concludes with a report and an oral presentation of results.

*Laboratory: 4 hours*

*Prerequisite(s): EET-1180 Surface Mount Soldering and EET-1241 Digital Fundamentals and EET-2220 Electronics II, or concurrent enrollment; and EET-2231 Wired and Wireless Communications, or concurrent enrollment.*

**EET-279H Sophomore Honors Contract**  
**1 Credit**

Sophomore Honors Contract in Electrical Engineering Technology complements and exceeds requirements and expected outcomes for an existing EET 2000-level course through formulation of a contract with a faculty mentor. In conjunction with a faculty mentor, student will formulate a contract that upon completion will result in distinctive scholarship appropriate to honors 2000-level. In order to complete the contract, student is required to meet on a regularly scheduled basis with instructor offering the contract for mentor-student tutorial sessions. A maximum of six Honors Contracts (six credits) may be taken at the College (includes 179H and 279H).

*Lecture: 1 hours*

*Prerequisite(s): Must be taken concurrently with a 2000-level course (not an honors course) in EET, whose instructor agrees to mentor the student in the sophomore honors contract. Departmental approval required.*

**EET-2813 Special Topics: Cisco CCNA Networking Security**  
**3 Credits**

Provides next step skills enhancement for individuals with Cisco CCENT level skills in order to broaden their skills to meet the growing demand for network security professionals. Introduces core security concepts and skills needed to install, troubleshoot, and monitor network devices to maintain the integrity, confidentiality, and availability of devices and data. Develop skills required to develop a network security infrastructure, recognize threats and vulnerabilities in a network, and mitigate security threats. Prepares students for the Cisco 210-260 IINS CCNA Security certification exam and meets US National Security Agency and Committee on National Security Systems CNSS 4011 training standard.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): EET-1302 Cisco I Basic Networking Technologies and EET-1312 Cisco II Basic Routing and Switching, or departmental approval: current CCENT or CCNA certification.*

**EET-2830 Cooperative Field Experience**  
**1-3 Credits**

Open to students eligible for the Cooperative Education Program. Employment in an approved training facility under College supervision. Requirement for one credit is 180 hours of approved work. Students may earn up to three credits in one semester. May be repeated for an accrued maximum of nine credits.

*Other Required Hours: 180 clock hours of approved work per credit hour*

*Prerequisite(s): See campus COOP Advisor for the Cooperative Education Program application*

**EET-2901 Clinical Internship**  
**3 Credits**

Internship where students are expected to perform 360 hours of service at a local hospital or other biomedical facility. Students are expected to perform activities related to their biomedical technology field, including but not limited to repair of biomedical equipment, safety inspections, and calibration.

*Other Required Hours: Practicum: 360 hours per semester/36 hours per week for 10 weeks.*

*Prerequisite(s): EET-2410 Biomedical Instrumentation II and EET-2220 Electronics II.*

**EET-2910 Directed Practice Electrical Utility Technology III  
4 Credits**

Supervised practical applications of electrical overhead line worker job duties in a setting under personal supervision of FirstEnergy personnel. Emphasis on skills required to identify, install, and maintain primary underground residential distribution (URD) equipment, including various methods of troubleshooting URD primary and secondary circuits. Grounding distribution circuits will also be learned. Students will develop the knowledge and skill to safely perform rubber gloving assignments utilizing the insulate and isolate techniques, will perform various tasks while working on an energized three-phase circuit under controlled conditions. Safety topics include: fire extinguisher safety, temporary protective grounds, stored energy devices, and utilities protective service. *Other Required Hours: Directed practice: 20 hours per week at site (300 hours per semester)*  
*Prerequisite(s): EET-1920 Directed Practice Electric Utility Technology II.*

**EET-2915 Directed Practice Substation Utility Technology III  
4 Credits**

Third in a four part series providing the student with the advanced knowledge and skills necessary to safely work in a supervised capacity on energized equipment and in an unsupervised capacity on de-energized equipment employed in the production and distribution of electrical energy. This course also introduces the student to power transformer testing, troubleshooting, alarm systems, circuit breaker troubleshooting, reclosers and sectionalizers, OCB maintenance and voltage regulators. *Other Required Hours: Directed Practice: 20 hours per week at site (300 hours per semester)*  
*Prerequisite(s): EET-1925 Directed Practice Substation Utility Technology II and concurrent enrollment in ISET-2240 Applied National Electric Code.*

**EET-2920 Directed Practice Electrical Utility Technology IV  
4 Credits**

Fourth in a four part series providing the student with the knowledge and skills to work safely and competently in a supervised or unsupervised capacity. The fourth series is the culmination of prior courses with the introduction of advanced knowledge and skills related to Motor Operates Air Brake Switch, electronic recloser controls, SF6 gas breakers, ACB maintenance, OCB timing and travel tests, calibration of various substation equipment, PT testing, phasing, switching procedures and the performance of energized primary work. *Other Required Hours: Directed Practice: 20 hours per week at site (300 hours per semester)*  
*Prerequisite(s): EET-2910 Directed Practice Electrical Utility Technology III.*

**EET-2925 Directed Practice Substation Utility Technology IV  
4 Credits**

Fourth in a four part series providing the student with the knowledge and skills to work safely and competently in a supervised or unsupervised capacity. The fourth series is the culmination of prior courses with the introduction of advanced knowledge and skills related to Motor Operates Air Brake Switch, electronic recloser controls, SF6 gas breakers, ACB maintenance, OCB timing and travel tests, calibration of various substation equipment, PT testing, phasing, switching procedures and the performance of energized primary work. *Other Required Hours: Directed Practice: 20 hours per week on site (300 hours per semester)*  
*Prerequisite(s): EET-2915 Directed Practice Substation Utility Technology III and concurrent enrollment in ISET-2200 Industrial Motor Controls.*

**EET-3100 Manufacturing Network Devices  
3 Credits**

Introduction to architectures, models, protocols, and networking elements that connect users, devices, applications and data through the Internet and across modern manufacturing networks. Covers how to verify communications between devices and recognize data transmission types. Also includes how to design, deploy, and maintain a logical and physical network infrastructure for their manufacturing operation. The student will gain a sufficient level of knowledge to build a converged multi-service, plant-wide network and operate as a credible domain expert in a multi-function team.

*Lecture: 1 hour. Laboratory: 4 hours*  
*Prerequisite(s): EET-1600 Industrial Routers, Switches, and Operating Systems for Smart Manufacturing and EET-1620 Industrial Protocols and Machine Connectivity for Smart Manufacturing.*

**EET-3200 Industrial IoT Fundamentals and Cybersecurity  
4 Credits**

Introduction to the Industrial Internet of Things (IIoT) and cybersecurity. Securing the connections, sensors, data, and safely adding new devices will be introduced. The basics of being safe online, securing sensors, and protecting collected data will be reviewed. Introduction to different types of malware and attacks and how manufacturing organizations protect themselves against these attacks. Corresponding CISCO badge may be awarded upon successful completion of the course.

*Lecture: 2 hours. Laboratory: 4 hours*  
*Prerequisite(s): EET-1600 Industrial Routers, Switches, and Operating Systems for Smart Manufacturing, and EET-1620 Industrial Protocols and Machine Connectivity for Smart Manufacturing.*

**EET-3210 CyberOps for Manufacturing  
4 Credits**

Provides the student knowledge and skills used for the Cisco Certified CyberOps Associate (200-201 CBPROPS) exam. Covers security concepts, common network and application operations and attacks, and the types of data needed to investigate security incidents. Includes methods of monitoring alerts and breaches with rationale and implementation of established procedures for response to alerts converted to incidents. This promotes understanding of the IT (Information Technologies) infrastructure, operations, and vulnerabilities.

*Lecture: 2 hours. Laboratory: 6 hours*  
*Prerequisite(s): Concurrent enrollment in EET-3100 Manufacturing Network Devices*

**EET-3300 Applications Programming for Smart Manufacturing  
3 Credits**

Programming course with emphasis on smart manufacturing applications. Languages used for embedded and non-embedded environments are covered. These applications require distinguishing between the internal workings of a microprocessor versus communicating over networks. Network communication requires networking protocols. Develop scripts to automate repetitive tasks and improve workflow using the CLI (Command-line interface). Software implementation requires applications performing API calls for both synchronous and asynchronous API (Application Programming Interface) as well as accessing various library routines. This course provides familiarity with universal concepts like data types, containers, functions, conditions, loops semantics, and the runtime environment.

*Lecture: 1 hour. Laboratory: 6 hours*  
*Prerequisite(s): EET-1600 Industrial Routers, Switches, and Operating Systems for Smart Manufacturing and EET-1620 Industrial Protocols and Machine Connectivity for Smart Manufacturing.*

**EET-3310 Industrial Software Applications Development****4 Credits**

This course prepares the student for the Cisco Certified DevNet Associate (DEVASC 200-901) exam. Includes software development and design, understanding and use of APIs, application deployment and security, infrastructure, and automation. IoT, DevOps and Cloud on Cisco platforms are topics that are also covered.

*Lecture: 2 hours. Laboratory: 4 hours*

*Prerequisite(s): EET-3100 Manufacturing Network Devices.*

**EET-4100 Network Security for Manufacturing****4 Credits**

The Network Security curriculum emphasizes core security technologies, the installation, troubleshooting and monitoring of manufacturing network devices to maintain integrity, confidentiality and availability of data and devices, and competency in the technologies that Cisco uses in its security structure. In this course, the student will learn the necessity of a comprehensive security policy and how it affects the strength of the network and to protect the industrial manufacturer's data from theft, damage, or disruption. The student will also learn to perform basic tasks to secure a small industrial network. Students will be prepared to sit for a corresponding Cisco Badge.

*Lecture: 2 hours. Laboratory: 4 hours*

*Prerequisite(s): EET-3100 Manufacturing Networking Devices.*

**EET-4200 Cloud Security for Manufacturing****3 Credits**

Cloud Security for Manufacturing provides an overview of cloud security while allowing students to gain insights into issues such as detecting suspicious traffic flows, policy violations, compromised sensors and IIoT devices, implementing data security controls, identity and access management, and key management.

*Lecture: 1 hour. Laboratory: 4 hours*

*Prerequisite(s): EET-3210 CyberOps for Manufacturing.*

**EET-4210 Big Data Analytics for Smart Manufacturing****3 Credits**

Introduction to big data and analytics with a focus on manufacturing applications. Defining, collecting, storing, and visualizing data obtained through IIoT sensors at each stage of the manufacturing process throughout the supply chain to manage and optimize production. Use of query functions in relational database operations and use of analytic tools. Corresponding CISCO badge may be awarded upon successful completion of the course.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): EET-3200 Industrial IoT Fundamentals and Cybersecurity and EET-3300 Applications Programming for Smart Manufacturing.*