

# NCCER ELECTRICAL CURRICULUM

*The following is a brief description of subjects contained in all four levels of the electrical program as well as the core curricula that all level one students are expected to pass.*

## CORE CURRICULUM

*The core curricula provides a basic introduction to construction work for all crafts. The core curriculum consists of 9 modules taught through in-person instruction and supplemented by online programming.*

### **Basic Safety**

Presents basic jobsite safety information to prepare workers for the construction environment. Describes the common causes of workplace incidents and accidents and how to avoid them. Introduces common personal protective equipment (PPE), including equipment required for work at height, and its proper use. Information related to safety in several specific environments, including welding areas and confined spaces, is also provided.

### **Introduction to Construction Math**

Reviews basic math skills related to the construction trades and demonstrates how they apply to the trades. Covers multiple systems of measurement, decimals, fractions, and basic geometry.

### **Introduction to Hand Tools**

Introduces common hand tools used in a variety of construction crafts. Identifies tools and how to safely use them. Proper hand tool maintenance is also presented.

### **Introduction to Power Tools**

Identifies and describes the operation of many power tools common in the construction environment. Provides instruction on proper use, as well as on safe-handling guidelines and basic maintenance.

### **Introduction to Construction Drawings**

Introduces the basic elements of construction drawings. The common components of drawings are presented, as well as the most common drawing types. The use of drawing scales and how to measure drawings is also covered.

### **Basic Rigging**

Provides basic information related to rigging and rigging hardware, such as slings, rigging hitches, and hoists. Emphasizes safe working habits in the vicinity of rigging operations.

### **Basic Communication Skills**

Provides good techniques for effective communication on the job. Includes examples that emphasize the importance of both written and verbal communication skills. Describes the importance of reading skills in the construction industry and covers proper techniques to use in a variety of different written communication formats.

### **Basic Employability Skills**

Describes the opportunities offered by the construction trades. Discusses critical thinking and essential problem-solving skills for the construction industry. Also identifies and discusses positive social skills and their value in the workplace.

### **Introduction to Material Handling**

Describes the hazards associated with handling materials and provides techniques to avoid both injury and property damage. Common material-handling equipment is also introduced.

## **ELECTRICAL – LEVEL ONE**

### **Orientation to the Electrical Trade**

Provides an overview of the electrical trade and discusses the career paths available to electricians.

### **Electrical Safety**

Covers safety rules and regulations for electricians, including precautions for electrical hazards found on the job. Also covers the OSHA-mandated lockout/tagout procedure.

### **Introduction to Electrical Circuits**

Introduces electrical concepts used in Ohm's law applied to DC series circuits. Covers atomic theory, electromotive force, resistance, and electric power equations.

### **Electrical Theory**

Introduces series, parallel, and series parallel circuits. Covers resistive circuits, Kirchhoff's voltage and current laws, and circuit analysis.

### **Introduction to the National Electrical Code®**

Provides a road map for using the NEC®. Introduces the layout and the types of information found within the code book. Allows trainees to practice finding information using an easy-to-follow procedure.

### **Device Boxes**

Covers the hardware and systems used by an electrician to mount and support boxes, receptacles, and other electrical components. Also, covers NEC® fill and pull requirements for device, and pull, and junction boxes under 100 cubic inches.

### **Hand Bending**

Introduces conduit bending and installation. Covers the techniques for using hand-operated and step conduit benders, as well as cutting, reaming, and threading conduit.

### **Raceways and Fittings**

Introduces the types and applications of raceways, wireways, and ducts. Stresses the applicable NEC® requirements.

### **Conductors and Cables**

Focuses on the types and applications of conductors and covers proper wiring techniques. Stresses the applicable NEC® requirements.

### **Basic Electrical Construction Drawings**

Describes electrical prints, drawings, and symbols, and the types of information that can be found on schematics, one-lines, and wiring diagrams.

### **Residential Electric Services**

Covers the electrical devices and wiring techniques common to residential construction and maintenance. Allows trainees to practice making service calculations. Stresses the applicable NEC® requirements.

### **Electrical Test Equipment**

Covers proper selection, inspection, and use of common electrical test equipment, including voltage testers, clamp-on ammeters, ohmmeters, multimeters, phase/motor rotation testers, and data recording equipment. Also covers safety precautions and meter category ratings.

## **ELECTRICAL – LEVEL TWO**

### **Alternating Current**

Describes forces that are characteristic of alternating-current systems and the application of Ohm's law to AC circuits.

### **Motors: Theory and Application**

Covers AC and DC motors, including the main components, circuits, and connections.

### **Electric Lighting**

Introduces principles of human vision and the characteristics of light. Focuses on the handling and installation of various types of lamps and lighting fixtures.

### **Conduit Bending**

Covers bends in conduit up to 6 inches. Focuses on mechanical, hydraulic, and electrical benders.

### **Pull and Junction Boxes**

Explains how to select and size pull boxes, junction boxes, and handholes.

### **Conductor Installations**

Covers the transportation, storage, and setup of cable reels; methods of rigging; and procedures for complete cable pulls in raceways and cable trays.

### **Cable Tray**

Focuses on NEC® installation requirements for cable tray, including cable installations.

### **Conductor Terminations and Splices**

Describes methods of terminating and splicing conductors, including preparing and taping conductors.

### **Grounding and Bonding**

Focuses on the purpose of grounding and bonding electrical systems. Thoroughly covers NEC® requirements.

### **Circuit Breakers and Fuses**

Describes fuses and circuit breakers along with their practical applications. Also covers sizing.

### **Control Systems and Fundamental Concepts**

Gives basic descriptions of various types of contactors and relays along with their practical applications.

## **ELECTRICAL – LEVEL THREE**

### **Load Calculations: Branch and Feeder Circuits**

Explains how to calculate branch circuit and feeder loads for residential and commercial applications.

### **Conductor Selection and Calculations**

Covers the factors involved in conductor selection, including insulation types, current-carrying capacity, temperature ratings, and voltage drop.

### **Practical Applications of Lighting**

Describes specific types of incandescent, fluorescent, and HID lamps, as well as ballasts. Also covers troubleshooting and various types of lighting controls.

### **Hazardous Locations**

Presents the NEC® requirements for equipment installed in hazardous locations.

### **Overcurrent Protection**

Explains how to size and select circuit breakers and fuses for various applications. Also covers short circuit calculations and troubleshooting.

### **Distribution Equipment**

Discusses switchboards and switchgear, including installation, grounding, and maintenance requirements. Includes a set of drawings.

### **Transformers**

Discusses transformer types, construction, connections, protection, and grounding.

### **Commercial Electrical Services**

Covers the components, installation considerations, and NEC® requirements for commercial services.

### **Motor Calculations**

Covers calculations required to size conductors and overcurrent protection for motor applications.

### **Voice, Data, and Video**

Covers installation, termination, and testing of voice, data, and video cabling systems.

### **Motor Controls**

Provides information on selecting, sizing, and installing motor controllers. Also covers control circuit pilot devices and basic relay logic.

## **ELECTRICAL – LEVEL FOUR**

### **Load Calculations: Feeders and Services**

Topics include basic calculation procedures for commercial and residential applications.

### **Health Care Facilities**

Covers the installation of electric circuits in health care facilities, including the requirements for life safety and critical circuits.

### **Standby and Emergency Systems**

Explains the NEC® requirements for electric generators and storage batteries.

### **Basic Electronic Theory**

Explains the function and operation of basic electronic devices, including semiconductors, diodes, rectifiers, and transistors.

### **Fire Alarm Systems**

Covers fire alarm control units, Digital Alarm Communicator Systems (DACS), installation wiring for alarm initiating and notification devices, and alarm system maintenance.

### **Specialty Transformers**

Covers various types of transformers and their applications. Also provides information on selecting, sizing, and installing these devices.

### **Advanced Controls**

Discusses applications and operating principles of solid-state controls, reduced-voltage starters, and adjustable frequency drives. Also covers basic troubleshooting procedures.

### **HVAC Controls**

Provides a basic overview of HVAC systems and their controls. Also covers electrical troubleshooting and NEC® requirements.

### **Heat Tracing and Freeze Protection**

Covers heat tracing systems along with their applications and installation requirements.

### **Motor Operation and Maintenance**

Covers motor cleaning, testing, and preventive maintenance. Also describes basic troubleshooting procedures.

### **Medium-Voltage Terminations/Splices**

Offers an overview of the NEC® and cable manufacturers' requirements for medium-voltage terminations and splices.

### **Special Locations**

Describes NEC® requirements for selecting and installing equipment, enclosures, and devices in special locations, including places of assembly, theaters, carnivals, agricultural buildings, marinas, temporary installations, wired partitions, and swimming pools.

### **Fundamentals of Crew Leadership**

Covers basic leadership skills and explains different leadership styles, communication, delegating, and problem solving. Jobsite safety and the crew leader's role in safety are discussed, as well as project planning, scheduling, and estimating. Includes performance tasks to assist the learning process.



## **THE NCCER PROGRAM**

NCCER (National Center for Construction Education & Research) maintains a portable and widely recognized credentialing and certification system through its Registry. This Registry assures portability of skills by providing transcripts, certificates, and wallet cards to students who successfully complete the NCCER Curriculum through an accredited sponsor. These valuable industry credentials benefit students as they seek

employment and build their careers. To be entered in NCCER's Automated National Registry, you must complete and sign a Registration and Release form. This form will be completed on the first night of class in each semester and requires your Social Security Number and your signature.

NCCER has developed a consistent program of accreditation, instructor certification, standardized curriculum, registry, assessment, and certification, which is a key element in developing a skilled workforce of craft professionals.

NCCER is the accrediting body for the industry and establishes the benchmark for quality training and assessments. By partnering with industry and academia, NCCER has developed a system for program accreditation that is similar to those found in institutions of higher learning. This process ensures that students receive quality training based on uniform standards and criteria.

The NCCER Curriculum, in cooperation with publishing partner Pearson, has developed and publishes a world-class curriculum created by "Subject Matter Experts" representing contractors and schools from around the country. "Subject Matter Experts" ensure exceptional training programs that meet or exceed national industry standards. The NCCER Curriculum, which includes more than 60 craft areas, is taught worldwide by contractors, associations, construction users, and secondary and post-secondary schools. In addition, multiple State Departments of Education recognize the curriculum along with the U.S. Department of Labor - Office of Apprenticeship.