

ELECTRICITY LEVEL I AND II

Program Description

The Electricity course of study provides students with an opportunity to learn the theory and skills necessary to take into the world of work or post secondary education. Students will master a variety of competencies including working with electricity in a safe and professional manner. Students participate in a variety of activities in the Electricity Lab to reinforce the attainment of technical skills. Program standards are aligned with the National Electric Code for residential and commercial wiring and incorporate the standards from the National Center for Construction Education and Research (NCCER). Prior to performing any electrical projects, students are required to pass the NCCER safety examination. All students wear protective clothing and gear appropriate for work in the electricity field.

Module 1: Safety for Electricians

Unit Objective:

Students will identify and follow safe work practices.

Unit Competencies:

1. Demonstrate the importance and proper use of personal protection equipment (PPE).
2. Demonstrate an understanding of safe operation and practices in the work area.
3. Recognize hazards and demonstrate safe working procedures and requirements.
4. Demonstrate the proper use of precautionary labeling and Material Safety Data Sheets (MSDS).
5. Demonstrate the proper use of ladders, scaffolds and stairs.

Module 2: Introduction to Mathematics for Electricity

Unit Objective:

Students will demonstrate mastery of math required to be successful in the Electricity profession.

Unit Competencies:

1. Demonstrate mastery in basic computational skills.
2. Read a standard and metric ruler and a measuring tape to accurately measure.
3. Perform basic computational skills involving fractions, decimals and percents.
4. Convert fractions and decimals.
5. Convert inches and decimals.
6. Identify and measure basic geometric shapes.
7. Perform calculations by using Ohm's law and Kirchhoff's law.
8. Define the units of measurement used to measure the properties of electricity.

Module 3: Introduction to Electrical Circuits

Unit Objective:

Students will be able to demonstrate an understanding of various types of electrical circuits.

Unit Competencies:

1. Define voltage and identify the ways in which it can be produced.
2. Demonstrate the difference between conductors and insulators.
3. Identify and read the meters used to measure voltage, current and resistance.
4. Demonstrate an understanding of the basic characteristics of series and parallel circuits.

Module 4: Electrical Theory

Unit Objective:

Students will perform calculations and demonstrate an understanding of the concepts necessary to apply theories in electricity.

Unit Competencies:

1. Explain the basic characteristics of combination circuits.
2. Perform calculations using Kirchhoff's voltage law, the voltage drop in series, parallel, and series parallel units.
3. Perform calculations using Kirchhoff's current law, the total current in parallel and series-parallel circuits.

- Using Ohm's law, find the unknown parameters in series, parallel and series parallel circuits.

Module 5: Introduction to the National Electrical Code (NEC)

Unit Objective:

Students will demonstrate an understanding and demonstrate proper application of the National Electrical Code in residential and commercial sites.

Unit Competencies:

1. Explain the purpose and history of the NEC.
2. Describe the layout of the NEC.
3. Demonstrate how to navigate the NEC.
4. Describe the purpose of the National Electrical Manufacturers Association.
5. Explain the role of nationally recognized testing laboratories.

Module 6: Device Boxes

Unit Objective:

Students will demonstrate proficiency in identifying and using device boxes.

Unit Competencies:

1. Describe the different types of nonmetallic and metallic boxes.
2. Calculate the NEC fill requirements for boxes under 100 cubic inches.
3. Identify the appropriate box type and size for a given application.
4. Select and demonstrate the appropriate method for mounting a given box.

Module 7: Hand Bending

Unit Objective:

Students will demonstrate competency in hand bending.

Unit Competencies:

1. Identify the methods for hand bending and installing conduit.
2. Determine conduit bends.
3. Make 90-degree bends, back-to-back-bends, offsets, kicks, and saddle bends using a hand bender.
4. Cut, ream and thread conduit.

Module 8: Raceways and Fittings

Unit Objective:

Students will demonstrate competency in identification and installation of raceway systems.

Unit Competencies:

1. Identify and select various types and sizes of raceways and fittings for a given application.
2. Identify various methods used to fabricate (join) and install raceway systems.
3. Identify permitted uses for selected raceways.
4. Demonstrate how to install a flexible raceway system.
5. Demonstrate how to terminate a selected raceway system.
6. Identify the appropriate conduit body for a given application.

Module 9: Conductors and Cables

Unit Objective:

Students will demonstrate fluency in identifying conductors and cables.

Unit Competencies:

1. Interpret cable markings to determine size, type, temperature rating, voltage rating and permitted uses.
2. Determine allowable ampacity of a conductor for a given application.
3. Identify NEC requirements for color coding of conductors.
4. Demonstrate installation of conductors in a raceway system.

Module 10: Basic Electrical Construction Drawings

Unit Objective:

Students will be able to read and interpret symbols and plans utilized in the Electricity industry.

Unit Competencies:

1. Interpret basic layout of construction drawings.
2. Demonstrate competency in converting architectural scale drawings.
3. Interpret electrical drawings.
4. Interpret equipment schedules on electrical drawings.
5. Describe information included in electrical specifications.

Module 11: Residential Electrical Services

Unit Objective:

Students will demonstrate competency of residential electrical services.

Unit Competencies:

1. Demonstrate competency in interpreting the NEC and determining electric service requirements.
2. Explain grounding requirements.
3. Calculate and select service-entrance equipment.
4. Select proper wiring methods for various types of residences.
5. Compute branch circuit loads and explain installation requirements.
6. Explain the types and purposes of equipment grounding conductors.
7. Explain the purpose and installation of ground fault circuit interrupters.
8. Size outlet boxes and select proper type for different wiring methods.
9. Describe rules for installing electric space heating and HVAC equipment.
10. Describe the installation rules for electrical systems around swimming pools, etc.
11. Explain how wiring devices are selected and installed.
12. Demonstrate use of electrical test equipment.
13. Select the appropriate meter based on category ratings.
14. Identify the safety hazards associated with test equipment.

Module 12: Conduit Bending

Unit Objective:

Students will demonstrate mastery of use of equipment for conduit bending.

Unit Competencies:

1. Describe the process of conduit bending using power tools.
2. Identify all parts of electric and hydraulic benders.
3. Demonstrate bend offsets, kicks, saddles, segmented and parallel bends.
4. Interpret requirements of NEC for bending conduit.
5. Compute the necessary calculations for bending and installing conduit.

Module 13: Conductor Installations

Unit Objective:

Students will demonstrate the skills necessary for proper conductor installation.

Unit Competencies:

1. Plan and prepare for a cable pull.
2. Set up reel stands and spindles for a wire-pulling installation.
3. Demonstrate how mandrels, swabs, and brushes are used to prepare conduit for conductors.
4. Properly install a pull line for a cable-pulling operation.
5. Explain application for conductors in vertical conduit runs.
6. Demonstrate installation of cables in cable trays.
7. Calculate the probable stress or tension in cable pulls.

Certifications Offered

- OSHA-10 Safety Certification
- NCCER Safety Certification

Articulation Agreements

- College of Southern Maryland