L1 ELECTRICAL LEVEL 1

Curriculum Notes
- 112.5 Hours (includes Core)
- Downloadable instructor resources are available.
- A Spanish translation of the 2008 NEC® version is available. Please see NCCER's online catalog for more information.

PAPERBACK ISBN
DIGITAL ISBN

MODULES
The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

Occupational Overview: The Electrical Industry (2.5 Hours)
(Module ID 26101-23) Provides an overview of the electrical craft and discusses the career paths available to electricians, including apprenticeship requirements.

Introduction to Electrical Circuits (7.5 Hours)
(Module ID 26103-23) Discusses basic atomic and electrical theory and electrical units of measurement. Explains how Ohm's law and the power equation can be used to determine unknown values, and introduces electrical schematic diagrams.

Alternating Current (10 Hours)
(Module ID 26102-23) Discusses hazards and describes the various types of personal protective equipment (PPE) used to reduce injuries. Covers the standards related to electrical safety and the OSHA-mandated lockout/tagout rule.

Introduction to the National Electrical Code® (7.5 Hours)
(Module ID 26105-23) Introduces the NEC® and explains how to use it to find the installation requirements. Provides an overview of the National Electrical Manufacturers Association and Nationally Recognized Testing Laboratories.

Outlet, Device, Pull, and Junction Boxes (10 Hours)
(Module ID 26106-23) Describes the various types of boxes and explains how to calculate the NEC® fill requirements for outlet, junction boxes under 100 cubic inches (1,450 cubic centimeters).

Basic Electrical Construction Documents (7.5 Hours)
(Module ID 26109-23) Introduces basic principles of human vision and characteristics of light. Covers different types of light sources and the operating characteristics and installation requirements of various lighting fixtures.

Hand Bending (10 Hours)
(Module ID 26107-23) Discusses methods for hand bending conduit, including 90-degree bends, back-to-back bends, offsets, and saddle bends. Describes how to cut, ream, and thread conduit.

Wireways, Raceways, and Fittings (20 Hours)
(Module ID 26108-23) Introduces various types of raceway systems along with their installation and NEC® requirements.

Pull and Junction Boxes (12.5 Hours)
(Module ID 26205-23) Explains how to size and install pull and junction boxes. Identifies various specialty enclosures, including conduit bodies, FS and FB boxes, and handholes.

Conductor Installations (10 Hours)
(Module ID 26206-23) Discusses various types of cable trays, supports, and associated fittings. Explains how to determine the loads on a cable tray and calculate fill per NEC® requirements.

Conductor Terminations and Splices (7.5 Hours)
(Module ID 26208-23) Explains how to prepare cable ends for terminations and splices. Describes how to train cable at termination points and describes crimping techniques.

Continued on following page
Grounding and Bonding (15 Hours)
(Module ID 26209-23) Explains the grounding and bonding requirements of NEC Article 250. Covers how to size the main and system bonding jumpers and the grounding electrode conductor for various AC systems.

Circuit Breakers and Fuses (12.5 Hours)
ISBN 978-0-13-825299-1
(Module ID 26210-23) Describes the operating principles of circuit breakers and fuses, and explains how to select and install overcurrent devices.

Conductor Selection and Calculations (15 Hours)
(Module ID 26302-23) Explains how to make conductor calculations. Covers other factors involved in conductor selection, including insulation types, current-carrying capacity, temperature ratings, and voltage drop.

Practical Applications of Lighting (12.5 Hours)
(Module ID 26303-20) Describes various luminaires and the types of luminaires suited for various applications. Covers dimming, lighting controls, and energy management systems.

Hazardous Locations (15 Hours)
(Module ID 26304-23) Presents the NEC® requirements for equipment installed in hazardous locations.

Overcurrent Protection (25 Hours)
(Module ID 26305-23) Explains how to size and select circuit breakers and fuses for various applications. Covers short circuit calculations and troubleshooting.

Distribution Equipment (12.5 Hours)
(Module ID 26306-23) Discusses switchboards and switchgear, including installation, grounding, and maintenance requirements. Covers ground fault relay testing.

Load Calculations — Branch and Feeder Circuits (17.5 Hours)
(Module ID 26301-23) Explains how to calculate branch circuit and feeder loads for residential and commercial applications. Covers various derating factors.

Loads Calculations — Feeders & Services (20 Hours)
(Module ID 26401-23) Covers basic calculations for commercial and residential applications, including raceway fill, conductor derating, and voltage drop.

Health Care Facilities (10 Hours)
(Module ID 26402-23) Covers the installation, alarm system, and backup system requirements of electrical systems in health care facilities, including the requirements for life safety and critical circuits.

Standby and Emergency Systems (10 Hours)
(Module ID 26403-23) Explains the NEC® installation requirements for electric generators and storage batteries used during such emergency situations.

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Continued on following page
Electrical Level 4 (continued)

**Advanced Controls** (20 Hours)  
(Module ID 26407-23) Discusses applications and operating principles of various control system components, such as solid-state relays, reduced-voltage starters, and adjustable-frequency drives. Covers basic troubleshooting procedures.

**HVAC Controls** (15 Hours)  
(Module ID 26408-23) Provides a basic overview of HVAC systems and their controls. Also covers electrical troubleshooting and NEC® requirements.

**Heat Tracing and Freeze Protection** (10 Hours)  
(Module ID 26409-23) Presents heat-tracing and freeze-protection systems along with various applications and installation requirements.

**Motor Operation and Maintenance** (10 Hours)  
(Module ID 26410-23) Covers motor care procedures, including cleaning, testing, and preventive maintenance. Describes basic troubleshooting procedures.

**Medium-Voltage Terminations/Splices** (10 Hours)  
(Module ID 26411-23) Identifies types of medium-voltage cable and describes how to make various splices and terminations. Covers hi-pot testing.

**Special Locations** (20 Hours)  
(Module ID 26412-23) Describes the NEC® requirements for selecting and installing equipment, enclosures, and devices for special locations that require unique attention. Locations include places of public assembly, theaters, carnivals, and livestock facilities, marinas, swimming pools, and temporary facilities.

**Introduction to Leadership** (22.5 Hours)  
(Module ID 46100) (Lockdown) Introduces leadership skills and different leadership styles, as well as communication and problem solving techniques. Jobsite safety and safety leadership are also discussed. Introduces business topics that are important to understand for construction projects.

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### Managing Electrical Hazards

12.5 Hours  
Revised: 2021, Fifth Edition  
Module ID 26501-21

**PAPERBACK**  
Trainee Guide: $29.99

- A copy of NFPA 70E®, Standard for Electrical Safety in the Workplace, 2021 Edition, is required material for this course. To order, contact NFPA at www.nfpa.org or 1-800-344-3555.

Describes how to assess and eliminate shock, arc blast, and arc flash hazards using the practical safe working requirements detailed in NFPA 70E: Standard for Electrical Safety in the Workplace®. Where it is not possible to eliminate a hazard, an energized electrical work permit must be completed, and workers must be protected by appropriate safety procedures and personal protective equipment.

### Advanced Electrical Topics

Much of the technology in emerging fields—such as wireless, integrated, and voice and data systems—has evolved greatly since the publication of Advanced Electrical Topics Volumes One and Two. Because of this, NCCER and Pearson suggest that those teaching a five-year electrical apprenticeship program use the following compilation of modules drawn from EST and Instrumentation.

**Trainee Guide:** $109.99  

- **Cable Selection:** 33208-10
- **Wire and Cable Terminations:** 33209-10
- **CCTV Systems:** 33410-12
- **Access Control Systems:** 33411-12
- **Buses and Networks:** 33301-11
- **Fiber Optics:** 33302-11
- **Programmable Logic Controllers:** 12406-03
- **Broadband Systems:** 33403-12
- **Distributed Control Systems:** 12407-03
- **Intrusion Detection Systems:** 33407-12
- **Audio Systems:** 33409-12
- **Overview of Nurse Call and Signaling Systems:** 33409-12

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## Level 1 Electrical

**Curriculum Notes**

- 187.5 Hours (Includes Core)
- Downloadable instructor resources are available.
- A Spanish translation of the 2008 NEC® version is available. Please see NCCER’s online catalog for more information.

<table>
<thead>
<tr>
<th>MODULES</th>
<th>ISBN 978-0-13-690853-1</th>
<th>25 Apprenticeship Requirements. (2.5 Hours)</th>
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<tbody>
<tr>
<td>NCCERconnect Access Card: $69.99</td>
<td>NCCERconnect + Hardcover Trainee Guide: $94.99</td>
<td>Provides an overview of the electrical craft and discusses the career paths available to electricians, including apprentice requirements.</td>
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<td></td>
<td>Introduction to Electrical Circuits (7.5 Hours)</td>
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<tr>
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<td></td>
<td>ISBN 978-0-13-690889-2 (Module ID 26104-20) Introduces basic circuits, as well as the methods for calculating the electrical energy within them. Covers resistive circuits, Kirchhoff’s voltage and current laws, and circuit analysis.</td>
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<tr>
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<td>Introduction to the National Electrical Code (7.5 Hours)</td>
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<td></td>
<td>ISBN 978-0-13-690888-3 (Module ID 26105-20) Introduces the NEC® and explains how to use it to find the installation requirements. Provides an overview of the National Electrical Manufacturers Association and Nationally Recognized Testing Laboratories.</td>
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<td>Device Boxes (10 Hours)</td>
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<td></td>
<td>ISBN 978-0-13-690874-6 (Module ID 26106-20) Describes the various types of boxes and explains how to calculate the NEC® fill requirements for outlet adjunction boxes under 100 cubic inches (1,450 cubic centimeters).</td>
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<td>Hand Bending (10 Hours)</td>
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## Level 2 Electrical

**Curriculum Notes**

- 145 Hours
- Downloadable instructor resources are available.

<table>
<thead>
<tr>
<th>MODULES</th>
<th>ISBN 978-0-13-690853-1</th>
<th>10 Hours</th>
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<tr>
<td></td>
<td></td>
<td>Wireways, Raceways, and Fittings (20 Hours)</td>
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<tr>
<td></td>
<td></td>
<td>ISBN 978-0-13-690887-6 (Module ID 26108-20) Introduces various types of raceway systems, along with their installation and NEC® requirements. Describes the use of various conduit bodies.</td>
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<td>Conductors and Cables (10 Hours)</td>
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<td>Basic Electrical Construction Documents (7.5 Hours)</td>
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<tr>
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<td></td>
<td>ISBN 978-0-13-690884-5 (Module ID 26110-20) Describes how to interpret electrical drawings, including the use of architect’s and engineer’s scales.</td>
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<tr>
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<td></td>
<td>Residential Wiring (15 Hours)</td>
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<td>Electrical Test Equipment (5 Hours)</td>
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## Level 2 Electrical Notes

- Downloadable instructor resources are available.

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<thead>
<tr>
<th>MODULES</th>
<th>ISBN 978-0-13-689729-3</th>
<th>17.5 Hours</th>
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<tr>
<td></td>
<td></td>
<td>Motors: Theory and Application (20 Hours)</td>
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<td></td>
<td>ISBN 978-0-13-689718-7 (Module ID 26202-20) Covers AC and DC motors, including the main components, circuits, and connections.</td>
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<td></td>
<td>Electric Lighting (15 Hours)</td>
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<tr>
<td></td>
<td></td>
<td>ISBN 978-0-13-689723-1 (Module ID 26203-20) Introduces the principles of human vision and the characteristics of light. Covers different types of light sources and the operating characteristics and installation requirements of various lighting fixtures.</td>
</tr>
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## Level 2 Electrical Notes

- Downloadable instructor resources are available.

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<th>MODULES</th>
<th>ISBN 978-0-13-689760-6</th>
<th>15 Hours</th>
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<td></td>
<td></td>
<td>Pull and Junction Boxes (12.5 Hours)</td>
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<td>Conductor Installations (10 Hours)</td>
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L3  ELECTRICAL

Curriculum Notes
• 155 Hours
• Revised: 2020, Tenth Edition, to reflect 2020 NEC®
• Downloadable instructor resources are available.

MODULES
The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

Load Calculations — Branch and Feeder Circuits
(17.5 Hours)
(Module ID 26301-20) Explains how to calculate branch circuit and feeder loads for residential and commercial applications. Covers various derating factors.

Conductor Selection and Calculations (15 Hours)
(Module ID 26302-20) Explains how to make conductor calculations. Covers other factors involved in conductor selection, including insulation types, current-carrying capacity, temperature ratings, and voltage drop.

Practical Applications of Lighting (12.5 Hours)
(Module ID 26303-20) Discusses various luminaries and the types of luminaries suited for various applications. Covers dimming, lighting controls, and energy management systems.

Hazardous Locations (15 Hours)
(Module ID 26304-20) Presents the NEC® requirements for equipment installed in hazardous locations.

Overcurrent Protection (25 Hours)
(Module ID 26305-20) Explains how to size and select circuit breakers and fuses for various applications. Covers short circuit calculations and troubleshooting.

Distribution Equipment (12.5 Hours)
(Module ID 26306-20) Discusses switchboards and switchgear, including installation, grounding, and maintenance requirements. Covers ground fault relay testing.

Control Systems and Fundamental Concepts
(12.5 Hours)
ISBN 978-0-13-689762-0
(Module ID 26211-20) Describes the operating principles of controllers and relays, including both mechanical and solid-state devices. Explains how to select and install relays and troubleshoot control circuits.

Transformers (12.5 Hours)
ISBN 978-0-13-690504-4
(Module ID 26300-20) Describes the construction, operation, and applications of various transformers. Covers transformer connections and grounding requirements.

Commercial Electrical Services (10 Hours)
(Module ID 26308-20) Covers the components, installation considerations, and NEC® requirements for commercial services.

Motor Calculations (12.5 Hours)
(Module ID 26309-20) Covers the calculations required to size the conductors and overcurrent protection required for motor applications.

Voice, Data, & Video (10 Hours)
(Module ID 26310-20) Covers the installation, termination, and testing of these systems.

Motor Controls (12.5 Hours)
(Module ID 26311-20) Provides information on selecting, sizing, and installing motor controllers, as well as control circuit pilot devices and basic relay logic.

L4  ELECTRICAL

Curriculum Notes
• 182.5 Hours
• Revised: 2020, Tenth Edition, to reflect 2020 NEC®
• Downloadable instructor resources are available.

MODULES
The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

Load Calculations — Feeders & Services (20 Hours)
(Module ID 26401-20) Covers basic calculations for commercial and residential applications, including raceway fill, conductor derating, and voltage drop.

Health Care Facilities (10 Hours)
(Module ID 26402-20) Covers the installation, alarm system, and backup system requirements of electrical systems in health care facilities, including the requirements for life safety and critical circuits.

Standby and Emergency Systems (10 Hours)
(Module ID 26403-20) Explains the NEC® installation requirements for electric generators and storage batteries used during such emergency situations.

Basic Electronic Theory (10 Hours)
(Module ID 26404-20) Explains the function and operation of basic electronic devices, including semiconductors, diodes, rectifiers, and transistors.

Fire Alarm Systems (15 Hours)
(Module ID 26405-20) Explains the technologies, codes, and wiring approaches used to assemble a fire alarm system. Examines installation and troubleshooting techniques.

Specialty Transformers (10 Hours)
(Module ID 26406-20) Covers various types of transformers, and provides information on selecting, sizing, and installing them.
Electrical Level 4 (continued)

**Advanced Controls** (20 Hours)
(Module ID 26407-20) Discusses applications and operating principles of various control system components, such as solid-state relays, reduced-voltage starters, and adjustable-frequency drives. Covers basic troubleshooting procedures.

**HVAC Controls** (15 Hours)
(Module ID 26408-20) Provides a basic overview of HVAC systems and their controls. Also covers electrical troubleshooting and NEC® requirements.

**Heat Tracing and Freeze Protection** (10 Hours)
ISBN 978-0-13-691095-4
(Module ID 26409-20) Presents heat-tracing and freeze-protection systems along with various applications and installation requirements.

**Motor Operation and Maintenance** (10 Hours)
ISBN 978-0-13-691121-0
(Module ID 26410-20) Covers motor care procedures, including cleaning, testing, and preventive maintenance. Describes basic troubleshooting procedures.

**Medium-Voltage Terminations/Splices** (10 Hours)
(Module ID 26411-20) Identifies types of medium-voltage cable and describes how to make various splices and terminations. Covers hi-pot testing.

**Special Locations** (20 Hours)
ISBN 978-0-13-691118-0
(Module ID 26412-20) Describes the NEC® requirements for selecting and installing equipment, enclosures, and devices for special locations that require unique attention. Locations include places of public assembly, theaters, carnivals, agricultural and livestock facilities, marinas, swimming pools, and temporary facilities.

**Fundamentals of Crew Leadership** (22.5 Hours)
(Module ID 46101) 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.