

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-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-1100 Mathematical Explorations 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, resistance capacitance (RC) and resistance inductance (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; appropriate Math placement score; 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 appropriate Math placement score; 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.

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.

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-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.

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.

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.

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 and Career Technical Assurance Guide CTEET003.

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-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.