

Michigan State University On-Line Electrical Apprenticeship Training

Course Descriptions

(Each course is 30 hours in length.)

ET010 Technical Mathematics -

Properties of real numbers, factoring, roots and radicals. Basic algebraic operations and systems of equations will, also, be covered.

ET011 Electrical Fundamentals I -

Application of Ohm's law, power law and Kirchoff's laws. The study of series and parallel circuits. Analyzing the operation and installation of the single-phase power systems. Introduction to magnetism and electromagnets.

ET012 Electrical Code I -

Introduction to the *National Electrical Code, Michigan Electrical Code, Michigan Residential Code, Michigan Public Act 230 of 1972, Michigan Public Act 407 of 216 and Michigan's Electrical Administrative Rules*. Introductory exploration into overcurrent protection, conductor sizing, service entrances, system grounding, bonding of electrical equipment and equipment grounding.

ET013 Electrical Circuitry -

Branch circuit installations. Techniques and procedures are examined. The wiring of common switches and receptacles utilizing cables and conduit systems. The wiring of GFCI and AFCI devices and an understanding of the electrical code requirements for there installation. Apprentices work on numerous hands-on activities for skill enhancement.

ET014 Electrical Wiring I -

National Electrical Code requirements for the common cables, conduits, and tubing systems used in the electrical trade. Also, installation techniques will be examined for the common electrical cables conduit and tubing. Underground and overhead service, feeder and branch circuit conductors will also be examined.

ET020 Electrical Fundamentals II -

Application of Ohm's law, power law and Kirchoff's laws. Analyzing the operation and installation of the three-phase power systems. Inductive, capacitive and resistive circuit analysis. Voltage drop, magnetism, power factor, power generation and distribution will be studied.

ET021 Electrical Applications -

Fundamentals and applications of light sources, lighting design. Examination of electric lamps including incandescent, fluorescent, induction, light emitting diodes, mercury vapor, metal halide, high pressure sodium and low pressure sodium. Special focus on determining efficiencies and luminaire selection.

ET022 Electrical Code II -

Determinating conductor sizes and allowable ampacities for electrical conductors for branch circuits, feeders and service entrances. Installation and sizing of enclosures including device, junction and pull boxes, auxiliary gutters, wireways, surface metal raceways and conduit bodies. Installation of service entrances where there could be: no single main; operating over 800 amperes; or multiple panelboards. More advanced study of system grounding, bonding and equipment grounding of electrical circuits and systems.

ET023 AC & DC Machines -

Operating characteristics of the common types of AC and DC electric motors that are found in residential, commercial, industrial and agricultural applications. Proper connection of motor leads, reversing shaft rotation and controlling rotation speed of AC and DC motors. Interpret the information provided on an induction motor nameplate to the point of finding a suitable replacement motor.

ET024 Electrical Wiring II -

Sizing branch equipment for a single-motor branch circuit. Sizing and installing branch circuits for electrical appliances, heating equipment, air conditioners and electrical vehicle chargers. Branch circuit and outlet requirements for single-family dwellings.

ET030 Automation & Controls I -

Introduction to motor control systems and motor protection techniques. Standard symbols, line diagraming and wire diagrams for control systems will be introduced. Study of manual motor starters and magnetic motor starters, two- and three-wire control circuits. Analyze the operation of jog circuits and electrical interlocking circuits. Control system development will be introduced.

ET031 Transformers -

Transformer fundamentals, wiring, selection and installation. Sizing overcurrent protection and conductors for transformers will be discussed for a wide range of applications. Equipment grounding for transformers and grounding of transformer secondary circuits that consist of a separately derived system.

ET032 Pools & Agricultural Wiring -

Grounding and bonding of swimming pools, hot tubs, man made bodies of water, fountains and livestock confinement areas. Understanding sources of neutral-to-earth voltage and mitigation techniques.

ET033 Electrical Code III -

Wiring in Class I, II, and III hazardous locations, health care facilities and other special occupancy facilities or locations.

ET034 Electrical Occupations -

Job site safety, OSHA and MIOSHA rules and regulations. NPFA standards and requirements for the protection of personnel.

ET040 Automation & Controls II -

Circuits for reversing motors, speed control and stopping shaft rotation of an electrical motor. Control circuit applications using electrical-mechanical relays, solid state relays and timers and counters. Sizing feeders for electrical motor circuits. The use of electronic sensors in control systems is, also, covered.

ET041 Electrical Systems Planning -

Basic electrical calculations and wiring layout. Circuit requirements, outlet location, branch circuits and services sizing, blueprint reading and electrical permits.

ET042 Electrical Code IV -

Commercial agricultural and industrial wiring, planning and installation, including transformers, poly-phase systems, standby power systems. Solar, wind and fuel cell power systems. Grid connecting renewable power systems. Analyzing the economic and carbon impact.

ET043 Other Automated Systems -

Installation, wiring programming and troubleshooting programmable logic control systems. Installation of fire detection and alarm circuits and fire suppression systems. Also, fiber optic cable installation and other forms of communication and data transmission circuits will be covered.

ET044 Journey Examination Preparation -

In-depth discussion of *National Electrical Code*, *Michigan Electrical Code*, *Michigan Residential Code*, *Michigan Public Act 230 of 1972*, *Michigan Public Act 407 of 216* and *Michigan's Electrical Administrative Rules* as they relate to the State of Michigan Electrical Journey Exam. Review of electrical fundamentals, theory and circuit analysis.