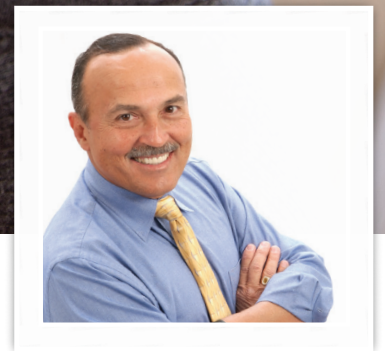


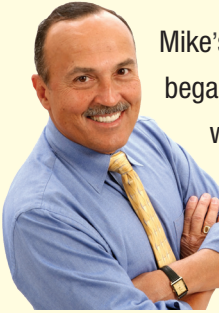


Mike Holt's

ELECTRICAL APPRENTICESHIP PROGRAM

Based on the 2020 NEC®

ABOUT MIKE HOLT ENTERPRISES



Mike's passion for the electrical industry and educating others on the *National Electrical Code* began in 1972 while studying for a local electrical exam. His inability to find material that was well-written or properly illustrated gave him the idea to start a school that would be devoted to electrical training.

In 1975 Mike Holt Enterprises was created with very clear principles of making electrical training more effective, and providing books that were straightforward and easy to understand. This desire to create books to help electricians pass exams grew into the nation's largest "electrical-only" publisher that specializes in books, videos, online training, school curriculum, and seminars—changing the way the *NEC* and electrical training is taught.

Forty years later, these standards continue to guide us. Our products are designed for student success:

- **Easy to Understand.** Our text simplifies difficult technical topics and includes clear, step-by-step, detailed explanations.
- **Visual.** We include full-color, detailed, instructional graphics that help students visualize what's being taught.
- **Effective.** Our instructor resources are designed to save teachers time and give them tools to be more successful in reaching their students.

Our primary goal as a company is to change the lives of electrical professionals through our products. We genuinely care about helping our instructors and schools prepare the next generation of electrical professionals with the skills and knowledge they need to succeed.

We're here to help you every step of the way and encourage you to contact us, so we can be a part of your success.

COPYRIGHT © 2020 Charles Michael Holt



Produced and Printed in the USA
December 2020



TABLE OF CONTENTS

ABOUT THIS LESSON PLAN	v
LEVEL 1	
Level 1–Outline	vii
Level 1–Lesson Plans At-A-Glance	ix
Level 1–Objectives	xi
LEVEL 2	
Level 2–Outline	xix
Level 2–Lesson Plans At-A-Glance	xxi
Level 2–Objectives	xxiii
LEVEL 3	
Level 3–Outline	xxix
Level 3–Lesson Plans At-A-Glance	xxxi
Level 3–Objectives	xxxiii
LEVEL 4	
Level 4–Outline	xiviii
Level 4–Lesson Plans At-A-Glance	i
Level 4–Objectives	lii
Lesson Plans–Level 1	
Level 1–Hours 1-39	1-1
Level 1–Hours 40–78	1-14
Level 1–Hours 79-117	1-27
Level 1–Hours 118-156	1-40
Lesson Plans–Level 2	
Level 2–Hours 1-39	2-1
Level 2–Hours 40-78	2-14
Level 2–Hours 79-117	2-27
Level 2–Hours 118-156	2-40

Lesson Plans–Level 3

Level 3–Hours 1-39 3-1

Level 3–Hours 40-78 3-14

Level 3–Hours 79-117 3-27

Level 3–Hours 118-156 3-40

Lesson Plans–Level 4

Level 4–Hours 1-39 4-1

Level 4–Hours 40-78 4-14

Level 4–Hours 79-117 4-27

Level 4–Hours 118-156 4-40



ABOUT THIS LESSON PLAN

Mike Holt's Electrical Apprenticeship Program Based on the 2020 NEC® has been developed with the goal of providing the knowledge required to become a competent journeyman electrician. The training resources used throughout this program have been selected to provide the most comprehensive education possible. Supplemented with Mike's instructional support material (such as presentations, videos, and practice exams), the program is tailored to meet the needs of different types of learners.

THE SCOPE OF THIS LESSON PLAN

This program is organized into hourly study increments that are designed to deliver a logical flow of the material and adaptable to any personal or institutional calendar. Whether your course delivery is one, two, or even five days per week, this lesson plan can accommodate your schedule. From day one, and maintained throughout the program, strong emphasis is placed on safe work practices. In addition, the program covers the *National Electrical Code* and Construction Safety (as prescribed by OSHA) in a manner relevant to today's apprentices, preparing them for their journeyman's exam and the jobsite.

- Level 1** Level 1 begins with the study of OSHA's construction safety rules and introduces apprentices to the principles associated with electricity, electrical theory, and the basics of electrical systems. These basic fundamentals are necessary in understanding complex *NEC* requirements covered throughout the program. Digital multimeter principles will also be covered. In the latter part of Level 1, students will be introduced to, and begin utilizing, the *National Electrical Code*.
- Level 2** Level 2 continues the study of OSHA's construction safety rules and then focuses on the first three chapters of the *NEC*. Some equipment specific to alternating current will be introduced. Residential and commercial wiring methods and practices will also be covered in depth during Level 2.
- Level 3** Level 3 covers additional OSHA construction safety rules, Chapter 4 of the *NEC*, and common industrial applications, methods, and requirements. While motors and controls are the major focus area, hazardous locations, special applications, and Solar (PV) Photovoltaic and Energy Storage Systems, are also introduced.
- Level 4** Level 4 of the program covers advanced *Code* calculations in great detail. Electrical estimating is covered as well as a review of electrical theory and motor controls. Additional OSHA construction safety rules will also be covered.

The anticipated hours of study for the 2020 Apprenticeship Program are as follows:

Level 1	156 hours
Level 2	156 hours
Level 3	156 hours
Level 4	156 hours
Total	624 total program hours

HOW TO USE THIS LESSON PLAN

These lesson plans take into account that not all students and institutions operate on the same calendar schedule. It is organized hour-by-hour and should be used as a guide for personal or class scheduling. This flexibility will successfully guide both classroom instructors and self-paced online learners through this course regardless of individual calendars. References to slide and video presentations for classroom instruction are included along with the references to online presentations in the online Capacitor®.

Each individual and each class is unique. As such, the flow of this course will vary accordingly. Some parts of this course will move more quickly than the time suggested, while other parts may require all of the time allotted. It's important to remember that this plan is flexible. Time overlap is expected and will balance out a student's learning pace to ensure that all course outcomes and objectives are met.

Note: Please make notes during the semester and provide us feedback in order to improve this schedule each year. Instructor-led course quizzes or assessments are at the instructor's discretion, or as mandated by individual institution requirements.

We all learn differently, and the same methods of presentation and study don't necessarily bring the same results for each student. Instructors should be aware of the differences in learning styles when presenting this material to the class. Some students learn better visually and need to see diagrams and illustrations; others learn better audibly such as lectures and class group discussions.

Hands-on learning is an important component of education, and most of it will be done on the jobsite rather than in the classroom. However, when it's feasible, bring equipment and material in to show the class. Just a little "show and tell" of components that your students haven't yet used, like motor control pushbuttons (start-stop-stations) or AFCI breakers, can help add understanding to a lesson. When possible, try to supplement classroom instruction with field trips to view live construction projects showcasing the material being studied.

We recommend the lesson material be presented in the form of lecture and include visual aids when possible. Slide and video presentations using a large screen can be very beneficial, but it's understood that this type of equipment isn't always available. In some cases, what is available, may limit the presentation to the use of student textbooks and whiteboards.

Self-paced learners should be sure to take advantage of our online Capacitor® and make full use of all included presentations, videos, and extra links as part of their learning experience. These tools will enhance comprehension and reinforce retention of the material.

Instructors should involve the students as much as possible. An example is how you would handle the questions that are assigned in the books. After completing the questions, have the students take turns reading the question and their answers so they're involved in the process. Don't just read the answers to your students—and don't just post them. Do what you can to interact with your students in discussion and allow their input. Another example is to incorporate a discussion of what some of students might already be doing in the field with the rest of the class.

Answer questions honestly, and don't be afraid to tell your students if you don't know an answer. Of course, do take time to look it up, and explain that you can't always know all the answers, but you're there to help them in the learning process. Make sure your students understand their responsibility in the learning process. They need to do their part by reading and studying the information in their textbooks and participating in discussions. Remind them that learning is a life-long process, and there are always new things to learn in the electrical field.

Instructors will be most successful if you remember that we all started here and empathize with your students. Provide encouragement and reassurance while they strive to achieve their personal goals. Help them develop a respect for the electrical profession and a love for learning—essential to a successful career in our ever-changing industry. Self-paced learners should also maintain the same perspective and try to not let yourself feel overwhelmed. Keep focused on achieving your career goals and the rewards that follow!



LEVEL 1 OUTLINE

LEVEL 1 RESOURCES

Mike Holt's Apprenticeship Training Program is designed to use textbooks, slide presentations, videos, labs/activities, review questions, and exams designed to enhance learning, comprehension, and retention of the material presented.

Videos

The instruction package includes videos that can be played along with the textbooks, or viewed in their entirety, to provide a practical viewpoint of the material covered. If something isn't understood or misinterpreted, stop, go back, and play that section again until the topic is clear.

Mike and a panel of industry experts are featured on these videos. They carefully examine the topics in a way that's both educational and entertaining. You'll hear stories, discussions, and opinions that aren't covered in the textbooks thereby making them an invaluable practical source of information.

Presentations

Included in this instruction package are presentations containing hundreds of slides that are synchronized with the textbooks. These presentations are sorted by individual article or unit resulting in much smaller, less cumbersome files and make it easier to follow along side by side with the textbook.

Labs/Activities

One of the most enjoyable parts of learning is "hands on" learning of mechanical parts such as meters, wire, magnets, coils, light bulbs, switches, fuses, circuit breakers, receptacles, GFCIs, AFCIs—basically anything that can be broken!

We strongly suggest you find or create labs that match the topic being studied as a hands-on experience to help students understand the material being covered. Seeing a mechanical concept in action makes it easier to understand the lesson being taught.

Assessments

Student assessments are an important aspect of the learning process. Studies have shown that regardless of the result, students who are required to mentally recall a subject upon review, are more likely to remember the content than those who didn't have this opportunity. Our program includes different options for assessment including, textbook review questions and exams. Online quizzes and exams are available in the blended and online programs in our online Capacitor®.

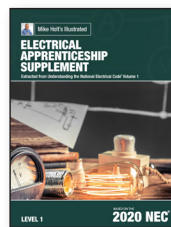
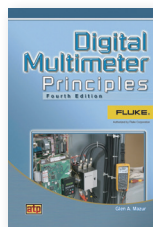
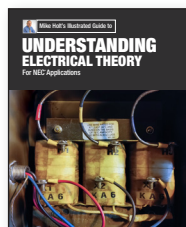
Textbook Questions. Our textbooks contain review questions and exams designed to reinforce the learning process when the online testing tools aren't used. We encourage you to have your students complete the textbook tests before taking the online tests to further reinforce their learning process.

Online Testing. Our online testing program has been specifically designed to take advantage of today's blended or self-paced learning environments and reinforce the material that's been covered.

Books

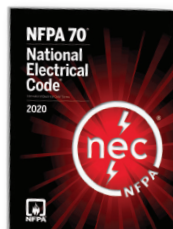
In Level 1, you'll be using the following books and we suggest you take a few moments to review the layout of each. Pay attention to the table of contents, the layout of the units and chapters, and the review questions.

- ▶ *OSHA Construction Safety Training Handbook, 7th Edition*
J.J. Keller & Associates
ISBN 979-8-88912-483-2, 2024
- ▶ *Mike Holt's Understanding Electrical Theory*
Mike Holt Enterprises
ISBN 978-1-950431-68-7, 2022
- ▶ *Digital Multimeter Principles, 4th Edition*
American Technical Publishers
ISBN 978-0-8269-1506-1, 2010
- ▶ *Mike Holt's Apprenticeship Supplement Level 1*
Mike Holt Enterprises
ISBN 978-1-950431-25-0, 2020



Suggested Additional Resources*

- ▶ *National Electrical Code, 2020 Edition*
National Fire Protection Association
ISBN 978-145592297-0, 2019



**Sold separately.*

LEVEL 1 LESSON PLANS– AT A GLANCE

Hours	Content	Hours	Content
1-3	Introduction Orientation Tools Safety <i>Electrical hazards and safe working practices</i> OSHA Construction Safety <i>Electrical Safety and PPE</i>	40-42	Electrical Theory–Unit 10 <i>Basic Math</i>
4-6	OSHA Construction Safety Falls Ladders and Stairs Scaffolds	43-45	Electrical Theory–Unit 11 <i>Trigonometry</i>
7-9	Electrical Theory–Units 1–2 <i>Atomic Structure, Electron Theory and Chemical Bonding</i>	46-48	Electrical Theory–Units 12–13 <i>Ohm's Law, Watt's Law</i>
10-12	Electrical Theory–Units 3–4 <i>Electrical Circuits and Power Sources, The Electrical System</i>	49-51	Electrical Theory–Units 14–15 <i>Series and Parallel Circuits</i>
13-15	Electrical Theory–Units 5–6 <i>Uses and Dangers of Electricity</i>	52-54	Electrical Theory–Units 15–16 <i>Parallel and Series-Parallel Circuits</i>
16-18	Electrical Theory–Units 7–9 <i>Magnetism and Electromagnetism</i>	55-57	Electrical Theory–Units 17–19 <i>AC Fundamentals, Inductance, Capacitance</i>
19-21	Digital Multimeter Principles <i>Chapters 1 through 4</i>	58-60	Electrical Theory–Unit 20 <i>True Power, Power Factor, and Apparent Power</i>
22-24	Digital Multimeter Principles <i>Chapters 5 through 9</i>	61-63	Electrical Theory–Unit 20 <i>True Power, Power Factor, and Apparent Power</i>
25-27	Digital Multimeter Principles <i>Chapter 10</i>	64-66	Electrical Theory–Unit 21 <i>Motors</i>
28-30	Digital Multimeter Principles <i>Review and Competency Test</i>	67-69	Lab/Activity <i>Instructor/Institution Choice</i>
31-33	Lab/Activity <i>3-4-way switching</i>	70-72	Flex Training <i>Instructor/Institution Choice</i>
34-36	Content Review	73-75	Content Review
37-39	Content Exam	76-78	Content Exam

Hours	Content
79-81	Electrical Theory–Unit 22 <i>Generators</i>
82-84	Electrical Theory–Unit 23 <i>Relays</i>
85-87	Electrical Theory–Unit 24 <i>Transformers</i>
88-90	Electrical Theory–Unit 25 <i>Overcurrent Protection</i>
91-93	Electrical Theory–Unit 26 <i>GFCIs, GFPEs, AFCIs, AND SPDs</i>
94-96	Electrical Theory–Unit 26 <i>GFCIs, GFPEs, AFCIs, AND SPDs</i>
97-99	Electrical Theory–Unit 27 <i>Wire Resistance and Voltage Drop</i>
100-102	Electrical Theory–Unit 28 <i>Multiwire Circuits</i>
103-105	Electrical Theory–Unit 29 <i>The Formula Wheel</i>
106-108	Lab/Activity <i>Box Fill</i>
109-111	Lab/Activity <i>Box Fill</i>
112-114	Content Review
115-117	Content Exam

Hours	Content
118-120	Apprenticeship Supplement <i>How to Use the NEC (Video)</i>
121-123	Apprenticeship Supplement <i>Articles 90 and 100</i>
124-126	Apprenticeship Supplement <i>Article 110</i>
127-129	AC/DC Fundamentals <i>Review</i>
130-132	Apprenticeship Supplement <i>Grounding and Bonding</i>
133-135	Apprenticeship Supplement <i>Grounding and Bonding</i>
136-138	Apprenticeship Supplement <i>Grounding and Bonding</i>
139-141	Lab/Activity <i>Conductor Ampacity</i>
142-144	Lab/Activity <i>Conductor Ampacity</i>
145-147	Content Review
148-150	Content Exam
151-153	Level 1 Review
154-156	Level 1 Final Exam



LEVEL 1 OBJECTIVES

The primary goal of Level 1 is for students to possess the knowledge necessary to safely and proficiently perform the job duties and responsibilities expected of a first-year apprentice. They'll have built a foundation of knowledge about construction safety, electrical safety, and electrical theory that's necessary to understand the *National Electrical Code (NEC)*. They'll be introduced to the *Code* rules that are related to general wiring requirements, outlet box sizing, raceway sizing, and bonding and grounding. In addition, they'll learn how a multimeter is used in the field and receive a multimeter competency certification.

LEVEL 1 (HOURS 1–39)

At the completion of the following content, students should be able to:

OSHA–Construction Safety

- Identify the general hazards that may be present on a construction site.
- Demonstrate or describe the safe handling and use of ladders and scaffolding.
- List safety precautions necessary to prevent falls on a construction site.
- Identify the hazards specific to the installation, maintenance, and servicing of electrical equipment.
- Identify and describe the levels (Categories) of arc-flash hazards.
- Identify and apply the level of personal protective equipment (PPE) required for each Category of arc-flash hazard.

Understanding Electrical Theory–Units 1–9

Unit 1–Atomic Structure

- Describe the structure of an atom.
- Define the subatomic particles of an atom.
- Exhibit an understanding of positive and negative electrostatic charges of an atom.
- Identify some of the hazards of a high-voltage electrostatic discharge and how to mitigate these hazards.
- Explain the cause and effect of a lightning strike.
- Describe what can be done to mitigate the effects of a lightning strike.
- Explain the intent of a lightning protection system.

Unit 2–Electron Theory and Chemical Bonding

- Exhibit an understanding of electron theory.
- Describe the relationship between electrons and protons.
- Explain what chemical bonding is and how it can change the electrical characteristic of an atom.
- Explain how the negative charge of electron movement participates in the creation of electricity.
- Describe the differences between conductors, semiconductors, and insulators.
- Explain what makes a good conductor and why.

Unit 3–Electrical Circuits and Power Sources

- Define what an electrical circuit is.
- Describe what components makeup an electrical circuit.
- Describe the different types of power sources that force electrons to move.

Unit 4–The Electrical System

- Describe how electricity is generated at the utility generating plant.
- Explain step-up and step-down substation transmission voltages.
- Explain how electricity goes from utility distribution transformers to a customer’s premises.

Unit 5–Uses of Electricity

- Describe how electricity is used for electro-plating.
- Describe the function of electromagnetism in motors, generators, relays, and transformers.
- Explain about (PV) photovoltaic systems.
- Explain how and why electricity produces heat.
- Describe the uses of different types of lighting systems.

Unit 6–Dangers of Electricity

- Explain the purpose of the National Electrical Code®.
- Describe how electrical fires are created.
- Describe what electric shock/electrocution are.
- Explain what arc flashes and arc blasts are.

Unit 7–Basics of Magnetism

- Describe the law of attraction and repulsion of magnets.
- Explain why some metals are easily magnetized and how to demagnetize metals.
- Describe the difference between permanent and temporary magnets.
- Illustrate the magnetic field around a magnet.

Unit 8–Electromagnetism

- Explain how electromagnetism in a wire is produced.
- Describe electromagnetic field intensity.
- Explain how an electromagnetic field is influenced by the shape of the wire.

Unit 9–Uses of Electromagnetism

- List some common uses of electromagnetism.

Digital Multimeter Principles

- Demonstrate the safe handling, storage, and use of a DMM (digital multimeter.)
- Define and explain the various displays, abbreviations, symbols, and terminology associated with a digital multimeter.
- Define and explain the application of the extended features of a typical digital multimeter.
- Demonstrate the proper settings and technique for measuring AC and DC voltages.
- Demonstrate the proper settings and technique for determining continuity, resistance, and AC and DC current.
- Apply Ohm’s Law and power formulas to determine the missing variable when two of the formula values are known.
- Explain how changes in frequency affect the operation of electrical equipment.
- Explain how to determine frequency and duty cycle using a digital multimeter (DMM).
- Demonstrate a working knowledge of all aspects of a DMM.
- Satisfactorily complete the DMM competency test.

Level 1, Content Exam

- Successfully pass the covered content exam within the program completion requirements.

LEVEL 1 (HOURS 40–78)

At the completion of the following content, students should be able to:

Understanding Electrical Theory–Units 10–21

Unit 10–Basic Math

- Explain the difference between whole numbers and fractional numbers.
- Describe the various ways fractional numbers can be expressed.
- Demonstrate how to convert a percentage into a decimal to use as a multiplier.
- Explain the differences between a reciprocal, a square root, and squaring a number.

Unit 11–Trigonometry

- Describe what right triangles are.
- Explain what the Pythagorean Theorem is.
- Describe the terms sine, cosine, and tangent.

Unit 12–Ohm’s Law

- Describe electromotive force, intensity, and resistance.
- Demonstrate what voltmeters, ammeters, and ohmmeters are used for.
- Demonstrate how to use the Ohm’s Law formula.

Unit 13–Watt’s Law

- Describe what Watt’s Law is.
- Demonstrate how to use Watt’s Law.
- Explain what a wattmeter is.

Unit 14–Series Circuits

- Explain the relationship between resistance, current, and voltage in series circuits.
- Describe how voltage is affected in a series circuit.
- Explain what series circuits are and their practical uses in the electrical industry.
- Perform calculations involving series circuits.

Unit 15–Parallel Circuits

- Explain relationship between resistance, current, and voltage in parallel circuits.
- Describe how voltage is affected in a parallel circuit.
- Describe how parallel circuits are used for the electrical wiring of receptacles, lighting, appliances, and equipment.
- Perform calculations involving parallel circuits.
- Explain any advantages of parallel circuits and how they differ from series circuits.

Unit 16–Series-Parallel Circuits

- Describe a series-parallel circuit.
- Identify which portions of a circuit are in series and which portions are in parallel.
- Perform calculations involving series-parallel circuits.

Unit 17–Alternating Current Fundamentals

- Explain the advantages (and disadvantages) of alternating current compared to direct current.
- Describe some of the uses for alternating current.
- Explain how alternating current is generated.
- Explain that a waveform is a mathematical representation on a graph that can be used to visualize the level and direction of current or voltage in a circuit.

- Describe the difference(s) between a “sinusoidal waveform” and a “nonsinusoidal waveform.”
- Analyze an ac waveform.
- Explain the difference(s) between “leading” and “lagging” waveforms.
- Define the various values associated with an ac waveform.

Unit 18–Inductance

- Define what is meant by “induction” and explain its various types.
- Explain the electrical characteristics of induction.
- Describe the benefits of induction as it relates to electrical power.

Unit 19–Capacitance

- Explain that “capacitance” is the ability of a device to store and release electrical energy.
- Describe the purpose of a capacitor and the precautions that should be taken where they are used.

Unit 20–True Power, Power Factor, and Apparent Power

- Explain the concept of “true power vs. “apparent power” and their units of measure.
- Correctly apply power factor formulas to determine “true power” and “apparent power.”
- Describe the effects of power factor as it relates to the efficiency of electrical circuits.
- Explain how the efficiency rating of utilization equipment affects power factor.
- Outline how true power is determined and its effects on the cost of the electricity to operate the equipment.
- Describe how the effects of power factor can influence sizing transformers and or branch circuits.
- Identify and apply the formulas necessary to determine the power loss(es) and efficiency of utilization equipment.

Unit 21–Motors

- Explain the basics principles and theory behind how motors convert electrical energy into mechanical work.
- Describe the primary components of a motor and their function.
- Define how the output of a motor is rated.
- Calculate the output of a motor in the appropriate unit of measure.
- Explain how input power relates to output power of a motor.
- Describe motor current ratings.
- Calculate the full-load ampere rating of a given single- or three-phase motor.
- Explain the difference(s) between a motor’s starting current versus its running current.
- Describe how motors are protected from overcurrent.
- Explain the difference(s) between “overload” protection of a motor and its short-circuit/ground-fault protection.

Level 1, Content Exam

- Successfully pass the covered content exam within the program completion requirements.

LEVEL 1 (HOURS 79–117)

At the completion of the following content, students should be able to:

Understanding Electrical Theory–Units 14–22**Unit 22–Generators**

- Explain the basic concept and theory behind how a generator produces electricity.
- Describe the primary difference between a dc and an ac generator.

Unit 23–Relays

- Describe how relays operate.
- Explain normally open (NO) and normally closed (NC) contacts.

Unit 24–Transformers

- Describe the benefits of transforming voltage and the theory by which this process occurs.
- Explain the difference(s) between the primary and secondary windings of a transformer.
- Apply the necessary formulas to predict the input and/or output voltages and currents of a transformer.
- Explain how true and apparent power relate to transformers.
- List various types of transformers and their applications.
- Describe how the efficiency rating of a transformer affects its output.
- Calculate and predict the output of a transformer based on its efficiency rating.
- Calculate the primary and/or secondary line current based on a set of known values.

Unit 25–Overcurrent Protection

- Explain the primary function of an overcurrent protective device.
- List and describe the conditions that will cause an overcurrent protection device to function.
- Describe the differences and similarities between a short-circuit and a ground-fault.
- Explain the concept of a “time-current curve”.
- List the most common types of overcurrent protective devices.
- Describe the differences between overcurrent, overload, and fault current protection.
- Explain the concept of an improper neutral to case connection and its potential hazards.

Unit 26– GFCIs, GFPEs, AFCIs, AND SPDs

- Explain the importance of “ground-fault circuit interrupter” (GFCI) protection.
- Describe the condition(s) that will cause a GFCI device to function.
- Describe the importance of and how to confirm a GFCI device is properly functioning.
- Define the term “arc-fault” and describe a series-arc vs. a parallel-arc.
- Describe how an (AFCI) arc-fault circuit interrupter functions.

- Reference the *National Electrical Code* to identify the requirements for AFCI protection.
- Describe the difference between GFCI protection and (GFPE) ground-fault protection of equipment.
- Describe what a surge protection device (SPD) is.

Unit 27–Wire Resistance and Voltage Drop

- Describe what is included in direct-current wire resistance.
- Describe what is included in alternating-current wire resistance.
- Demonstrate how to calculate voltage drop in a wire using Ohm's Law.

Unit 28–Multiwire Circuits

- Describe the purpose of a “balanced” electrical system.
- Describe a multiwire branch circuit.
- Justify the advantages in the use of multiwire branch circuits.
- Evaluate the effects on the neutral conductor when employing multiwire branch circuits.
- Demonstrate and correctly calculate voltage drop for various multiwire branch circuits.
- Explain the hazards involved when using multiwire branch circuits and how they are to be avoided.
- Identify and apply the *NEC* requirements regarding the use of multiwire branch circuits.

Unit 29–The Formula Wheel

- Explain how The Formula combines both Ohm's and Watt's Laws.
- Explain the relationship between Ohm's Law and Watt's (Power) Law.
- Demonstrate how to perform calculations using the Formula Wheel.

Level 1, Content Exam

- Successfully pass the covered content exam within the program completion requirements.

LEVEL 1 (HOURS 118–156)

At the completion of the following content, students should be able to:

Apprenticeship Supplement–Introduction to the *National Electrical Code*

Article 90–Introduction

- Explain the history of the *NEC*—when it was established and how it's updated.
- Understand the purpose of the *NEC*, practical safeguarding, adequacy, and intention.
- Describe the scope of the *NEC*, including what is and isn't covered.

Article 100–Definitions

- Explain and comprehend the importance of understanding the language and terminology of the *Code* and the meaning of the terms contained within the *NEC*’s Article 100–Definitions.

Article 110–Requirements for Electrical Installations

- Describe the significance of the listing and labeling of electrical equipment.
- Discuss interrupting ratings of overcurrent devices.
- Explain short-circuit current and short-circuit current ratings of electrical equipment.
- Describe the effects of deteriorating agents and mechanical execution of work.
- Thoroughly explain electrical connections focusing on temperature limitations and equipment provisions.

AC/DC Fundamentals–Review

- Review and demonstrate retained knowledge specific to alternating and direct currents covered in Level 1, *Understanding Electrical Theory*.

Apprenticeship Supplement–Grounding and Bonding

- Describe the scope of *NEC* Article 250–Grounding and Bonding.
- Identify and apply the *Code* rules for grounding and bonding connections and their protection from physical damage.
- Explain the importance of “clean surfaces” where a bonding or grounding connection is made.
- Identify and apply the *Code* rules pertaining to a “Grounding Electrode System.”
- List various types of grounding electrodes permitted by the *Code*.
- Describe the installation requirements for grounding electrodes.
- Explain the importance of a reliable connection to an “effective ground-fault current path.”
- Identify and apply the *Code* requirements for various types of equipment grounding conductors (EGC) and their terminations.

Level 1, Content Exam

- Successfully pass the covered content exam within the program completion requirements.

Level 1, Final Exam

- Successfully pass the Level 1 Final Exam within the program completion requirements.



LEVEL 2 OUTLINE

LEVEL 2 RESOURCES

Mike Holt's Apprenticeship Training Program is designed to use textbooks, slide presentations, videos, labs/activities, review questions, and exams designed to enhance learning, comprehension, and retention of the material presented.

Videos

The instruction package includes videos that can be played along with the textbooks, or viewed in their entirety, to provide a practical viewpoint of the material covered. If something isn't understood or misinterpreted, stop, go back, and play that section again until the topic is clear.

Mike and a panel of industry experts are featured on these videos. They carefully examine the topics in a way that's both educational and entertaining. You'll hear stories, discussions, and opinions that aren't covered in the textbooks thereby making them an invaluable practical source of information.

Presentations

Included in this instruction package are presentations containing hundreds of slides that are synchronized with the textbooks. These presentations are sorted by individual article or unit resulting in much smaller, less cumbersome files and make it easier to follow along side by side with the textbook.

Labs/Activities

One of the most enjoyable parts of learning is "hands on" learning of mechanical parts such as meters, wire, magnets, coils, light bulbs, switches, fuses, circuit breakers, receptacles, GFCIs, AFCIs—basically anything that can be broken!

We strongly suggest you find or create labs that match the topic being studied as a hands-on experience to help students understand the material being covered. Seeing a mechanical concept in action makes it easier to understand the lesson being taught.

Assessments

Student assessments are an important aspect of the learning process. Studies have shown that regardless of the result, students who are required to mentally recall a subject upon review, are more likely to remember the content than those who didn't have this opportunity. Our program includes different options for assessment including, textbook review questions and exams. Online quizzes and exams are available in the blended and online programs in our online Capacitor®.

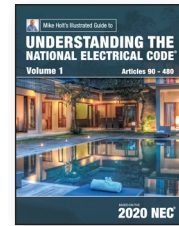
Textbook Questions. Our textbooks contain review questions and exams designed to reinforce the learning process when the online testing tools aren't used. We encourage you to have your students complete the textbook tests before taking the online tests to further reinforce their learning process.

Online Testing. Our online testing program has been specifically designed to take advantage of today's blended or self-paced learning environments and reinforce the material that's been covered.

Books

In Level 2, you'll be using the following books or textbooks and we suggest you take a few moments to review the layout of each. Pay attention to the table of contents, the layout of the units/chapters, and the review questions.

- ▶ *OSHA Construction Safety Training Handbook, 7th Edition*
J.J. Keller & Associates
ISBN 979-8-88912-483-2, 2024
- ▶ *Mike Holt's Understanding the National Electrical Code, Volume 1*
Mike Holt Enterprises
ISBN 978-1-950431-07-6, 2020



Suggested Additional Resources*

- ▶ *National Electrical Code, 2020 Edition*
National Fire Protection Association
ISBN 978-145592297-0, 2019



**Sold separately.*

LEVEL 2 LESSON PLANS– AT A GLANCE

Hours	Content	Hours	Content
1-3	Introduction Orientation Tool Safety <i>Level 2</i>	40-42	NEC–Article 215 <i>Feeders</i>
4-6	OSHA Construction Safety <i>Electrical Safety and PPE</i>	43-45	NEC–Article 220 <i>Branch-Circuit, Feeder, and Service Calculations 1</i>
7-9	OSHA Construction Safety <i>Confined Space, Emergency Response, and Lockout/Tagout</i>	46-48	NEC–Article 220 <i>Branch-Circuit, Feeder, and Service Calculations 2</i>
10-12	NEC–Article 90 <i>Introduction</i>	49-51	NEC–Article 225 <i>Outside Branch Circuits and Feeders</i>
13-15	NEC–Article 100 <i>Definitions</i>	52-54	NEC–Article 230 <i>Services 1</i>
16-18	NEC–Article 110 <i>Requirements for Electrical Installations 1</i>	55-57	NEC–Article 230 <i>Services 2</i>
19-21	NEC–Article 110 <i>Requirements for Electrical Installations 2</i>	58-60	NEC–Article 240 <i>Overcurrent Protection 1</i>
22-24	NEC–Article 200 <i>Use and Identification of Grounded [Neutral] Conductors</i>	61-63	NEC–Article 240 <i>Overcurrent Protection 2</i>
25-27	NEC–Article 210 <i>Branch Circuits 1</i>	64-66	NEC–Article 250 <i>Grounding and Bonding</i>
28-30	NEC–Article 210 <i>Branch Circuits 2</i>	67-69	Lab <i>GFCI Devices</i>
31-33	NEC–Article 210 <i>Branch Circuits 3</i>	70-72	Flex Training <i>Institution/Instructor Choice</i>
34-36	Content Review	73-75	Content Review
37-39	Content Exam	76-78	Content Exam

Hours	Content
79-81	NEC–Article 242 <i>Surge-Protective Devices (SPDs)</i>
82-84	NEC–Article 300 <i>General Requirements for Wiring Methods and Materials 1</i>
85-87	NEC–Article 300 <i>General Requirements for Wiring Methods and Materials 2</i>
88-90	NEC–Article 310 <i>Conductors for General Wiring 1</i>
91-93	NEC–Article 310 <i>Conductors for General Wiring 2</i>
94-96	NEC–Article 312 <i>Cabinets, Cutout Boxes, and Meter Socket Enclosures</i>
97-99	NEC–Article 314 <i>Outlet, Device, Pull, and Junction Boxes; Conduit Bodies; and Handhole Enclosures 1</i>
100-102	NEC–Article 314 <i>Outlet, Device, Pull, and Junction Boxes; Conduit Bodies; and Handhole Enclosures 2</i>
103-105	NEC–Articles 320 and 330 <i>Armored Cable (Type AC) and Metal-Clad Cable (Type MC)</i>
106-108	Lab/Activity <i>Voltage-Drop Calculations</i>
109-111	Flex Training <i>Institution/Instructor Choice</i>
112-114	Content Review
115-117	Content Exam

Hours	Content
118-120	NEC–Articles 334, 336, and 338 <i>Cables Types, NM, NMC, TC, SE, and USE</i>
121-123	NEC–Articles 340, 342, and 348 <i>Cable Type UF, Conduits Types, IMC and FMC</i>
124-126	NEC–Articles 350, 352, and 356 <i>Conduits Types LFMC, PVC, and LFNC</i>
127-129	NEC–Articles 344 and 358 <i>Conduits Types, RMC and EMT</i>
130-132	NEC–Articles 362 and 376 <i>Conduit Type ENT and Metal Wireways</i>
133-135	NEC–Articles 380, 386, and 392 <i>Multioutlet Assemblies, Surface Metal Raceways, and Cable Trays</i>
136-138	Lab/Activity <i>Conduit Bending</i>
139-141	Lab/Activity <i>Raceway Sizing Calculations</i>
142-144	Flex Training <i>Institution/Instructor Choice</i>
145-147	Content Review
148-150	Content Exam
151-153	Level 2 Review
154-156	Level 2 Final Exam



LEVEL 2 OBJECTIVES

Upon the completion of Level 2, students will possess the knowledge necessary to safely and proficiently perform the job duties and responsibilities expected of a second-year apprentice. The student will develop a further knowledge of construction safety, electrical safety, and Chapters 1–3 of the *National Electrical Code*.

As the student studies the rules in the first three chapters of the *NEC*, they will have a greater understanding of the purpose of the *Code*'s general wiring methods, materials, and different types of protection along with developing a deeper understanding of residential and commercial wiring systems.

LEVEL 2 (HOURS 1–39)

At the completion of the following content, students should be able to:

Tool Safety

- Demonstrate the safe and proper usage of various hand tools.
- Explain and demonstrate the safe usage, storage, and pre-use inspection of various power tools.

OSHA Construction Safety

- List some electrical hazards and explain safe electrical practices.
- Explain the importance of PPE and why it's considered “your last line of defense against injury.”
- Define what is meant by a “confined space” relative to working conditions.
- Describe how to get in and out of confined spaces safely.
- Describe an “emergency response” protocol and how you might deal with an incident on a jobsite.
- Outline the “lockout/tagout” procedure and how to control exposure to hazardous electrical energy.

Understanding the *National Electrical Code*, Volume 1

Article 90–Introduction

- Explain the intent and purpose of the *NEC*.
- List what is and is not covered by the rules in the *NEC*.
- List the general articles and how they can be modified by other articles relative to Chapters 1–4.
- Identify key words that identify mandatory and permissive rules.

Article 100–Definitions

- Explain and comprehend the importance of understanding the language and terminology of the *Code* and the meaning of the terms contained within the *NEC*'s Article 100–Definitions.
- Identify and apply more common definitions from memory.

Article 110–Requirements for Electrical Installations

- Describe the significance of the listing and labeling of electrical equipment.
- Discuss interrupting ratings of overcurrent devices.
- Explain short-circuit current and short-circuit current ratings of electrical equipment.
- Describe the effects of deteriorating agents and mechanical execution of work.
- Thoroughly explain electrical connections focusing on temperature limitations and equipment provisions.
- Explain the requirements for high-leg identification and flash protection warning signs.
- Properly select an enclosure for a given installation condition.
- Explain and understand spaces about electrical equipment.
- Discuss working depth in relation to voltage and conditions as shown in Table 110.26(A)(1) Working Space.
- Explain the significance of maintaining proper working width, height, and clear spaces.
- Lay out electrical equipment with proper clearances along with adequate entrance/egress.
- Explain the requirements for foreign systems in dedicated electrical space.

Article 200–Use and Identification of Grounded (Neutral) Conductors

- Demonstrate knowledge of the requirements for the use and identification of the grounded conductor which (in most cases) is the neutral conductor.
- Identify and apply the *Code* requirements for re-identifying white conductors within multi-conductor cables.
- Explain how neutral terminals are identified.
- Describe the dangers of reverse polarity relative to neutral terminals or conductor leads.

Article 210–Branch Circuits

- Identify and apply the requirements for specific branch circuits where necessary.
- Explain how a branch circuit rating is determined.
- Identify and apply the requirements for “multiwire branch circuits.”
- Identify and apply the requirements for branch circuits specific to dwelling units.
- Explain the requirements for branch circuits such as conductor sizing, identification, and AFCI and GFCI protection.
- Describe outlet device ratings for branch circuits and cord-and-plug connected loads.
- Identify and apply the *Code* sections on permissible loads, multiple occupancies, and required outlets general requirements.
- Outline how the *NEC* defines “wall space” as it pertains to the location of “general-use” receptacle outlets within dwelling occupancies.
- Outline how the *NEC* defines “countertop space” as it pertains to the location of receptacles served by small-appliance branch circuits.

- Identify and apply the *Code* requirements for receptacle placement in dwelling unit bathrooms, garages, basements, outdoors, and hallways.
- Identify and apply the *Code* requirements for guest rooms, suites, dormitories, and similar occupancies with respect to receptacle placement for permanent furniture layout.

Level 2, Content Exam

- Successfully pass the covered content exam within the program completion requirements.

LEVEL 2 (HOURS 40–78)

At the completion of the following content, students should be able to:

Understanding the *National Electrical Code*, Volume 1

Article 215–Feeders

- Discuss the requirements for the installation of feeders and calculate their ampacities.
- Discuss the requirements for calculating the required sizes for branch circuits, feeders, and services. Accurately determine the mandatory number of branch circuits and the required number of receptacles on each.
- Outline the requirements for wiring methods located outside (both overhead and underground) including feeders that run on or between buildings, poles, and other structures which may be present on the premises and used to feed equipment.

Article 220–Branch-Circuit, Feeder, and Service Calculations

- Calculate branch-circuit loads.
- Select proper overcurrent protection devices (OCPD) for branch circuits.
- Select minimum conductor size for branch circuits.
- Calculate service/feeder loads and selection ampacities.
- Select proper OCPD for service/feeder loads.
- Select minimum conductor size for service/feeders.

Article 225–Outside Branch Circuits and Feeders

- Outline the requirements for wiring methods located outside (both overhead and underground) including feeders that run on or between buildings, poles, and other structures which may be present on the premises and used to feed equipment.

Article 230–Services

- Demonstrate knowledge of the terminology and definitions related to services such as where an electrical service begins and ends when applying the requirements for services.
- Outline the installation requirements for service conductors and equipment.
- Explain the service disconnect requirements as related to grouping and limitations.
- Identify and apply the service disconnect requirements specific to one- and two-family dwellings.

Article 240–Overcurrent Protection

- Explain the purpose and function of various OCPDs.
- List the more common standard OCPD current ratings.
- Identify the different types of circuit breakers and fuses, and apply the *Code* rules for each.
- Explain the difference between an OCPD “rated” current and “fault” current rating and the purpose of each.
- Describe the requirements for where an OCPD is to be located in a given circuit.
- Identify and apply the *Code* rules for “tap conductors.”

Article 250–Grounding and Bonding

- Demonstrate a thorough understanding of the terminology used throughout Article 250.
- Define what is meant by the “bonding” of electrical equipment.
- Define what is meant by “grounding” an electrical system.
- Explain the significance of distinguishing between grounding and bonding.
- Apply the grounding requirements for providing a path to the Earth to reduce overvoltage from lightning.
- Define an “effective ground-fault current path.”
- Explain the bonding requirements necessary to maintain a low-impedance fault current path necessary to facilitate the operation of overcurrent protective devices in the event of a ground fault.
- Identify and apply the requirements for the installation of a grounding electrode.
- Correctly size the grounding electrode conductor (GEC) for a separately derived system.
- Identify and apply the rules for equipment grounding and equipment grounding conductors.
- Correctly size an equipment grounding conductor for a given application.

Level 2, Content Exam

- Successfully pass the covered content exam within the program completion requirements.

LEVEL 2 (HOURS 79–117)

At the completion of the following content, students should be able to:

Understanding the *National Electrical Code*, Volume 1**Article 242–Overvoltage Protection**

- Describe the purpose of a surge protective device (SPD).
- Describe how SPDs functions.
- List the different “types” of SPD devices and how each is rated.
- Explain the general installation and connection requirements for SPDs permanently installed on both the line side and load side of service disconnects.

Article 300–General Requirements for Wiring Methods and Materials

- Identify and apply the general requirements for conductors and raceways such as:
 - protection against physical damage
 - minimum “cover” requirements for underground installations
 - raceways exposed to different temperatures and wet locations
 - electrical and mechanical continuity of raceways
 - mechanical and electrical continuity of conductors, splices, and pigtails
 - number and size of conductors in a raceway, vertical support, and conductor jamming
 - induced current in a non-ferrous raceway
- Identify and apply the *Code* rules to prevent the spread of fire, and the requirements for wiring in ducts and plenums.

Article 310–Conductors for General Wiring

- List the requirements for conductors installed in parallel including minimum size.
- Identify locations and corrosive conditions affecting conductor selection.
- Explain conductor insulation limitations and the letter designators used for the identification of these limitations.
- Select the appropriate conductor ampacity for a single-family dwelling service or feeder.
- Demonstrate proficiency in determining conductor ampacity subject to correction or adjustment—or both.
- Identify and apply correct conductors sizes based on the Ampacity Table 310.16.

Article 312–Cabinets, Cutout Boxes, and Meter Socket Enclosures

- Select the equipment necessary for installation in damp or wet locations.
- Describe the *Code* rules for enclosure installations recessed in wall cavities.
- Explain conductor protection when entering or leaving an enclosure.
- Identify and apply the requirements relative to wire bending space.
- Explain when and if an enclosure is permitted to be used as a raceway.

Article 314–Outlet, Device, Pull, and Junction Boxes; Conduit Bodies; and Handhole Enclosures

- Identify and apply the *Code* rules for both metallic and non-metallic boxes.
- Identify and apply the requirements relative to “box-fill” calculations.
- Identify and apply the formulas necessary to determine the power losses and efficiency of utilization equipment.
- Identify and apply the requirements for sizing pull-boxes based on raceway sizes and type of pull.

Cable Articles–Articles 320 through 330

- Select which cables are appropriate for a given type of electrical installation and outline the rules for their installation.
- Explain that the *NEC* includes rules pertaining to which types of cables are suitable for underground installations.
- Identify and apply the *Code* rules for the uses permitted, securing, supporting, and protection of various cable types.

Level 2, Content Exam

- Successfully pass the covered content exam within the program completion requirements.

LEVEL 2 (HOURS 118–156)

At the completion of the following content, students should be able to:

Understanding the *National Electrical Code*, Volume 1

Wiring Methods and Raceway Articles–Articles 334 through 392

- Select which wiring methods and raceways are appropriate for a given type of electrical installation and outline the rules for their installation.
- Explain that the *NEC* includes rules pertaining to which types of raceways are suitable for underground installations and exposure to corrosive environments.
- Identify and apply the *Code* rules for the uses permitted, securing, supporting, and protection of various raceways.

Level 2, Content Exam

- Successfully pass the covered content exam within the program completion requirements.

Level 2, Final Exam

- Successfully pass the Level 2 Final Exam within the program completion requirements.



LEVEL 3 OUTLINE

LEVEL 3 RESOURCES

Mike Holt's Apprenticeship Training Program is designed to use textbooks, slide presentations, videos, labs/activities, review questions, and exams designed to enhance learning, comprehension, and retention of the material presented.

Videos

The instruction package includes videos that can be played along with the textbooks, or viewed in their entirety, to provide a practical viewpoint of the material covered. If something isn't understood or misinterpreted, stop, go back, and play that section again until the topic is clear.

Mike and a panel of industry experts are featured on these videos. They carefully examine the topics in a way that's both educational and entertaining. You'll hear stories, discussions, and opinions that aren't covered in the textbooks thereby making them an invaluable practical source of information.

Presentations

Included in this instruction package are presentations containing hundreds of slides that are synchronized with the textbooks. These presentations are sorted by individual article or unit resulting in much smaller, less cumbersome files and make it easier to follow along side by side with the textbook.

Labs/Activities

One of the most enjoyable parts of learning is "hands on" learning of mechanical parts such as meters, wire, magnets, coils, light bulbs, switches, fuses, circuit breakers, receptacles, GFCIs, AFCIs—basically anything that can be broken!

We strongly suggest you find or create labs that match the topic being studied as a hands-on experience to help students understand the material being covered. Seeing a mechanical concept in action makes it easier to understand the lesson being taught.

Assessments

Student assessments are an important aspect of the learning process. Studies have shown that regardless of the result, students who are required to mentally recall a subject upon review, are more likely to remember the content than those who didn't have this opportunity. Our program includes different options for assessment including, textbook review questions and exams. Online quizzes and exams are available in the blended and online programs in our online Capacitor®.

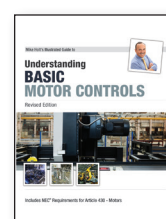
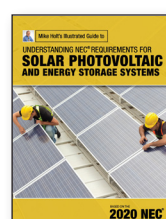
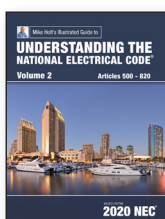
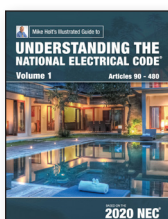
Textbook Questions. Our textbooks contain review questions and exams designed to reinforce the learning process when the online testing tools aren't used. We encourage you to have your students complete the textbook tests before taking the online tests to further reinforce their learning process.

Online Testing. Our online testing program has been specifically designed to take advantage of today's blended or self-paced learning environments and reinforce the material that's been covered.

Books

You'll be using the following books or textbooks and we suggest you take a few moments to review the layout of each. Pay attention to the table of contents, the layout of the units and chapters, and the review questions.

- ▶ *Mike Holt's Understanding the National Electrical Code, Volume 1*
Mike Holt Enterprises
ISBN 978-1-950431-07-6, 2020
- ▶ *Mike Holt's Understanding NEC Requirements for Bonding and Grounding*
Mike Holt Enterprises
ISBN 978-1-950431-03-8, 2020
- ▶ *Mike Holt's Understanding the National Electrical Code, Volume 2*
Mike Holt Enterprises
ISBN 978-1-950431-08-3, 2020
- ▶ *OSHA Construction Safety Training Handbook, 7th Edition*
J.J. Keller & Associates
ISBN 979-8-88912-483-2, 2024
- ▶ *Mike Holt's Understanding NEC Requirements for Solar Photovoltaic (PV) and Energy Storage Systems*
Mike Holt Enterprises
ISBN 978-1-950431-05-2, 2020
- ▶ *Mike Holt's Understanding Basic Motor Controls*
Mike Holt Enterprises
ISBN 978-0-9992038-4-2, Revised Edition



Suggested Additional Resources*

- ▶ *National Electrical Code, 2020 Edition*
National Fire Protection Association
ISBN 978-145592297-0, 2019



**Sold separately.*

LEVEL 3 LESSON PLANS– AT A GLANCE

Hours	Content	Hours	Content
1-3	Introduction Orientation Tool Safety <i>Level 3</i>	40-42	Lab/Activity <i>Lighting–Ballasts and Transformers</i>
4-6	OSHA Construction Safety <i>Electrical Safety and PPE</i>	43-45	NEC–Articles 440, 445, and 450 <i>Air-Conditioning/Refrigeration Equipment and Transformers</i>
7-9	OSHA Construction Safety <i>Excavation/Motor Vehicles/Tool Safety</i>	46-48	Bonding and Grounding–Fundamentals <i>Units 1, 2, 3, and 4</i>
10-12	NEC–Articles 400 and 402 <i>Flexible Cords and Cables, and Fixture Wires</i>	49-51	Bonding and Grounding–NEC <i>Articles, 90, 100, and 110</i>
13-15	NEC–Articles 404 and 406 <i>Switches and Receptacles</i>	52-54	Bonding and Grounding–NEC <i>Article 250</i>
16-18	NEC–Article 408 <i>Switchboards, Switchgear, and Panelboards</i>	55-57	Bonding and Grounding–NEC <i>Article 250</i>
19-21	NEC–Articles 410 and 411 <i>Luminaires and Low-Voltage Lighting Systems</i>	58-60	Bonding and Grounding–NEC <i>Article 250</i>
22-24	NEC–Article 422 <i>Appliances</i>	61-63	NEC–Articles 500-503, 511, and 514 <i>Hazardous Locations, Commercial Garages, and Motor Fuel Dispensing</i>
25-27	NEC–Article 424 <i>Fixed Electric Space-Heating Equipment</i>	64-66	NEC–Articles 517, 518, 550, and 590 <i>Health Care Facilities, Assembly Occupancies, Mobile/Manufactured Homes, and Temporary Installations</i>
28-30	NEC–Article 430 <i>Motors, Motor Circuits, and Controllers 1</i>	67-69	NEC–Articles 600, 604, and 620 <i>Electric Signs, Manufactured Wiring Systems, and Elevators</i>
31-33	NEC–Article 430 <i>Motors, Motor Circuits, and Controllers 2</i>	70-72	Flex Training <i>Institution/Instructor Choice</i>
34-36	Content Review	73-75	Content Review
37-39	Content Exam	76-78	Content Exam

Hours	Content
79-81	NEC–Articles 625 and 630 <i>Electric Vehicle Charging System and Electric Welders</i>
82-84	NEC–Articles 640 and 645 <i>Audio Signal Processing and Information Technology Equipment</i>
85-87	NEC–Article 680 <i>Swimming Pools, Spas, Hot Tubs, Fountains, and Similar Installations</i>
88-90	NEC–Articles 700, 701, and 702 <i>Emergency, Legally Required, and Optional Standby Systems</i>
91-93	NEC–Article 725 <i>Remote-Control, Signaling, and Power-Limited Circuits</i>
94-96	NEC–Articles 760, 770, 800, 805, 810, and 820 <i>Fire Alarm Systems, Optical Fiber Cables and Raceways, Communications Circuits, Radio and Television Equipment, and CATV and Radio Distribution Systems.</i>
97-99	NEC–Article 690 <i>Solar Photovoltaic (PV) Systems 1</i>
100-102	NEC–Article 690 <i>Solar Photovoltaic (PV) Systems 2</i>
103-105	NEC–Articles 480, 691, and 705 <i>Storage Batteries, Large-Scale Solar Photovoltaic (PV) Electric Supply Stations, and Interconnected Electric Power Production Sources (IEPPS)</i>
106-108	NEC–Articles 705 and 706 <i>Interconnected Electric Power Production Sources (IEPPS) and Energy Storage Systems</i>
109-111	NEC–Articles 706 and 710 <i>Energy Storage and Stand-Alone Systems</i>
112-114	Content Review
115-117	Content Exam

Hours	Content
118-120	Motor Controls–Units 1–3 <i>Introduction to Motor Controls</i>
121-123	Motor Controls– Units 4–8 <i>Motor Controls and Schematics 1</i>
124-126	Motor Controls–Units 9–10 <i>Motor Controls and Schematics 2</i>
127-129	Motor Controls– Units 11–12 <i>Reversing Controls 1</i>
130-132	Motor Controls–Units 13–14 <i>Reversing Controls 2</i>
133-135	Motor Controls–Units 15–16 <i>Controls for Multiple Motors</i>
136-138	Motor Controls–Units 17–20 <i>Miscellaneous Requirements</i>
139-141	Lab/Activity <i>Instructor/Institution Choice</i>
142-144	Flex Training <i>Institution/Instructor Choice</i>
145-147	Content Review
148-150	Content Exam
151-153	Level 3 Review
154-156	Level 3 Final Exam



LEVEL 3 OBJECTIVES

Upon the completion of Level 3, students will possess the knowledge necessary to safely and proficiently perform the job duties and responsibilities expected of a third-year apprentice. The student will continue building a foundation of knowledge about construction safety, electrical safety, and the *National Electrical Code*.

LEVEL 3 (HOURS 1–39)

At the completion of the following content, students should be able to:

Tool Safety

- Demonstrate the safe and proper usage of various hand tools.
- Explain and demonstrate the safe usage, storage, and pre-use inspection of various power tools.

OSHA–Construction Safety

- List some electrical hazards and explain safe electrical practices.
- Explain the importance of PPE and why it's considered “your last line of defense against injury.”
- Demonstrate an understanding of excavation safety in and around the site.
- Demonstrate an understanding of construction vehicle operations and safety protocols.

Understanding the *National Electrical Code*, Volume 1

Article 400–Flexible Cords and Cables

- Identify and apply ampacity ratings for various cords and cables.
- Describe some of the more commonly used types of cords and cables.
- Explain the application and purpose of “strain relief” where cords or cables are the wiring method.

Article 402–Fixture Wires

- Demonstrate the ability to properly select fixture wires for a given ampacity.
- List where the use of fixture wires is permitted.

Article 404–Switches

- Explain the primary function of a switch and describe various types of switches and their applications.
- Select the appropriate switching equipment based on location and rating.
- Commit to memory the maximum mounting height for switches.
- Demonstrate the proper switch connections for 3- and 4-way switches.
- Identify and apply the acceptable methods for the bonding of metal switch plates or covers.

Article 406–Receptacles

- Describe various receptacle types and their applications.
- Explain the concept of receptacle ratings and the reason for various NEMA configurations.
- List the criteria for the replacements of non-grounding type receptacles.
- Identify and apply the *Code* rules for attachment plugs and cord connectors.

Article 408–Switchboards, Switchgear, and Panelboards

- Define the terms, “switchboard,” “switchgear,” and “panelboard.”
- Explain the “phase” arrangement with respect to the high-leg of a Delta-type electrical system.
- Identify and apply the *Code* rules pertaining to panel directories.
- List types of enclosures suitable for installing panelboards in damp and wet locations.
- Demonstrate proper termination of conductors in panelboards.
- List the proper percent fill for panelboard enclosures when used as raceways and for splices.

Article 410–Luminaires

- Describe the definitions associated with luminaires, lampholders, and lamps.
- Identify and apply the requirements for luminaires installed near combustibles.
- Identify and apply the *Code* rules for luminaires installed in clothes closets.
- Identify and apply the *Code* rules for luminaires installed in bathtub and shower spaces.

Article 411–Low-Voltage Lighting Systems

- Outline the requirements for the installation of low-voltage lighting systems and their associated components, as well as their ac/dc voltage limitations.

Article 422–Appliances

- Identify and apply the requirements specific to the branch circuit ratings and overcurrent protection for various appliances.
- Identify and apply the *Code* rules for proper appliance disconnecting means and types.
- List instances where ground-fault circuit interrupter (GFCI) protection is required for specific appliances.
- Describe the permitted uses of flexible cords for appliances.
- Identify equipment to properly assemble cord-and-plug connections for appliances.

Article 424–Fixed Electric Space-Heating Equipment

- Describe the requirements that cover fixed electric equipment used for space heating.
- Recognize that heating equipment includes heating cable, unit heaters, boilers, central systems, and other fixed electric space-heating equipment.
- Understand that Article 424 does not apply to process heating and room air-conditioning.

Article 430–Motors

- Demonstrate knowledge of the specific requirements for conductor sizing, overcurrent protection, control circuit conductors, motor controllers, and disconnecting means covered in Article 430.
- Competently calculate the minimum conductor required, maximum overload protection rating, and maximum branch-circuit OCPD ratings for motor branch circuits.
- Competently calculate maximum OCPD for motor feeders.

Level 3, Content Exam

- Successfully pass the covered content exam within the program completion requirements.

LEVEL 3 (HOURS 40–78)

At the completion of the following content, students should be able to:

Understanding the *National Electrical Code*, Volume 1

Article 440–Air Conditioning and Refrigeration Equipment

- Describe the requirements pertaining to electrically driven air-conditioning and refrigeration equipment with motorized hermetic refrigerant motor compressors.
- Demonstrate the ability to size the appropriate conductors based on the equipment demand load.
- Determine the equipment overcurrent protection as required.
- Identify and apply the branch circuit requirements pertaining to “room” air conditioners.

Article 445–Generators

- Outline the electrical installation requirements for generators and other requirements such as where they can be installed, their nameplate markings, conductor ampacity, and disconnecting means.

Article 450–Transformers

- Explain the general requirements for the installation of transformers, calculating overcurrent protection, and when it is necessary.
- Identify and apply the requirements for transformer primary and secondary overcurrent protection.

Bonding and Grounding–Fundamentals

Unit 1–Matter

- Describe the structure of an atom.
- Define the subatomic particles of an atom.
- Exhibit an understanding of positive and negative electrostatic charges of an atom.
- Identify some of the hazards of a high-voltage electrostatic discharge and how to mitigate these hazards.
- Explain the cause and effect of a lightning strike.
- Describe what can be done to mitigate the effects of a lightning strike.
- Explain the intent of a lightning protection system.

Unit 2–Electron Theory

- Exhibit an understanding of electron theory.
- Describe the relationship between electrons and protons.
- Explain the characteristics of electrons relative to conductive and insulative properties of an element.
- Explain what makes a good conductor and why.

Unit 3–Sources, Uses, and Dangers of Electricity

- List common sources of electrical power.
- Describe electrical current flow.
- Describe how photoelectricity is produced in a PV system.
- List the dangers inherent with the use of electricity.
- Explain the intent of the *NEC* with regard to the use of electricity.

Unit 4–Circuit Protective Devices

- Explain the primary function of an overcurrent protective device.
- List and describe the conditions that will cause an overcurrent protection device to function.
- Describe the differences and similarities between a short-circuit and a ground-fault.
- Explain the concept of a “time-current curve.”
- List the most common types of overcurrent protective devices.
- Describe the difference between overload and fault current protection.
- Explain the importance of ground-fault circuit interrupter (GFCI) protection.
- Describe the conditions that will cause a GFCI device to function.
- Describe the importance of how to confirm a GFCI device is properly functioning.

Bonding and Grounding–NEC**Article 90–Introduction to the *National Electrical Code***

- Explain the intent and purpose of the *NEC*.
- List what is and is not covered by the rules in the *NEC*.
- Understand the arrangement of the *NEC*.
- Explain by whom and how the rules in the *NEC* are enforced.
- Identify key words that identify mandatory and permissive rules.

Chapter 1–General Rules

- Explain and comprehend the importance of understanding the language and terminology of the *Code* and the meaning of the terms contained within the *NEC*'s Article 100–Definitions.
- Reference and apply the *Code* rules for the examination, identification, installation, use, and product listing (certification) of equipment.
- Describe the rules regarding conductor material.
- List the standards that express conductor sizes.
- List and describe the effects of deteriorating agents, and the rules that apply to wiring methods in these environments.
- Identify and apply the rules for conductor splicing.
- Thoroughly explain and apply the rules relating to conductor material and terminations, and electrical connections with regard to temperature limitations and proper torquing.

Bonding and Grounding–Article 250**Part I–General Requirements**

- Demonstrate a thorough understanding of the terminology used throughout Article 250.
- Define what is meant by the “bonding” of electrical equipment.
- Define what is meant by “grounding” an electrical system.
- Explain the significance of distinguishing between grounding and bonding.
- Identify the various grounding terminations, their locations and performance requirements, in a solidly grounded (ac) system.
- Explain the significant hazards created when an electrical system is not properly grounded.
- Define, and explain the importance of, an “effective ground-fault-current path.”
- List what components of an electrical system must be connected together to maintain electrical continuity.
- Explain the importance of ensuring the electrical continuity of all noncurrent-carrying metal parts of an electrical system.
- Describe how Earth grounding does not remove touch potential and why this is such a dangerous misconception.
- Apply the grounding requirements for providing a path to the Earth to reduce overvoltage from lightning, and the bonding requirements for the low-impedance fault current path necessary to facilitate the operation of overcurrent protective devices in the event of a ground fault.

Part II–System Grounding and Bonding

- Explain what is meant by an “ungrounded system” and why such systems must be grounded.
- Define the term objectionable current and explain the hazards involved.
- List and apply the *Code* rules regarding objectionable current.
- List the permitted methods for making bonding and grounding connections.
- Apply the surface contact requirements for effective grounding and/or bonding connections.
- Identify (ac) systems that are required to be grounded.
- Identify the following and their respective locations in an electrical system:
 - main bonding jumper (MBJ)
 - system bonding jumper (SBJ)
 - supply-side bonding jumper (SSBJ)
- Describe where the service neutral conductor must be grounded AND bonded.
- Explain when a service or feeder neutral must be insulated and why.
- Describe the requirements for bonding and grounding at the supply side of the service disconnect.
- Define a “separately derived system.”
- Explain the bonding and grounding requirements for a separately derived system.
- Correctly size a supply-side bonding jumper and neutral conductor originating from a separately derived system.
- Explain the rules for neutral conductors installed in parallel.

Part III–Grounding Electrode System and Grounding Electrode Conductor

- Correctly size the grounding electrode conductor (GEC) for a separately derived system.
- Define both a “common grounding electrode” and “common grounding electrode conductor.”
- Explain the rules for grounding relative to buildings supplied by a feeder.
- Distinguish between, and describe the intent of, a GEC and an equipment grounding conductor (EGC).
- Explain the rules for the grounding of generators.
- Define a “high-impedance (or high-resistance) system” and explain the rules for grounding of such systems.
- Explain what is meant by a “grounding electrode system.”
- List various types of grounding electrodes and explain what may be used as a grounding electrode.
- Apply the requirements for the installation of, and connections to, various type of grounding electrode conductors.
- Apply the requirements for supplemental ground rods.
- Define an “auxiliary grounding electrode.”
- Identify and apply the requirements for grounding electrode conductors and their installation.
- Demonstrate the ability to correctly size grounding electrode conductors.
- Identify fittings listed for grounding electrode conductor terminations.

Part IV–Enclosure, Raceway, and Service Cable Connections

- List the components of a service that must be bonded.

Part V–Bonding for Fault Current

- Identify and apply the requirements for the bonding of:
 - equipment containing service conductors
 - communications systems
 - other enclosures
 - 277/480V circuits
 - loosely jointed metal raceways
- Apply the values in Table 250.102(C)(1) to correctly size neutral conductors and bonding jumpers.
- Identify and apply the requirements for the bonding of metal piping systems.

Part VI–Equipment Grounding and Equipment Grounding Conductors

- Identify and apply the rules for equipment grounding and equipment grounding conductors for:
 - metal enclosures and cord-and-plug connected equipment
 - the types and identification of equipment grounding conductors
 - the installation and restricted use of equipment grounding conductors
 - the sizing of equipment grounding conductors

Part VII–Methods of Equipment Grounding Conductor Connections

- Identify and apply the rules for the connections of equipment grounding conductors for:
 - permanent wiring methods and equipment secured to metal supports
 - cord-and-plug connected equipment and the frames of ranges, ovens, and dryers
 - using the neutral conductor to provide an effective ground-fault current path
 - receptacle grounding terminals
 - continuity and attachment to metal boxes

Understanding the *National Electrical Code*, Volume 2

Articles 500–503–Hazardous (Classified) Locations

- List general requirements applicable to all hazardous (classified) locations.
- Explain that a hazardous (classified) location is an area where the possibility of fire or explosion exists due to the presence of flammable or combustible liquid-produced vapors, flammable gases, combustible dusts, or easily ignitable fibers/flyings.
- Explain that a Class I hazardous (classified) location is an area where flammable or combustible liquid-produced vapors or flammable gases may present the hazard of a fire or explosion.
- Describe the Class I divisions and identify the appropriate wiring methods for such locations.
- Explain that a Class II hazardous (classified) location is an area where the possibility of fire or explosion may exist due to the presence of combustible dust.
- Describe the Class II divisions and identify the appropriate wiring methods for such locations.
- Explain that Class III hazardous (classified) locations are hazardous because fire or explosion risks may exist due to easily ignitable fibers/flyings. Identify the locations that may produce fibers from materials such as cotton and rayon which are found in textile mills and clothing manufacturing plants.

- Explain that these locations can also include establishments and industries such as sawmills and woodworking plants.
- Describe the Class III divisions and identify the appropriate wiring methods for such locations.

Article 511–Commercial Garages, Repair, and Storage

- Outline that commercial garages used for repair and storage are locations used for service and repair operations in connection with self-propelled vehicles including (but not limited to) passenger automobiles, buses, trucks, and tractors in which flammable liquids or flammable gases are used for fuel or power. Identify the appropriate wiring methods for such locations.

Article 514–Motor Fuel Dispensing Facilities

- Explain that motor fuel dispensing facilities are gasoline dispensing and service stations where gasoline or other volatile liquids are transferred to the fuel tanks of self-propelled vehicles.
- Outline the wiring and equipment requirements for the area of service and repair rooms of service stations in compliance with the installation requirements in Article 511.

Article 517–Health Care Facilities

- Apply the *Code* requirements which apply to electrical wiring in human health care facilities such as hospitals, nursing homes, limited-care facilities, clinics, medical and dental offices, and ambulatory care—whether permanent or movable.

Article 518–Assembly Occupancies

- Apply the *NEC* requirements which apply to assembly occupancies.
- Explain that these rules apply to buildings or portions of buildings specifically designed or intended for the assembly of 100 or more persons.

Article 550–Mobile Home, Manufactured Homes, and Mobile Home Parks

- Outline the *NEC* requirements for the installation of electrical conductors and equipment within or on mobile and manufactured homes, conductors that connect mobile and manufactured homes to the electrical supply, and the installation of electrical wiring, luminaires, and electrical equipment in or on mobile and manufactured homes.

Article 590–Temporary Installations

- Define temporary power and lighting for construction, remodeling, maintenance, repair, demolitions, and decorative lighting. List the general requirements for temporary electrical installations and explain their time limitations.

Article 600–Electric Signs

- Identify and apply the electrical installation requirements for the conductors and equipment for electric signs and outline lighting as defined in Article 100.
- Explain that all products and installations utilizing neon tubing such as signs, decorative elements, skeleton tubing, or art forms are included.
- Define the process of, and identify the rules that apply to, retrofitting existing lighting installations.

Article 604–Manufactured Wiring Systems

- Identify and apply the *Code* requirements for field-installed manufactured wiring systems used for branch circuits, remote-control circuits, signaling circuits, and communications circuits in accessible areas.
- Explain that the components of a listed manufactured wiring system can be assembled at the jobsite.

Article 620–Elevators

- List the *NEC* requirements for the installation of electrical equipment and wiring used in connection with elevators, dumbwaiters, escalators, moving walks, wheelchair lifts, and stairway chair lifts.
- Identify and apply the *Code* rules for wiring and equipment located in the elevator pit.
- Identify and apply the *Code* rules for electrical installations in the elevator machine room.

Level 3, Content Exam

- Successfully pass the covered content exam within the program completion requirements.

LEVEL 3 (HOURS 79–117)

At the completion of the following content, students should be able to:

Understanding the *National Electrical Code*, Volume 2

Article 625–Electric Vehicle Power Transfer System

- Define an “electric vehicle power transfer system.”
- List the requirements for the electrical equipment needed to charge automotive-type electric and hybrid vehicles including cars, bikes, and buses.
- Explain the concept of “bi-directional power transfer.”

Article 630–Electric Welders

- Apply the *Code* requirements for the wiring of electric arc welding and resistance welding apparatus, and other similar welding equipment connected to an electrical supply system.
- Accurately perform branch circuit, feeder, and overcurrent protection calculations for electric welders.

Article 640–Audio Signal Processing

- Explain the *NEC* requirements that apply to equipment and wiring for audio signal generation, recording, processing, amplification and reproduction, distribution of sound, public address, speech input systems, temporary audio system installations, and electronic musical instruments such as electric organs, electric guitars, and electronic drums/percussion.

Article 645–Information Technology Equipment

- Discuss the *Code* requirements that apply to equipment, power-supply wiring, equipment interconnecting wiring, and grounding of information technology equipment and systems (including terminal units) in an information technology equipment room.
- Define underfloor wiring and list the approved wiring methods for these areas.

Article 680–Swimming Pools, Spas, Hot Tubs, Fountains, and Similar Installations

- Explain the significance of correctly applying the *NEC* requirements for the installation of bonding and grounding devices and the electric wiring and equipment that supply swimming, wading, therapeutic and decorative pools, fountains, hot tubs, spas, hydromassage bathtubs, and powered pool lifts whether permanently installed or storable.
- Describe equipotential bonding as applied to swimming pools.

Article 695–Fire Pumps

- Recite the wiring considerations specific to the reliable operation of fire pumps.
- Explain the *NEC* rules as they apply to the electric power sources and interconnecting circuits for electric motor-driven fire pumps and switching and control equipment dedicated to fire pump drivers.

Article 700–Emergency Standby Systems

- Describe how the requirements of Article 700 apply only to the wiring methods for “emergency systems” that are essential for safety to human life and required by federal, state, municipal, or other regulatory codes.
- Explain that according to the *NEC*, when normal power is lost, emergency systems must be capable of supplying emergency power in 10 seconds or less and be able to run loads for at least 2 hours on gasoline and 90 minutes on a battery.

Article 701–Legally Required Standby Systems

- Define “legally required standby systems” as those that provide electrical power to aid in firefighting, rescue operations, control of health hazards, and similar operations and are required by federal, state, municipal, or other regulatory *codes*.
- Explain that according to the *Code*, when normal power is lost, legally required standby systems must be capable of automatically supplying standby power in 60 seconds or less and be able to run loads for at least 2 hours on gasoline and 90 minutes on a battery.
- List who might determine that a standby system is legally required.
- Apply the Article 701 requirements when connecting such systems.

Article 702–Optional Standby Systems

- Define “optional standby systems” as those intended to protect public or private facilities or property where life safety does not depend on the performance of the system.
- Explain that these systems are typically installed to serve loads that, when stopped during any power outage, can cause discomfort, serious interruption of a process, or damage to a product or process.
- Explain that optional standby systems are intended to supply onsite generated power, either automatically or manually, to loads selected by the customer.
- Explain the difference between legally required and optional standby systems.
- Apply the Article 702 requirements when connecting such systems.

Article 725–Remote-Control, Signaling, and Power-Limited Circuits

- Identify and apply the *NEC* requirements for remote-control, signaling, and power-limited circuits that are not an integral part of a device or appliance.
- Define a “remote-control circuit” as a circuit that controls others through a relay or solid-state device.
- Define a “signaling circuit” as a circuit that supplies energy to an appliance or device that gives a visual and audible signal. List examples of signaling circuits.

Article 760–Fire Alarm Systems

- Identify and apply the *Code* requirements for the installation of wiring and equipment for fire alarm systems.
- Explain that these requirements apply to fire detection and alarm notification, voice communications, guard’s tour, sprinkler waterflow, and sprinkler supervisory systems.

Article 770–Optical Fiber Cables and Raceways

- List and define the various types of optical fiber cables. Identify and apply the *NEC* requirements for the installation of optical fiber cables.
- Explain that optical fiber cables are those cables that transmit signals using light for control, signaling, and communications.
- Identify and apply the installation requirements for raceways that contain optical fiber cables, and the rules for composite cables (often called “hybrid” cables in the field) that combine optical fibers with current-carrying metallic conductors.

Article 800–Communications Systems

- List and describe the general requirements for the installation of communications systems.
- Explain that these requirements can be modified by Articles 805 or 820.
- Describe how these communications circuits fit into the premises electrical grounding system.
- List and describe the installation requirements for communications circuits and equipment related to telephone wiring and other telecommunications purposes such as computer local area networks (LANs) and outside wiring for fire and burglar alarm systems connected to central monitoring stations.
- Describe how these communications systems fit into the premises electrical grounding system.

Article 805–General Requirements For Communications Systems

- List and describe the installation requirements for communications circuits and equipment related to telephone wiring and other telecommunications purposes such as computer local area networks (LANs) and outside wiring for fire and burglar alarm systems connected to central monitoring stations.
- Describe how these communications systems fit into the premises electrical grounding system.

Article 810–Radio and Television Antenna Equipment

- Identify the requirements that apply to antenna systems for radio and television receiving equipment, amateur radio transmitting and receiving equipment, and certain features of transmitter safety.
- Explain that these requirements also include antennas such as multi-element, vertical rod and dish, and the wiring and cabling that connects them to the equipment.
- Describe how these different components fit into the premises electrical grounding system.

Article 820–CATV Radio Distribution Systems (Coaxial Cable)

- Identify the requirements that apply to the installation of coaxial cables that distribute limited-energy high-frequency signals for television, cable TV, and closed-circuit television (CCTV) which is often used for security purposes.
- Explain that these requirements also apply to the premises wiring of satellite TV systems where the dish antenna is outside and covered by Article 810.
- Describe how these cable systems fit into the premises electrical grounding system.

Article 690–Solar Photovoltaic (PV) Systems

- Describe the electrical hazards that may arise from installing and operating a solar photovoltaic (PV) system.
- State the definitions of some of the equipment terminology that is specific to PV systems and their purposes.
- Paraphrase the wiring and installation requirements for PV systems.
- Explain that the requirements of the *NEC* Chapters 1–4 apply to these installations, except as specifically modified in Article 690.

Article 480–Storage Batteries

- Explain the requirements and safety considerations for the installation of storage batteries.

Article 691–Large Scale Solar Photovoltaic (PV) Electric Supply Stations

- Discuss the *Code* rules that apply to large-scale solar photovoltaic (PV) electric supply stations with a generating capacity of 5,000 kW or more and not under exclusive utility control.

Article 705–Interconnected Electric Power Production Sources (IEPPS)

- Understand that interconnected electric power production sources (IEPPS) are alternate power sources (such as solar or wind turbines) that run in parallel with a primary utility source and need particular consideration and requirements.
- Apply the *NEC* requirements when connecting such systems.

Article 706–Energy Storage Systems

- Explain that energy storage systems (ESS) can be (and usually are) connected to other energy sources, such as the local utility distribution system and that there can be more than one source of power connected to an ESS.
- Identify the requirements of Article 705 which covers installation of one or more interconnected electric power production sources operating in parallel with a utility source of electricity.
- Confirm how Article 706 correlates with other articles in the *Code* such as Articles 480, 690, 692, and 694.

Article 710–Stand Alone Systems

- Define a “stand-alone system” as an electrical system that is self-sufficient and a completely “off the grid” source of electrical energy such as solar or wind.
- Explain that a stand-alone system may be connected to a utility supply as part of an interconnected system and how Article 710 specifically addresses these systems.

Level 3, Content Exam

- Successfully pass the covered content exam within the program completion requirements.

LEVEL 3 (HOURS 118–156)

At the completion of the following content, students should be able to:

Motor Controls

Motor Controls–Units 1–3, Introduction

- Explain the basic concepts of motor controls, concentrating on how specialized electrical symbols, words, and line diagrams are used to convey information about motor control circuits.
- Describe the purpose of various types of motor circuit diagrams such as:
 - ladder diagrams (these are also called line diagrams or elementary diagrams)
 - connection diagrams (also called wiring diagrams)
 - pictorial diagrams
- Recognize and explain various definitions, abbreviations, and graphic symbols used on motor control diagrams.
- Identify and explain the purposes of various types of common motor control devices including auxiliary contacts, control relays, pushbutton stations, solenoids and solenoid valves, flow switches, pressure switches, limit switches, and timing relays.

Motor Controls–Units 4–10, Motor Controls and Schematics

- Interpret the information found in a motor control schematic called a “ladder diagram” (also called an “elementary diagram” or “line diagram”). Explain how this type of diagram is used to illustrate a simple 2-wire control circuit used with small single-phase motors, and a similar circuit with a mechanical automatic control device (in this case, a float switch for controlling a pump).
- Describe the concept of magnetic motor control, and how it’s used for the remote control of both single-phase and three-phase motors. Define the concept of “mechanically held contactors.” Exhibit a satisfactory knowledge of the following concepts:
 - Circuit types classified by power source (common control circuits, transformer control wiring, and separate control wiring)
 - Control devices (solenoids, relays, and contactors, both mechanically held and electrically held)
 - Remote-control circuits
 - Using 120V control circuits and magnetic devices to control 480V loads
- Describe the operation and use of magnetic motor starters. Explain in detail, motor overload protection devices, auxiliary contacts, and motor starter add-on accessories.

- Explain the differences between 2-wire and 3-wire control schemes and related concepts such as:
 - Holding circuits (also called sealing circuits)
 - Low-voltage protection with 3-wire control circuits and how this improves safety
 - Reading motor control wiring (connection) diagrams
 - Pilot devices such as start-stop pushbuttons
- Explain the importance of providing overcurrent protection for motor control circuits. Identify and apply the *Code* rules for motor control circuits that are tapped from motor power supply circuits in accordance with Article 725. Demonstrate the ability to correctly select conductor sizes, control transformers, and fuses. Explain the *NEC* requirements for motor control circuits that involve fire pump motors and why they are less stringent.
- Explain some of the uses for pilot (indicator) lights and illuminated pushbuttons in motor control circuits. Describe the purposes of various types and colors of lamps, typical applications of pilot lights and illuminated pushbuttons, symbols used on wiring diagrams, and the “push-to-test” safety application.
- Explain some of the uses for two- and three-position selector switches. Describe how to read a “truth table” to determine what the contacts do in each position of the selector switch. Explain how a selector switch can be used on a 3-wire control circuit in a jogging (inching) application.
- Demonstrate the use of a selector switch on a 2-wire circuit for a hand-off-auto (HOA) application.

Motor Controls—Units 11–14, Reversing Controls

- Describe the basic concepts, components, and schematic diagrams used with reversing controls for three-phase motors. Explain that reversing motor controls are basically a variation of 3-wire control circuits, even though they may have four or five conductors. Describe how combining mechanical interlocking with electrical interlocking provides a greater degree of safety by reducing the possibility of phase-to-phase shorts.
- Explain how pilot (indicator) lights are used with reversing controls for three-phase motors. Outline a motor reversing control circuit to include, control schematics, motor starter auxiliary contacts, and the additional conductors needed to add pilot (indicator) lights for these circuits.
- Explain the use of limit switches in reversing motor control circuits, control schematics, and the wiring of pushbutton stations. Describe the use of microswitches for control applications such as raising and lowering garage doors. Draw a simple reversing control schematic using 2-wire circuits.
- Explain reversing controls for single-phase motors making the important point that manufacturer’s instructions should always be followed when reversing single-phase motors. Recognize that there are variations in making the connections, and that dual-voltage motors, or those from different manufacturers or different countries, may not use the same schemes for identifying the motor leads.

Motor Controls—Units 15–16, Controls for Multiple Motors

- Explain the concept of “sequence” controls for multiple motors. Recognize that these motor control concepts are logical extensions of typical motor control circuits involving industrial machinery with hundreds of wires and many contactors and relays, and that the control of the sequencing functions is typically handled by computers.
- Explain the purpose of, and how to implement, a master stop function for multiple motors. Describe how motor overload units (OLs) can be connected in series so that if any motor stops due to an overload condition, all related motors will stop.

Motor Controls—Units 17–20, Miscellaneous Requirements

- Identify and apply the *NEC* requirements for disconnecting means used with motor and motor controllers. Explain that the pushbutton (PB) controls aren't usually the actual motor controller or disconnect.
- Explain how control relays and selector switch PBs are used to expand the capability of a basic 2- or 3-wire motor control circuit by combining equipment used for motor control.
- Explain wiring configurations for different types of three-phase motors and how to reverse three-phase motors by interchanging the L1 and L3 power leads.
- Describe different ways to wire doorbell circuits. Recognize the importance of using the manufacturer's wiring diagrams to wire the controls for heating and cooling equipment.

Level 3, Content Exam

- Successfully pass the covered content exam within the program completion requirements.

Level 3, Final Exam

- Successfully pass the Level 3 Final Exam within the program completion requirements.



LEVEL 4 OUTLINE

LEVEL 4 RESOURCES

Mike Holt's Apprenticeship Training Program is designed to use textbooks, slide presentations, videos, labs/activities, review questions, and exams designed to enhance learning, comprehension, and retention of the material presented.

Videos

The instruction package includes videos that can be played along with the textbooks, or viewed in their entirety, to provide a practical viewpoint of the material covered. If something isn't understood or misinterpreted, stop, go back, and play that section again until the topic is clear.

Mike and a panel of industry experts are featured on these videos. They carefully examine the topics in a way that's both educational and entertaining. You'll hear stories, discussions, and opinions that aren't covered in the textbooks thereby making them an invaluable practical source of information.

Presentations

Included in this instruction package are presentations containing hundreds of slides that are synchronized with the textbooks. These presentations are sorted by individual article or unit resulting in much smaller, less cumbersome files and make it easier to follow along side by side with the textbook.

Labs/Activities

One of the most enjoyable parts of learning is "hands on" learning of mechanical parts such as meters, wire, magnets, coils, light bulbs, switches, fuses, circuit breakers, receptacles, GFCIs, AFCIs—basically anything that can be broken!

We strongly suggest you find or create labs that match the topic being studied as a hands-on experience to help students understand the material being covered. Seeing a mechanical concept in action makes it easier to understand the lesson being taught.

Assessments

Student assessments are an important aspect of the learning process. Studies have shown that regardless of the result, students who are required to mentally recall a subject upon review, are more likely to remember the content than those who didn't have this opportunity. Our program includes different options for assessment including, textbook review questions and exams. Online quizzes and exams are available in the blended and online programs in our online Capacitor®.

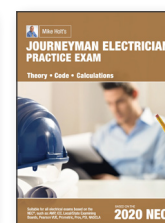
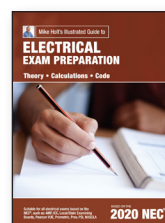
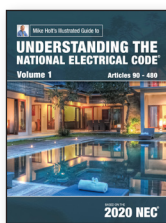
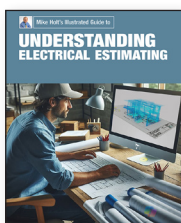
Textbook Questions. Our textbooks contain review questions and exams designed to reinforce the learning process when the online testing tools aren't used. We encourage you to have your students complete the textbook tests before taking the online tests to further reinforce their learning process.

Online Testing. Our online testing program has been specifically designed to take advantage of today's blended or self-paced learning environments and reinforce the material that's been covered.

Books

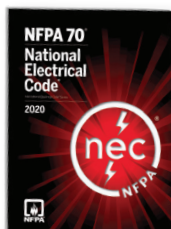
You'll be using the following books or textbooks and we suggest you take a few moments to review the layout of each. Pay attention to the table of contents, the layout of the units/chapters, and the review questions.

- ▶ *Mike Holt's Guide to Electrical Estimating, 2nd Edition*
Mike Holt Enterprises
ISBN 978-1-932685-50-3, 2012
- ▶ *Mike Holt's Leadership Skills*
Mike Holt Enterprises
ISBN 978-0-9975452-2-7, 2016
- ▶ *Mike Holt's Understanding the National Electrical Code, Volume 1*
Mike Holt Enterprises
ISBN 978-1-950431-07-6, 2020
- ▶ *OSHA Construction Safety Training Handbook, 7th Edition*
J.J. Keller & Associates
ISBN 979-8-88912-483-2, 2024
- ▶ *Mike Holt's Guide to Electrical Exam Preparation*
Mike Holt Enterprises
ISBN 978-0-9992038-7-3, 2020
- ▶ *Mike Holt's Journeyman Practice Exam*
Mike Holt Enterprises
ISBN 978-0-9992038-8-0, 2020



Suggested Additional Resources*

- ▶ *National Electrical Code, 2020 Edition*
National Fire Protection Association
ISBN 978-145592297-0, 2019



**Sold separately.*

LEVEL 4 LESSON PLANS– AT A GLANCE

Hours	Content
1-3	Introduction Orientation Tool Safety <i>Level 4</i>
4-6	OSHA Construction Safety <i>Electrical Safety and PPE</i>
7-9	OSHA Construction Safety <i>Hazard Communication/Jobsite Exposures/ Work Zone Safety</i>
10-12	Electrical Estimating–Chapters 1 and 2 <i>Introduction to Estimating and Qualities of an Estimator</i>
13-15	Electrical Estimating–Chapter 3 <i>The Estimating Process</i>
16-18	Electrical Estimating–Chapter 4 <i>The Takeoff</i>
19-21	Electrical Estimating–Chapter 5 <i>Determining Labor Cost</i>
22-24	Electrical Estimating–Chapters 6 and 7 <i>Unit Pricing and Determining Break-Even Cost</i>
25-27	Lab/Activity <i>Blueprint Takeoff</i>
28-30	Leadership Training, Part 1 <i>Leadership Skills</i>
31-33	Leadership Training, Part 2 <i>Leadership Skills</i>
34-36	Content Review
37-39	Content Exam

Hours	Content
40-42	Code Review <i>Articles 90 through 110 and 200 through 240</i>
43-45	Code Review <i>Articles 300 through 314</i>
46-48	Code Review <i>Articles 400 through 480</i>
49-51	Fundamentals Review–Unit 1 <i>Electrician's Math and Basic Electrical Formulas</i>
52-54	Fundamentals Review–Unit 2 <i>Series, Parallel, and Multiwire Circuits</i>
55-57	Fundamentals Review–Unit 3 <i>Understanding Alternating Current</i>
58-60	Fundamentals Review–Unit 4 <i>Motor Basics</i>
61-63	Fundamentals Review–Unit 4 <i>Transformers</i>
64-66	Fundamentals Final Review <i>Units 1–4</i>
67-69	Flex Training <i>Institution/Instructor Choice</i>
70-72	NEC Calculations–Unit 5 <i>Raceway and Box Calculations</i>
73-75	Content Review
76-78	Content Exam

Hours	Content	Hours	Content
79-81	<i>NEC Calculations–Unit 6, Part A Conductor Sizing and Protection Calculations 1</i>	118-120	<i>NEC Calculations–Unit 11, Parts A and B Commercial Calculations 1</i>
82-84	<i>NEC Calculations–Unit 6, Part B Conductor Sizing and Protection Calculations 2</i>	121-123	<i>NEC Calculations–Unit 11, Parts B and C Commercial Calculations 2</i>
85-87	<i>NEC Calculations–Unit 7, Parts A and B Motor and Air-Conditioning Calculations 1</i>	124-126	<i>NEC Practice Quiz 16 Sections 90.1–680.25</i>
88-90	<i>NEC Calculations–Unit 7, Parts B and C Air-Conditioning Calculations–Transformers 2</i>	127-129	<i>NEC Practice Quiz 17 Sections 680.26–701.12</i>
91-93	<i>NEC Calculations–Unit 8, Parts A and B Voltage-Drop Calculations</i>	130-132	<i>OSHA Construction Safety Handbook Review safety rules and practices</i>
94-96	<i>NEC Calculations–Unit 9, Parts A and B Dwelling Unit Calculations 1</i>	133-135	<i>Electrical Theory Review All Theory related material</i>
97-99	<i>NEC Calculations–Unit 9, Parts B and C Dwelling Unit Calculations 2</i>	136-138	<i>Final Exam Part 1–Electrical Theory Journeyman Practice Exam, Electrical Theory</i>
100-102	<i>Lab/Activity Dwelling Unit Calculations</i>	139-141	<i>National Electrical Code Review</i>
103-105	<i>NEC Calculations–Unit 10, Parts A and B Multifamily Dwelling Calculations 1</i>	142-144	<i>Final Exam Part 2–National Electrical Code Journeyman Practice Exam, National Electrical Code</i>
106-108	<i>NEC Calculations–Unit 10 Parts B and C Multifamily Dwelling Calculations 2</i>	145-147	<i>Electrical Calculations Review</i>
109-111	<i>Lab/Activity Fire Alarm Systems</i>	148-150	<i>Final Exam Part 3–Electrical Calculations Journeyman Practice Exam, Electrical Calculations</i>
112-114	<i>Content Review</i>	151-153	<i>Final Exam Review Test Results and Questions</i>
115-117	<i>Content Exam</i>	154-156	<i>Final Processing, Graduation Documents</i>



LEVEL 4 OBJECTIVES

Upon the completion of Level 4, students will possess the knowledge necessary to safely and proficiently perform the job duties and responsibilities expected of a Journeyman Electrician. They'll develop a further knowledge of construction safety, electrical safety, the *NEC* in preparation for their exam. Your students will also gain an understanding of some basic leadership principals necessary to excel on the job, and to be introduced to fire alarm system basics.

LEVEL 4 (HOURS 1–39)

At the completion of the following content, students should be able to:

Tool Safety

- Demonstrate complete knowledge in the safe and proper usage of various hand and power tools.

OSHA–Construction Safety

- List some electrical hazards and explain safe electrical practices.
- Explain the importance of PPE and why it's considered “your last line of defense against injury.”
- Demonstrate an understanding of jobsite physical, chemical, and health hazards.
- Demonstrate an understanding of jobsite hazards and the protective measures that should be taken.

Electrical Estimating

Chapter 1—Introduction to Estimating

- Describe the purpose of an estimate
- List various types of estimates
- Understand what goes into developing and estimating system
- Explain difference between estimating and bidding
- Describe how the market can affect estimating

Chapter 2—Qualities of an Estimator

- Describe the qualities of a good estimator and their responsibilities.
- Explain the importance of field experience.

Chapter 3—The Estimating Process

- Describe the importance of an adequate estimating workspace and its components.
- Recognize what might affect the accuracy of an estimate
- List and explain various estimating techniques

Chapter 4—The Takeoff

- Recognize how and why the takeoff is the foundation for everything that follows in developing an accurate estimate.
- Describe:
 - the takeoff sequence
 - takeoff systems
 - the bill of material (BOM)
 - determining and pricing labor and material
 - Explain how historical data can promote more accurate estimating

Chapter 5—Determining Labor Cost

- Describe and explain:
 - how labor units are expressed and why
 - what makes up a labor unit
 - the benefits of labor unit manuals
 - what adjustments might be necessary
 - labor unit variables

Chapter 6—Unit Pricing

- Explain “unit pricing” and how it is applied

Chapters 7—Determining Break-Even Cost

- Explain what is meant by “break-even cost”.
- List common expenses that might contribute to the break-even cost on any given job.

Leadership Training

- Outline the concept of “personal branding” and the factors that contribute to it.
- Describe the development of the basic skills that make-up an effective career path.
- Explain some of the strategies involved in the advancement of your career.
- Recognize that an effective leader is one who not only manages, but also mentors others to become leaders.
- Outline some of the ways to remain a healthy, knowledgeable, and effective leader.

Level 4, Content Exam

- Successfully pass the covered content exam within the program completion requirements.

LEVEL 4 (HOURS 40–78)

At the completion of the following content, students should be able to:

Code–Review

- Demonstrate and advanced ability to identify and apply *Code* requirements located throughout *NEC* Chapters 1–2.

Exam Preparation–Review

Understanding Electrical Theory–Review

- Review and commit to memory, the concepts of basic electrical theory and calculations using the Ohm's and Watt's Formula Wheel.

NEC–Calculations, Unit 5

- Demonstrate and advanced ability to identify and apply *Code* requirements relative to raceways, box fill, and box selection.

Level 4, Content Exam

- Successfully pass the covered content exam within the program completion requirements.

LEVEL 4 (HOURS 79–117)

At the completion of the following content, students should be able to:

Exam Preparation

NEC–Calculations, Unit 6–10

- Demonstrate an advanced ability to identify and apply *Code* requirements for calculations relative to conductor sizing and protection.
- Demonstrate an advanced ability to identify and apply *Code* requirements for calculations relative to motors, air-conditioning equipment, and transformers.

- Demonstrate an advanced ability to identify and apply *Code* requirements for calculations relative to voltage drop.
- Demonstrate an advanced ability to identify and apply *Code* requirements for calculations relative to dwelling units.
- Demonstrate an advanced ability to identify and apply *Code* requirements for calculations relative to multifamily dwellings.

Level 4, Content Exam

- Successfully pass the covered content exam within the program completion requirements.

LEVEL 4 (HOURS 118–156)

At the completion of the following content, students should be able to:

Exam Preparation

NEC–Calculations, Unit 11

- Demonstrate an advanced ability to identify and apply *Code* requirements for calculations relative to commercial spaces.

NEC–Practice Quizzes

- Demonstrate an advanced ability to identify and apply *Code* requirements for questions.

OSHA Construction Safety Handbook

- Demonstrate advanced knowledge of construction safety in preparation for obtaining an OSHA 10 certification.

Review and Final Exams

Electrical Theory–Review

- Demonstrate as second nature, common knowledge of the concepts of basic electrical theory and Ohm's Law calculations, to the extent of correctly answering questions that may appear on a licensing exam.

Electrical Theory–Part 1 Final Exam

- Successfully pass the Electrical Theory section of the *Journeyman Practice Exam* within the program completion requirements.

Final Exams–Part 2

National Electrical Code–Review

- Confidently navigate the requirements of the *NEC* to the extent of correctly answering questions that may appear on a licensing exam.

National Electrical Code–Part 2 Final Exam

- Successfully pass the *NEC* section of the *Journeyman Practice Exam* within the program completion requirements.

Final Exams–Part 3

Electrical Calculations–Review

- Demonstrate an advanced ability to complete all calculations that may be required to correctly answer questions that may appear on a Journeyman Licensing Exam.

Electrical Calculations–Part 3 Final Exam

- Successfully pass the calculations section of the *Journeyman Practice Exam* within the program completion requirements.

Final Exams Review

- Review the graded final exams.
- Identify and focus upon any weaknesses that may have impeded students' ability to take and pass a timed Journeyman Licensing Exam.

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 1	• Introduction, Orientation, Tool Safety • Construction Safety—Electrical Safety and Personal Protective Equipment	• Textbook—<i>OSHA Construction Safety Handbook</i> <i>Chapters—Electrical Safety and Personal Protective Equipment</i> • Apprenticeship Program Level 1, Safety <i>Slides 5–123</i>	• Complete any paper-work, distribute books and tools. • Cover electrical hazards and safe electrical practices. • Cover the importance of PPE—“your last line of defense” against injury.	
Hour 2	• Construction Safety—Electrical Safety and Personal Protective Equipment	• Textbook—<i>OSHA Construction Safety Handbook</i> <i>Chapters—Electrical Safety and Personal Protective Equipment</i> • Apprenticeship Program Level 1, Safety <i>Slides 5–123</i>	• Cover electrical hazards and safe electrical practices. • Cover the importance of PPE—“your last line of defense” against injury.	
Hour 3	• Construction Safety—Electrical Safety and Personal Protective Equipment	• Textbook—<i>OSHA Construction Safety Handbook</i> • Review <i>Electrical Safety and Personal Protective Equipment</i> • Quiz—Capacitor <i>Construction Safety, Electrical Safety and Personal Protective Equipment</i>	• Take this time to review the unit. • Successfully pass the unit quiz (located in the textbook) within the program completion requirements.	
Hour 4	• Construction Safety—Fall Protection	• Textbook—<i>OSHA Construction Safety Handbook</i> <i>Chapter—Fall Protection</i> • Apprenticeship Program Level 1, Safety <i>Slides 124–154</i>	• Cover and understand fall protection systems.	
Hour 5	• Construction Safety—Ladders and Stairways	• Textbook—<i>OSHA Construction Safety Handbook</i> <i>Chapter—Ladders and Stairways</i> • Apprenticeship Program Level 1, Safety <i>Slides 159–199</i>	• Cover and understand ladder and stairway safety.	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 6	Construction Safety—Scaffolds	- Textbook—<i>OSHA Construction Safety Handbook</i> Chapter—Scaffolds - Apprenticeship Program Level 1, Safety Slides 200–228 - Review Fall Protection, Ladders and Stairways, Scaffolds - Quiz—Capacitor Fall Protection, Ladders and Stairways, and Scaffolds	- Take this time to review the unit. - Successfully pass the unit quiz (located in the textbook) within the program completion requirements.	
Hour 7	Electrical Fundamentals—Atomic Structure	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 1, Unit 1 Pages 3–8 - PowerPoint—Theory Unit 1–Slides (58) - Video—<i>Understanding Electrical Theory</i>, Disk 1 Unit 1–(0:54:44)	- To be discussed: - the atomic structure of an atom - the law of electrical charges about static charge and static electricity - what lightning is and how lightning protection works	
Hour 8	Electrical Fundamentals—Electron Theory and Chemical Bonding	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 1, Unit 2 Pages 9–14 - PowerPoint—Theory Unit 2–Slides (47) - Video—<i>Understanding Electrical Theory</i>, Disk 1 Unit 2–(0:42:12)	- Learn to understand: - how the negative charge of electron movement participates in the creation of electricity - the differences between conductors, semiconductors, and insulators - what chemical bonding is and how it can change the electrical characteristic of an atom	
Hour 9	Electrical Fundamentals—Atomic Structure, Electron Theory and Chemical Bonding	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 1, Units 1 and 2 - Review Pages 3–14	Take this time to review the units and complete the unit practice questions at the end of the chapter.	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 10	Electrical Fundamentals—Electrical Circuits and Power Sources	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 1, Unit 3 <i>Pages 15–20</i> - PowerPoint—Theory <i>Unit 3–Slides (38)</i> - Video—<i>Understanding Electrical Theory</i>, Disk 1 <i>Unit 3–(0:36:21)</i>	- Learn to understand: - what an electrical circuit is - what components make up an electrical circuit - the two theories of electron current flow - the different types of power sources that force electrons to move	
Hour 11	Electrical Fundamentals—The Electrical System	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 1, Unit 4 <i>Pages 21–24</i> - PowerPoint—Theory <i>Unit 4–Slides (28)</i> - Video—<i>Understanding Electrical Theory</i>, Disk 1 <i>Unit 4–(0:24:19)</i>	- Learn to understand: - how electricity is generated at the utility generating plant - about step-up and step-down substation transmission voltages - how electricity goes from utility distribution transformers to a customer's premises	
Hour 12	- Electrical Fundamentals - Review	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 1, Units 3 and 4 - Review <i>Pages 15–24</i>	Take this time to review the units and complete unit practice questions at the end of the chapter.	
Hour 13	Uses and Dangers of Electricity—Uses of Electricity	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 2, Unit 5 <i>Pages 33–40</i> - PowerPoint—Theory <i>Unit 5–Slides (57)</i> - Video—<i>Understanding Electrical Theory</i>, Disk 1 <i>Unit 5–(1:04:45)</i>	- Learn to understand: - how electricity is used for electroplating - about the use of electromagnetism in motors, generators, relays, and transformers - about solar PV systems - how electricity produces heat - about the uses of different types of lighting systems	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 14	Uses and Dangers of Electricity—Dangers of Electricity	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 2, Unit 6 Pages 41–48 - PowerPoint—Theory Unit 6—Slides (68) - Video—<i>Understanding Electrical Theory</i>, Disk 1 Unit 6—(1:13:27)	- Learn to understand: - the purpose of the <i>National Electrical Code</i> - how electrical fires are created - what electric shock/electrocution are - what arc flashes and arc blasts are	
Hour 15	- Uses and Dangers of Electricity - Review	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 2, Units 5 and 6 - Review Pages 33–48	Take this time to review the units and complete unit practice questions at the end of the chapter.	
Hour 16	Magnetism and Electromagnetism—Basics of Magnetism	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 3, Unit 7 Pages 55–60 - PowerPoint—Theory Unit 7—Slides (29)) - Video—<i>Understanding Electrical Theory</i>, Disk 2 Unit 7—(0:24:28)	- Learn to understand: - the law of attraction and repulsion of magnets - why some metals are easily magnetized and how to demagnetize metals - the difference between permanent and temporary magnets - about the magnetic field around a magnet	
Hour 17	Magnetism and Electromagnetism—Electromagnetism, Uses of Electromagnetism	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 3, Units 8 and 9 Pages 61–64, 65–66 - PowerPoint—Theory Unit 8—Slides (29) Unit 9—Slides (15) - Video—<i>Understanding Electrical Theory</i>, Disk 2 Unit 8—(0:30:47) Unit 9—(0:26:07)	- Learn to understand: - how electromagnetism in a wire is produced - about electromagnetic field intensity - how an electromagnetic field is influenced by the shape of the wire - common uses of electromagnetism for motors, generators, relays, and transformers.	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 18	• Magnetism and Electromagnetism—Basics of Magnetism • Review	• Textbook—<i>Understanding Electrical Theory</i>, Chapter 3 • Review <i>Pages 55–66</i>	• Take this time to review the units and complete unit practice questions at the end of the chapter.	
Hour 19	• Digital Multimeter Principles—Safety	• Textbook—<i>Digital Multimeter Principles</i>, Chapter 1 <i>Pages 1–18</i> • PowerPoint—Chapter 1 <i>Slides 1–18 (classroom)</i> • Capacitor—<i>Digital Multimeter Principles</i>, Chapter 1 • Apprenticeship Program Level 1, Term 1 <i>Slides 186–203</i> • Quiz—Capacitor—<i>Digital Multimeter Principles</i>, Chapter 1	• Demonstrate the safe handling, storage, and use of a digital multimeter.	
Hour 20	• Digital Multimeter Principles—DMM Abbreviations, Symbols and Terminology, and DMM Displays	• Textbook—<i>Digital Multimeter Principles</i>, Chapters 2 and 3 <i>Pages 19–32</i> • PowerPoint—Chapters 2 and 3 <i>Slides 1–12 and 1–19 (classroom)</i> • Capacitor—<i>Digital Multimeter Principles</i>, Chapters 2 and 3 • Apprenticeship Program Level 1, Term 1 <i>Slides 204–222</i> • Quiz—Capacitor—<i>Digital Multimeter Principles</i>, Chapters 2 and 3	• Define and explain the various displays, abbreviations, symbols, and terminology associated with a digital multimeter.	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 21	Digital Multimeter Principles—DMM Advanced Features	- Textbook—<i>Digital Multimeter Principles</i>, Chapter 4 <i>Pages 33–45</i> - PowerPoint—Chapter 4 <i>Slides 1–19 (classroom)</i> - Capacitor—<i>Digital Multimeter Principles</i>, Chapter 4 - Apprenticeship Program Level 1, Term 1 <i>Slides 223–240</i> - Quiz—Capacitor—<i>Digital Multimeter Principles</i>, Chapter 4	Define and explain the application of the extended features of a typical digital multi-meter.	
Hour 22	Digital Multimeter Principles—Measuring AC Voltage and Measuring DC Voltage	- Textbook—<i>Digital Multimeter Principles</i>, Chapters 5 and 6 <i>Pages 47–64</i> - PowerPoint—Chapters 5 and 6 <i>Slides 1–16 and 1–12 (classroom)</i> - Capacitor—<i>Digital Multimeter Principles</i> <i>Chapters 5 and 6</i> - Apprenticeship Program Level 1, Term 1 <i>Slides 241–266</i> - Quiz—Capacitor—<i>Digital Multimeter Principles</i> <i>Chapters 5 and 6</i>	Demonstrate the proper settings and technique for measuring AC and DC voltages	
Hour 23	Digital Multimeter Principles—Measuring Resistance and Continuity Testing, and Measuring AC and DC Current	- Textbook—<i>Digital Multimeter Principles</i>, Chapters 7 and 8 <i>Pages 65–86</i> - PowerPoint—Chapters 7 and 8 <i>Slides 1–17 and 1–19 (classroom)</i> - Capacitor—<i>Digital Multimeter Principles</i>, <i>Chapters 7 and 8</i> - Apprenticeship Program Level 1, Term 1 <i>Slides 267–300</i> - Quiz—Capacitor—<i>Digital Multimeter Principles</i> <i>Chapters 7 and 8</i>	Demonstrate the proper settings and technique for determining continuity, resistance, AC and DC current.	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 24	Digital Multimeter Principles—Ohm's Law and Power Formula	- Textbook—<i>Digital Multimeter Principles</i>, Chapter 9 <i>Pages 87–95</i> - PowerPoint—Chapter 9 <i>Slides 1–16 (classroom)</i> - Capacitor—<i>Digital Multimeter Principles</i> <i>Chapter 9</i> - Apprenticeship Program Level 1, Term 1 <i>Slides 301–315</i> - Quiz—Capacitor—<i>Digital Multimeter Principles</i> <i>Chapter 9</i>	Apply the Ohm's Law Wheel power formulas to determine the missing variable when two of the formula values are known.	
Hour 25	Digital Multimeter Principles—Measuring Frequency and Duty Cycle	- Textbook—<i>Digital Multimeter Principles</i>, Chapter 10 <i>Pages 97–106</i> - PowerPoint—Chapter 10 <i>Slides 1–16 (classroom)</i> - Capacitor—<i>Digital Multimeter Principles</i> <i>Chapter 10</i> - Apprenticeship Program Level 1, Term 1 <i>Slides 316–330</i> - Quiz—Capacitor—<i>Digital Multimeter Principles</i> <i>Chapter 10</i>	Explain how changes in frequency affect the operation of electrical equipment and demonstrate how to determine frequency and duty cycle using a digital multimeter.	
Hour 26	- Digital Multimeter Principles - Review Chapters 1–5 and study questions related to their meters.	Textbook—<i>Digital Multimeter Principles</i>, Chapters 1–5 <i>Review Pages 1–53</i>	Review the digital-multimeter and accessories you will use every day and exhibit a working knowledge of all aspects of a digital-multimeter.	
Hour 27	- Digital Multimeter Principles - Review Chapters 6–10 and study questions related to their meters.	Textbook—<i>Digital Multimeter Principles</i>, Chapters 6–10 <i>Review Pages 55–106</i>	Review the digital-multimeter and accessories you will use every day and exhibit a working knowledge of all aspects of a digital-multimeter.	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 28	Digital Multimeter Principles Review	All <i>Digital Multimeter Principles</i> material used	Review all material from <i>Digital Multimeter Principles</i> Chapters 1–5.	
Hour 29	Digital Multimeter Principles Review	All <i>Digital Multimeter Principles</i> material used	Review all material from <i>Digital Multimeter Principles</i> Chapters 6–10.	
Hour 30	Digital Multimeter Principles Review	All <i>Digital Multimeter Principles</i> material used	Complete the competency test in the back of the book. <i>Pages 181–182</i>	
Hour 31	Lab/Activity 3-way, 4-way switching	Instructor/Institution provided	Explain different scenarios where 3- and 4-way switching can be installed and the various wiring configurations	
Hour 32	Lab/Activity 3-way, 4-way switching	Instructor/Institution provided	Explain different scenarios where 3- and 4-way switching can be installed and the various wiring configurations	
Hour 33	Lab/Activity 3-way, 4-way switching	Instructor/Institution provided	Explain different scenarios where 3- and 4-way switching can be installed and the various wiring configurations	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 34	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 35	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 36	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 37	Content Exam	Open-book exam	Successfully pass the covered content exam within the program completion requirements.	
Hour 38	Content Exam	Open-book exam	Successfully pass the covered content exam within the program completion requirements.	
Hour 39	Content Exam	Open-book exam	Successfully pass the covered content exam within the program completion requirements.	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 40	Mathematics—Basic Math	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 4, Unit 10 <i>Pages 71–80</i> - PowerPoint—Theory <i>Unit 10–Slides (57)</i> - Video—<i>Understanding Electrical Theory</i>, Disk 2 <i>Unit 10–(0:42:55)</i>	- Learn to understand: - the difference between whole numbers and fractional numbers - how to convert a percentage into a decimal to use as a multiplier - the differences between a reciprocal, a square root, and squaring a number	
Hour 41	Mathematics—Basic Math	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 4, Unit 10 <i>Pages 71–80</i> - PowerPoint—Theory <i>Unit 10–Slides (57)</i> - Video—<i>Understanding Electrical Theory</i>, Disk 2 <i>Unit 10–(0:42:55)</i>	- Learn to understand: - the difference between whole numbers and fractional numbers - how to convert a percentage into a decimal to use as a multiplier - the differences between a reciprocal, a square root, and squaring a number	
Hour 42	Mathematics—Basic Math	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 4, Unit 10 <i>Pages 71–80</i> - PowerPoint—Theory <i>Unit 10–Slides (57)</i> - Video—<i>Understanding Electrical Theory</i>, Disk 2 <i>Unit 10–(0:42:55)</i>	Take this time to review the units and complete unit practice questions at the end of the chapter.	
Hour 43	Mathematics—Trigonometry	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 4, Unit 11 <i>Pages 81–84</i> - PowerPoint—Theory <i>Unit 11–Slides (31)</i> - Video—<i>Understanding Electrical Theory</i>, Disk 2 <i>Unit 11–(0:15:54)</i>	- Learn to understand: - what right triangles are - what the Pythagorean Theorem is - what sines, cosines, and tangents are	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 44	Mathematics—Trigonometry	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 4, Unit 11 <i>Pages 81–84</i> - PowerPoint—Theory <i>Unit 11–Slides (31)</i> - Video—<i>Understanding Electrical Theory</i>, Disk 2 <i>Unit 11–(0:15:54)</i>	- Learn to understand: - what right triangles are - what the Pythagorean Theorem is - what sines, cosines, and tangents are	
Hour 45	- Mathematics—Basic Math, Trigonometry - Review	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 4 - Review <i>Pages 71–84</i>	Take this time to review the units and complete unit practice questions at the end of the chapter.	
Hour 46	Ohm's Law and Watt's Law—Ohm's Law	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 5, Unit 12 <i>Pages 91–98</i> - PowerPoint—Theory <i>Unit 12–Slides (52)</i> - Video—<i>Understanding Electrical Theory</i>, Disk 2 <i>Unit 12 –(0:41:29)</i>	- Learn to understand: - what electromotive force, intensity, and resistance are - what voltmeters, ammeters, and ohmmeters are - how to use the Ohm's Law formula	
Hour 47	Ohm's Law and Watt's Law—Watt's Law	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 5, Unit 13 <i>Pages 99–102</i> - PowerPoint—Theory <i>Unit 13–Slides (30)</i> - Video—<i>Understanding Electrical Theory</i>, Disk 2 <i>Unit 13 –(0:19:19)</i>	- Learn to understand: - what Watt's Law is - how to use Watt's Law - what a wattmeter is	
Hour 48	- Ohm's Law and Watt's Law - Review	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 5 - Review <i>Pages 91–102</i>	Take this time to review the units and complete unit practice questions at the end of the chapter.	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 49	Electrical Circuit Types—Series Circuits	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 6, Unit 14 <i>Pages 107–116</i> - PowerPoint—Theory <i>Unit 14—Slides (65)</i> - Video—<i>Understanding Electrical Theory, Disk 2</i> <i>Unit 14—(0:41:22)</i>	- Learn to understand: - the relationship between resistance, current, and voltage in series circuits - about the voltage of series-connected power supplies - about common applications of series circuits	
Hour 50	Electrical Circuit Types—Series Circuits	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 6, Unit 14 <i>Pages 107–116</i> - PowerPoint—Theory <i>Unit 14—Slides (65)</i> - Video—<i>Understanding Electrical Theory, Disk 2</i> <i>Unit 14—(0:41:22)</i>	- Learn to understand: - the relationship between resistance, current, and voltage in series circuits - about the voltage of series-connected power supplies - about common applications of series circuits	
Hour 51	Electrical Circuit Types—Parallel Circuits	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 6, Unit 15 <i>Pages 117–124</i> - PowerPoint—Theory <i>Unit 15—Slides (65)</i> - Video—<i>Understanding Electrical Theory, Disk 2</i> <i>Unit 15—(0:40:30)</i>	- Learn to understand: - the relationship between resistance, current, and voltage in parallel circuits - about the voltage of parallel-connected power supplies - about common applications of parallel circuits	
Hour 52	Electrical Circuit Types—Parallel Circuits	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 6, Unit 15 <i>Pages 117–124</i> - PowerPoint—Theory <i>Unit 15—Slides (65)</i> - Video—<i>Understanding Electrical Theory, Disk 2</i> <i>Unit 15—(0:40:30)</i>	- Learn to understand: - the relationship between resistance, current, and voltage in parallel circuits - about the voltage of parallel-connected power supplies - about common applications of parallel circuits	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 53	Electrical Circuit Types—Series–Parallel Circuits	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 6, Unit 16 <i>Pages 125–128</i> - PowerPoint—Theory <i>Unit 16–Slides (23)</i> - Video—<i>Understanding Electrical Theory</i>, Disk 2 <i>Unit 16–(0:14:01)</i>	- Learn to understand: - how to calculate total circuit resistance for series-parallel circuits.	
Hour 54	- Electrical Circuit Types - Review	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 6 - Review <i>Pages 107–128</i>	Take this time to review the units and complete unit practice questions at the end of the chapter.	
Hour 55	Alternating Current—Alternating Current Fundamentals	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 7, Unit 17 <i>Pages 137–146</i> - PowerPoint—Theory <i>Unit 17–Slides (80)</i> - Video—<i>Understanding Electrical Theory</i>, Disk 3 <i>Unit 17–(1:39:07)</i>	- Learn to understand: - how alternating current is produced - the relationship of voltage and current waveforms	
Hour 56	Alternating Current—Inductance, Capacitance	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 7, Units 18 and 19 <i>Pages 147–154</i> - PowerPoint—Theory <i>Unit 18– Slides (36)</i> <i>Unit 19–Slides (37)</i> - Video—<i>Understanding Electrical Theory</i>, Disk 3 <i>Unit 18–(0:30:48)</i> <i>Unit 19–(0:33:14)</i>	- Learn to understand: - about self-inductance and mutual inductance - the relationship between induced voltage and current - how inductive reactance is calculated - what capacitance is - how capacitive reactance is calculated - common uses of capacitors	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 57	- Alternating Current—Alternating Current Fundamentals, Inductance, Capacitance - Review	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 7, Units 17, 18, and 19 - Review <i>Pages 137–154</i>	Take this time to review the units and complete unit practice questions at the end of the chapter.	
Hour 58	Alternating Current—True Power, Power Factor, and Apparent Power	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 7, Unit 20 <i>Pages 155–164</i> - PowerPoint—Theory <i>Unit 20–Slides (78)</i> - Video—<i>Understanding Electrical Theory, Disk 3</i> <i>Unit 20–(0:52:02)</i>	- Learn to understand: - what true power and apparent power are - the relationship between true power and apparent power - the effects of power factor on alternating-current circuits	
Hour 59	Alternating Current—True Power, Power Factor, and Apparent Power	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 7, Unit 20 <i>Pages 155–164</i> - PowerPoint—Theory <i>Unit 20–Slides (78)</i> - Video—<i>Understanding Electrical Theory, Disk 3</i> <i>Unit 20–(0:52:02)</i>	- Learn to understand: - what true power and apparent power are - the relationship between true power and apparent power - the effects of power factor on alternating-current circuits	
Hour 60	Alternating Current—True Power, Power Factor, and Apparent Power	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 7, Unit 20 <i>Pages 155–164</i> - PowerPoint—Theory <i>Unit 20–Slides (78)</i> - Video—<i>Understanding Electrical Theory, Disk 3</i> <i>Unit 20–(0:52:02)</i>	- Learn to understand: - what true power and apparent power are - the relationship between true power and apparent power - the effects of power factor on alternating-current circuits	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 61	Alternating Current—True Power, Power Factor, and Apparent Power	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 7, Unit 20 <i>Pages 155–164</i> - PowerPoint—Theory <i>Unit 20—Slides (78)</i> - Video—<i>Understanding Electrical Theory, Disk 3</i> <i>Unit 20—(0:52:02)</i>	- Learn to understand: - what true power and apparent power are - the relationship between true power and apparent power - the effects of power factor on alternating-current circuits	
Hour 62	Alternating Current—True Power, Power Factor, and Apparent Power	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 7, Unit 20 <i>Pages 155–164</i> - PowerPoint—Theory <i>Unit 20—Slides (78)</i> - Video—<i>Understanding Electrical Theory, Disk 3</i> <i>Unit 20—(0:52:02)</i>	- Learn to understand: - what true power and apparent power are - the relationship between true power and apparent power - the effects of power factor on alternating-current circuits	
Hour 63	- Alternating Current—True Power, Power Factor, and Apparent Power - Review	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 3, Unit 20 - Review <i>Pages 155–164</i>	Take this time to review the unit and complete unit practice questions at the end of the chapter.	
Hour 64	Motors, Generators, Relays, and Transformers—Motors	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 8, Unit 21 <i>Pages 177–186</i> - PowerPoint—Theory <i>Unit 21—Slides (76)</i> - Video—<i>Understanding Electrical Theory, Disk 3</i> <i>Unit 21—(0:57:20)</i>	- Learn to understand: - motor basics - motor starting, running, and locked-rotor amperes - motor calculations involving horsepower and nameplate ratings - about dual-voltage motors and reversing the rotation of alternating-current motors	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 65	Motors, Generators, Relays, and Transformers—Motors	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 8, Unit 21 <i>Pages 177–186</i> - PowerPoint—Theory <i>Unit 21–Slides (76)</i> - Video—<i>Understanding Electrical Theory, Disk 3</i> <i>Unit 21–(0:57:20)</i>	- Learn to understand: - motor basics - motor starting, running, and locked-rotor amperes - motor calculations involving horsepower and nameplate ratings - about dual-voltage motors and reversing the rotation of alternating-current motors	
Hour 66	- Motors, Generators, Relays, and Transformers—Motors - Review	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 3, Unit 21 - Review <i>Pages 177–186</i>	Take this time to review the unit and complete unit practice questions at the end of the chapter.	
Hour 67	- Lab/Activity - Instructor/Institution Choice	- Lab/Activity Suggestion(s) - Worksheet (series-parallel calculations) - Web content video	Perform series-parallel circuit calculations.	
Hour 68	- Lab/Activity - Instructor/Institution Choice	- Lab/Activity Suggestion(s) - Worksheet (series-parallel calculations) - Web content video	Perform series-parallel circuit calculations.	
Hour 69	- Lab/Activity - Instructor/Institution Choice	- Lab/Activity Suggestion(s) - Worksheet (series-parallel calculations) - Web content video	Perform series-parallel circuit calculations.	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 70	Flex Training	Institution/Instructor Choice	- Use this day for any of the following: - Make-up day - Safety training - Special event - Study—practice - Manufacturer's training - Company specific training	
Hour 71	Flex Training	Institution/Instructor Choice	- Use this day for any of the following: - Make-up day - Safety training - Special event - Study—practice - Manufacturer's training - Company specific training	
Hour 72	Flex Training	Institution/Instructor Choice	- Use this day for any of the following: - Make-up day - Safety training - Special event - Study—practice - Manufacturer's training - Company specific training	
Hour 73	Content Review	All covered material used.	- Review all covered content utilizing unit summaries to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 74	Content Review	All covered material used.	- Review all covered content utilizing unit summaries to prepare for the content exam. - Make sure all information that will be on the exam is covered.	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 75	Content Review	All covered material used.	- Review all covered content utilizing unit summaries to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 76	Content Exam	Open-book exam	Successfully pass the covered content exam within the program completion requirements.	
Hour 77	Content Exam	Open-book exam	Successfully pass the covered content exam within the program completion requirements.	
Hour 78	Content Exam	Open-book exam	Successfully pass the covered content exam within the program completion requirements.	
Hour 79	Motors, Generators, Relays, and Transformers—Generators	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 8, Unit 22 <i>Pages 187–190</i> - PowerPoint—Theory <i>Unit 22–Slides (38)</i> - Video—<i>Understanding Electrical Theory, Disk 3</i> <i>Unit 22–(0:34:26)</i>	- Learn to understand: - generator basics - the differences between single- and three-phase generators - how to calculate generator output volt-amperes and amperes	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 80	Motors, Generators, Relays, and Transformers—Generators	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 8, Unit 22 <i>Pages 187–190</i> - PowerPoint—Theory <i>Unit 22–Slides (38)</i> - Video—<i>Understanding Electrical Theory</i>, Disk 3 <i>Unit 22–(0:34:26)</i>	- Learn to understand: - generator basics - the differences between single- and three-phase generators - how to calculate generator output volt-amperes and amperes	
Hour 81	- Motors, Generators, Relays, and Transformers—Generators - Review	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 8, Unit 22 - Review <i>Pages 187–190</i>	Take this time to review the units and complete unit practice questions at the end of the chapter.	
Hour 82	Motors, Generators, Relays, and Transformers—Relays	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 8, Unit 23 <i>Pages 190–192</i> - PowerPoint—Theory <i>Unit 23–Slides (19)</i> - Video—<i>Understanding Electrical Theory</i>, Disk 3 <i>Unit 23–(0:12:42)</i>	- Learn to understand: - how relays operate - about normally open and normally closed relay contacts	
Hour 83	Motors, Generators, Relays, and Transformers—Relays	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 8, Unit 23 <i>Pages 190–192</i> - PowerPoint—Theory <i>Unit 23–Slides (19)</i> - Video—<i>Understanding Electrical Theory</i>, Disk 3 <i>Unit 23–(0:12:42)</i>	- Learn to understand: - how relays operate - about normally open and normally closed relay contacts	
Hour 84	- Motors, Generators, Relays, and Transformers—Relays - Review	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 8, Unit 23 - Review <i>Pages 190–192</i>	Take this time to review the units and complete unit practice questions at the end of the chapter.	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 85	Motors, Generators, Relays, and Transformers—Transformers	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 8, Unit 24 <i>Pages 193–204</i> - PowerPoint—Theory <i>Unit 24–Slides (95)</i> - Video—<i>Understanding Electrical Theory, Disk 3</i> <i>Unit 24–(1:25:23)</i>	- Learn to understand: - the uses of transformers - about different types of transformers - how to calculate primary and secondary current - the differences between delta/ wye- and delta/ delta-connected transformers	
Hour 86	Motors, Generators, Relays, and Transformers—Transformers	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 8, Unit 24 <i>Pages 193–204</i> - PowerPoint—Theory <i>Unit 24–Slides (95)</i> - Video—<i>Understanding Electrical Theory, Disk 3</i> <i>Unit 24–(1:25:23)</i>	- Learn to understand: - the uses of transformers - about different types of transformers - how to calculate primary and secondary current - the differences between delta/ wye- and delta/ delta-connected transformers	
Hour 87	- Motors, Generators, Relays, and Transformers—Transformers - Review	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 8, Unit 24 - Review <i>Pages 193–204</i>	Take this time to review the unit and complete unit practice questions at the end of the chapter.	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 88	Protective Devices—Overcurrent Protection	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 9, Unit 25 <i>Pages 215–228</i> - PowerPoint—Theory <i>Unit 25–Slides (125)</i> - Video—<i>Understanding Electrical Theory</i>, Disk 4 <i>Unit 25–(2:51:48)</i>	- Learn to understand: - the role of circuit over-current protection - the difference between a circuit breaker and a fuse - the fundamentals of time-current curves and selective coordination - the difference between interrupting ratings and short-circuit current ratings	
Hour 89	Protective Devices—Overcurrent Protection	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 9, Unit 25 <i>Pages 215–228</i> - PowerPoint—Theory <i>Unit 25–Slides (125)</i> - Video—<i>Understanding Electrical Theory</i>, Disk 4 <i>Unit 25–(2:51:48)</i>	- Learn to understand: - the role of circuit over-current protection - the difference between a circuit breaker and a fuse - the fundamentals of time-current curves and selective coordination - the difference between interrupting ratings and short-circuit current ratings	
Hour 90	- Protective Devices—Overcurrent Protection - Review	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 9, Unit 25 - Review <i>Pages 215–228</i>	Take this time to review the unit and complete unit practice questions at the end of the chapter.	
Hour 91	Protective Devices—GFCIs, GFPEs, AFCIs, AND SPDs	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 9, Unit 26 <i>Pages 229–240</i> - PowerPoint—Theory <i>Unit 26–Slides (49)</i> - Video—<i>Understanding Electrical Theory</i>, Disk 4 <i>Unit 26–(1:23:08)</i>	- Learn to understand: - what a ground-fault circuit interrupter is - what an arc-fault circuit interrupter is - what ground-fault protection of equipment is - what a surge protective device is	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 92	Protective Devices—GFCIs, GFPEs, AFCIs, AND SPDs	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 9, Unit 26 <i>Pages 229–240</i> - PowerPoint—Theory <i>Unit 26–Slides (49)</i> - Video—<i>Understanding Electrical Theory, Disk 4</i> <i>Unit 26–(1:23:08)</i>	- Learn to understand: - what a ground-fault circuit interrupter is - what an arc-fault circuit interrupter is - what ground-fault protection of equipment is - what a surge protective device is	
Hour 93	Protective Devices—GFCIs, GFPEs, AFCIs, AND SPDs	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 9, Unit 26 <i>Pages 229–240</i> - PowerPoint—Theory <i>Unit 26–Slides (49)</i> - Video—<i>Understanding Electrical Theory, Disk 4</i> <i>Unit 26–(1:23:08)</i>	- Learn to understand: - what a ground-fault circuit interrupter is - what an arc-fault circuit interrupter is - what ground-fault protection of equipment is - what a surge protective device is	
Hour 94	Protective Devices—GFCIs, GFPEs, AFCIs, AND SPDs	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 9, Unit 26 <i>Pages 229–240</i> - PowerPoint—Theory <i>Unit 26 (classroom)</i> - Video—<i>Understanding Electrical Theory, Disk 4</i> <i>Unit 26–(1:23:08)</i>	- Learn to understand: - what a ground-fault circuit interrupter is - what an arc-fault circuit interrupter is - what ground-fault protection of equipment is - what a surge protective device is	
Hour 95	Protective Devices—GFCIs, GFPEs, AFCIs, AND SPDs	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 9, Unit 26 <i>Pages 229–240</i> - PowerPoint—Theory <i>Unit 26–Slides (49)</i> - Video—<i>Understanding Electrical Theory, Disk 4</i> <i>Unit 26–(1:23:08)</i>	- Learn to understand: - what a ground-fault circuit interrupter is - what an arc-fault circuit interrupter is - what ground-fault protection of equipment is - what a surge protective device is	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 96	- Protective Devices—GFCIs, GFPEs, AFCIs, AND SPDs - Review	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 9, Unit 26 - Review <i>Pages 229–240</i>	Take this time to review the unit and complete unit practice questions at the end of the chapter.	
Hour 97	General Knowledge—Wire Resistance and Voltage Drop	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 10, Unit 27 <i>Pages 243–248</i> - PowerPoint—Theory <i>Unit 27–Slides (63)</i> - Video—<i>Understanding Electrical Theory, Disk 4</i> <i>Unit 27–(0:40:28)</i>	- Learn to understand: - what is included in direct-current wire resistance - what is included in alternating-current wire resistance - how to calculate wire voltage drop using Ohm's Law	
Hour 98	General Knowledge—Wire Resistance and Voltage Drop	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 10, Unit 27 <i>Pages 243–248</i> - PowerPoint—Theory <i>Unit 27–Slides (63)</i> - Video—<i>Understanding Electrical Theory, Disk 4</i> <i>Unit 27–(0:40:28)</i>	- Learn to understand: - what is included in direct-current wire resistance - what is included in alternating-current wire resistance - how to calculate wire voltage drop using Ohm's Law	
Hour 99	- General Knowledge—Wire Resistance and Voltage Drop - Review	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 10, Unit 27 - Review <i>Pages 243–248</i>	Take this time to review the unit and complete unit practice questions at the end of the chapter.	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 100	General Knowledge—Multiwire Circuits	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 10, Unit 28 <i>Pages 249–254</i> - PowerPoint—Theory <i>Unit 28–Slides (55)</i> - Video—<i>Understanding Electrical Theory</i>, Disk 4 <i>Unit 28–(0:47:18)</i>	- Learn to understand: - that a multiwire circuit is a circuit consisting of two or more phase wires that have a voltage between them - and an equal voltage between each phase wire and the neutral wire - a typical 3-wire, 120/240V, single-phase circuit is an example	
Hour 101	General Knowledge—Multiwire Circuits	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 10, Unit 28 <i>Pages 249–254</i> - PowerPoint—Theory <i>Unit 28–Slides (55)</i> - Video—<i>Understanding Electrical Theory</i>, Disk 4 <i>Unit 28–(0:47:18)</i>	- Learn to understand: - that a multiwire circuit is a circuit consisting of two or more phase wires that have a voltage between them - and an equal voltage between each phase wire and the neutral wire - a typical 3-wire, 120/240V, single-phase circuit is an example	
Hour 102	- General Knowledge—Multiwire Circuits - Review	- Textbook— <i>Understanding Electrical Theory</i>, Chapter 10, Unit 28 - Review <i>Pages 249–254</i>	Take this time to review the unit and complete unit practice questions at the end of the chapter.	
Hour 103	General Knowledge—The Formula Wheel	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 10, Unit 29 <i>Pages 255–258</i> - PowerPoint—Theory <i>Unit 29–Slides (23)</i> - Video—<i>Understanding Electrical Theory</i>, Disk 4 <i>Unit 29–(0:16:26)</i>	- Learn to understand: - the formula wheel combines the Ohm's Law Formula Circle and Power Formula Circle (Watt's Law) - how to perform calculations using the formula wheel	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 104	General Knowledge—The Formula Wheel	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 10, Unit 29 <i>Pages 255–258</i> - PowerPoint—Theory <i>Unit 29–Slides (23)</i> - Video—<i>Understanding Electrical Theory</i>, Disk 4 <i>Unit 29–(0:16:26)</i>	- Learn to understand: - the formula wheel combines the Ohm's Law Formula Circle and Power Formula Circle (Watt's Law) - how to perform calculations using the formula wheel	
Hour 105	- General Knowledge—The Formula Wheel - Review	- Textbook—<i>Understanding Electrical Theory</i>, Chapter 10, Unit 29 - Review <i>Pages 255–258</i>	Take this time to review the unit and complete unit practice questions at the end of the chapter.	
Hour 106	Lab/Activity <i>Box Fill–NEC Article 314</i>	Textbook—<i>Electrical Apprenticeship Supplement, Level 1</i> <i>Pages 158–178</i>	- Perform box fill calculations. - Properly size device boxes. - Properly size junction and pull boxes.	
Hour 107	Lab/Activity <i>Box Fill–NEC Article 314</i>	Textbook—<i>Electrical Apprenticeship Supplement, Level 1</i> <i>Pages 158–178</i>	- Perform box fill calculations. - Properly size device boxes. - Properly size junction and pull boxes.	
Hour 108	Lab/Activity <i>Box Fill–NEC Article 314</i>	Textbook—<i>Electrical Apprenticeship Supplement, Level 1</i> <i>Pages 158–178</i>	- Perform box fill calculations. - Properly size device boxes. - Properly size junction and pull boxes.	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 109	Lab/Activity <i>Box Fill—NEC Article 314</i>	Textbook—<i>Electrical Apprenticeship Supplement, Level 1</i> <i>Pages 158–178</i>	- Perform box fill calculations. - Properly size device boxes. - Properly size junction and pull boxes.	
Hour 110	Lab/Activity <i>Box Fill—NEC Article 314</i>	Textbook—<i>Electrical Apprenticeship Supplement, Level 1</i> <i>Pages 158–178</i>	- Perform fill calculations. - Properly size device boxes. - Properly size junction and pull boxes.	
Hour 111	Lab/Activity <i>Box Fill—NEC Article 314</i>	Textbook—<i>Electrical Apprenticeship Supplement, Level 1</i> <i>Pages 158–178</i>	- Perform fill calculations. - Properly size device boxes. - Properly size junction and pull boxes.	
Hour 112	Content Review	Textbook—<i>Understanding Electrical Theory</i>	Review all units in the <i>Understanding Electrical Theory</i> textbook to prepare for the content exam.	
Hour 113	Content Review	Textbook—<i>Understanding Electrical Theory</i>	Review all units in the <i>Understanding Electrical Theory</i> textbook to prepare for the content exam.	
Hour 114	Content Review	Textbook—<i>Understanding Electrical Theory</i>	Review all units in the <i>Understanding Electrical Theory</i> textbook to prepare for the content exam.	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 115	Content Exam	Textbook—<i>Understanding Electrical Theory</i>	Successfully pass the content exam within the program completion requirements.	
Hour 116	Content Exam	Textbook—<i>Understanding Electrical Theory</i>	Successfully pass the content exam within the program completion requirements.	
Hour 117	Content Exam	Textbook—<i>Understanding Electrical Theory</i>	Successfully pass the content exam within the program completion requirements.	
Hour 118	How to Use the <i>NEC</i>	- Textbook—<i>Electrical Apprenticeship Supplement, Level 1</i> <i>Pages 1–6</i> - Capacitor—How to Use the <i>National Electrical Code</i> - Apprenticeship Program Level 1, Term 4 <i>Slides 3–30</i> - Video—How to Use the <i>NEC</i> [0:29:13]	- Possess a general understanding of how to use the <i>National Electrical Code</i> and its intent. - Understand the general layout of the <i>NEC</i>.	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 119	How to Use the <i>NEC</i>	- Textbook—<i>Electrical Apprenticeship Supplement, Level 1</i> <i>Pages 1–6</i> - Capacitor—How to Use the <i>National Electrical Code</i> - Apprenticeship Program Level 1, Term 4 <i>Slides 3–30</i> - Video—How to Use the <i>NEC</i> <i>[0:29:13]</i>	- Possess a general understanding of how to use the <i>National Electrical Code</i> and its intent. - Understand the general layout of the <i>NEC</i>.	
Hour 120	How to Use the <i>NEC</i>	- Textbook—<i>Electrical Apprenticeship Supplement, Level 1</i> <i>Pages 1–6</i> - Capacitor—How to Use the <i>National Electrical Code</i> - Apprenticeship Program Level 1, Term 4 <i>Slides 3–30</i> - Video—How to Use the <i>NEC</i> <i>[0:29:13]</i>	- Possess a general understanding of how to use the <i>National Electrical Code</i> and its intent. - Understand the general layout of the <i>NEC</i>.	
Hour 121	The <i>National Electrical Code</i>—Article 90, Introduction to the <i>National Electrical Code</i>	- Textbook—<i>Electrical Apprenticeship Supplement, Level 1</i> and the <i>NEC</i>, Article 90 <i>Pages 7–14</i> - PowerPoint—<i>Apprenticeship Level 1, Article 90</i> <i>Slide 61 (classroom)</i> - Capacitor—<i>Electrical Apprenticeship Supplement, Article 90</i> - Apprenticeship Program Level 1, Term 4 <i>Slides 37–99</i> - Video—General Requirements Article 90 <i>[1:16:42]</i>	- Study the history of the <i>NEC</i>—when it was established and how it's updated. - Understand the purpose of the <i>NEC</i>, practical safeguarding, adequacy, and intention. - Cover the scope of the <i>NEC</i>, including what is and isn't covered.	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 122	The <i>National Electrical Code</i>—Article 100, Definitions	- Textbook—<i>Electrical Apprenticeship Supplement, Level 1</i> and the <i>NEC</i>, Article 100 Pages 19–62 - PowerPoint—<i>Apprenticeship, Level 1</i>, Article 100 Slide 357 (classroom) - Capacitor—<i>Electrical Apprenticeship Supplement</i>, Chapter 1, Article 100 - Apprenticeship Program Level 1, Term 4 Slides 100–458 - Video—Chapter 1 Article 100 [1:55:46]	- Understand the meaning of terms used throughout the <i>NEC</i>. - Understand why some terms are contained in specific articles.	
Hour 123	The <i>National Electrical Code</i>—Articles 90 and 100, Introduction to the <i>National Electrical Code</i> and Definitions	- Textbook—<i>Electrical Apprenticeship Supplement, Level 1</i> and the <i>NEC</i>, Articles 90 and 100 Review Pages 7–14 and 19–63 - Capacitor—<i>Electrical Apprenticeship Supplement</i>, Article 90 and Chapter 1, Article 100 Review—Articles 90-100	- Take this time to review these articles. - Successfully pass the article Quiz within the program completion requirements.	
Hour 124	The <i>National Electrical Code</i>—Article 110, Requirements for Electrical Installations	- Textbook—<i>Electrical Apprenticeship Supplement, Level 1</i> and the <i>NEC</i>, Article 110 Pages 67–78 - PowerPoint—<i>Apprenticeship Level 1</i>, Article 110 Slides 3–87 (classroom) - Capacitor—<i>Electrical Apprenticeship Supplement</i>, Chapter 1, Article 110 - Apprenticeship Program Level 1, Term 4 Slides 459–547 - Video—Chapter 1, Article 110 Sections 110.1–110.14 [1:27:11]	Demonstrate a clear understanding of the importance of installing products in accordance to their listing/labeling instructions and termination/torquing requirements.	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 125	The <i>National Electrical Code</i>—Article 110, Requirements for Electrical Installations	- Textbook—<i>Electrical Apprenticeship Supplement, Level 1</i> and the <i>NEC</i>, Article 110 Pages 79–92 - PowerPoint—<i>Apprenticeship Level 1, Article 110</i> Slides 88–184 (classroom) - Capacitor—<i>Electrical Apprenticeship Supplement, Chapter 1, Article 110</i> - Apprenticeship Program Level 1, Term 4 Slides 548–644 - Video—Chapter 1, Article 110 Sections 110.15–110.28 [2:12:52]	- Understand short-circuit current and short-circuit current ratings of electrical equipment. - Cover deteriorating agents and mechanical execution of work. - Thoroughly understand electrical connections focusing on temperature limitations, equipment provisions.	
Hour 126	The <i>National Electrical Code</i>—Article 110, Requirements for Electrical Installations	- Textbook—<i>Electrical Apprenticeship Supplement, Level 1</i> and the <i>NEC</i>, Article 110 Review Pages 67–92 - Capacitor—<i>Electrical Apprenticeship Supplement, Chapter 1, Article 110</i> Review—Article 110	- Take this time to review the article. - Successfully pass the article quiz within the program completion requirements.	
Hour 127	AC/DC Fundamentals	All Theory-Related Materials	Review all material pertaining to electrical theory using unit summaries to prepare for the Level 1 Final Exam.	
Hour 128	AC/DC Fundamentals	All Theory-Related Materials	Review all material pertaining to electrical theory using unit summaries to prepare for the Level 1 Final Exam.	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 129	AC/DC Fundamentals	All Theory-Related Materials	Review all material pertaining to electrical theory using unit summaries to prepare for the Level 1 Final Exam.	
Hour 130	The <i>National Electrical Code</i>—Article 250, Grounding and Bonding	- Textbook—<i>Electrical Apprenticeship Supplement, Level 1</i> and the <i>NEC</i>, Article 250 Pages 97–99 - PowerPoint—<i>Apprenticeship Level 1, Article 250</i> Slides 4–15 (classroom) - Capacitor—<i>Electrical Apprenticeship Supplement</i>, Chapter 2, Article 250 - Apprenticeship Program Level 1, Term 4 Slides 645–659 - Video—Chapter 2, Article 250 Sections 250.1–250.12 [1:50:36]	- Understand the general requirements for the installation and termination of grounding and bonding conductors. - Comprehend the protection of fittings and clean surfaces.	
Hour 131	The <i>National Electrical Code</i>—Article 250, Grounding and Bonding	- Textbook—<i>Electrical Apprenticeship Supplement, Level 1</i> and the <i>NEC</i>, Article 250 Pages 97–99 - PowerPoint—<i>Apprenticeship Level 1, Article 250</i> Slides 4–15 (classroom) - Capacitor—<i>Electrical Apprenticeship Supplement</i>, Chapter 2, Article 250 - Apprenticeship Program Level 1, Term 4 Slides 645–659 - Video—Chapter 2, Article 250 Sections 250.1–250.12 [1:50:36]	- Understand the general requirements for the installation and termination of grounding and bonding conductors. - Review the protection of fittings and clean surfaces.	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 132	The <i>National Electrical Code</i>—Article 250, Grounding and Bonding	- Textbook—<i>Electrical Apprenticeship Supplement, Level 1</i> and the <i>NEC</i>, Article 250 <i>Review Pages 97–99</i> <i>Sections 250.1–250.12</i> - Capacitor—<i>Electrical Apprenticeship Supplement</i>, Chapter 2, Article 250 <i>Review—Sections 250.1–250.12</i>	- Understand the general requirements for the installation and termination of grounding and bonding conductors. - Comprehend the protection of fittings and clean surfaces.	
Hour 133	The <i>National Electrical Code</i>—Article 250, Grounding and Bonding	- Textbook—<i>Electrical Apprenticeship Supplement, Level 1</i> and the <i>NEC</i>, Article 250 <i>Pages 99–106</i> - PowerPoint—<i>Apprenticeship-Level 1, Article 250</i> <i>Slides 16–67 (classroom)</i> - Capacitor—<i>Electrical Apprenticeship Supplement</i>, Chapter 2, Article 250 - Apprenticeship Program Level 1, Term 4 <i>Slides 660–711</i> - Video—Chapter 2, Article 250 <i>Sections 250.50–250.53 [0:50:23]</i>	- Understand service raceways and enclosures. - Comprehend other enclosures.	
Hour 134	The <i>National Electrical Code</i>—Article 250, Grounding and Bonding	- Textbook—<i>Electrical Apprenticeship Supplement, Level 1</i> and the <i>NEC</i>, Article 250 <i>Pages 99–106</i> - PowerPoint—<i>Apprenticeship-Level 1, Article 250</i> <i>Slides 16–67 (classroom)</i> - Capacitor—<i>Electrical Apprenticeship Supplement</i>, Chapter 2, Article 250 - Apprenticeship Program Level 1, Term 4 <i>Slides 660–711</i> - Video—Chapter 2, Article 250 <i>Sections 250.50–250.53 [0:50:23]</i>	- Understand bonding equipment and intersystem bonding termination. - Comprehend bonding enclosures.	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 135	The <i>National Electrical Code</i>—Article 250, Grounding and Bonding	- Textbook—<i>Electrical Apprenticeship Supplement, Level 1</i> and the <i>NEC</i>, Article 250 <i>Review Pages 99–106</i> <i>Sections 250.50–250.53</i> - Capacitor—<i>Electrical Apprenticeship Supplement, Chapter 2</i>, Article 250 <i>Review—Sections 250.50–250.53</i>	Understand bonding and lightning protection systems.	
Hour 136	The <i>National Electrical Code</i>—Article 250, Grounding and Bonding	- Textbook—<i>Electrical Apprenticeship Supplement, Level 1</i> and the <i>NEC</i>, Article 250 <i>Pages 107–114</i> - PowerPoint—<i>Apprenticeship Level 1</i>, Article 250 <i>Slides 68–112 (classroom)</i> - Capacitor—<i>Electrical Apprenticeship Supplement, Chapter 2</i>, Article 250 - Apprenticeship Program Level 1, Term 4 <i>Slides 712–757</i> - Video—Chapter 2, Article 250 <i>Sections 250.114–250.121</i> [0:49:25]	Understand equipment grounding and equipment grounding conductors.	
Hour 137	The <i>National Electrical Code</i>—Article 250, Grounding and Bonding	- Textbook—<i>Electrical Apprenticeship Supplement, Level 1</i> and the <i>NEC</i>, Article 250 <i>Pages 107–114</i> - PowerPoint—<i>Apprenticeship Level 1</i>, Article 250 <i>Slides 68–111 (classroom)</i> - Capacitor—<i>Electrical Apprenticeship Supplement, Chapter 2</i>, Article 250 - Apprenticeship Program Level 1, Term 4 <i>Slides 712–757</i> - Video—Chapter 2, Article 250 <i>Sections 250.114–250.121</i> [0:49:25]	Understand equipment grounding and equipment grounding conductors.	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 138	The <i>National Electrical Code</i>—Article 250, Grounding and Bonding	- Textbook—<i>Electrical Apprenticeship Supplement, Level 1</i> and the <i>NEC</i>, Article 250 <i>Review Pages 107–114</i> - Capacitor—<i>Electrical Apprenticeship Supplement, Chapter 2</i>, Article 250 <i>Review Sections 250.110–250.122</i>	- Take this time to review this article. - Successfully pass the article quiz within the program completion requirements.	
Hour 139	Lab/Activity <i>Conductor Ampacity</i>	<i>NEC</i>—Article 310	- Identify the correct conductor size and ampacity using the <i>NEC</i> for a given basic application. - Perform conductor ampacity calculations considering conduit fill and ambient temperature.	
Hour 140	Lab/Activity <i>Conductor Ampacity</i>	<i>NEC</i>—Article 310	- Identify the correct conductor size and ampacity using the <i>NEC</i> for a given basic application. - Perform conductor ampacity calculations considering conduit fill and ambient temperature.	
Hour 141	Lab/Activity <i>Conductor Ampacity</i>	<i>NEC</i>—Article 310	- Identify the correct conductor size and ampacity using the <i>NEC</i> for a given basic application. - Perform conductor ampacity calculations considering conduit fill and ambient temperature.	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 142	Lab/Activity <i>Conductor Ampacity</i>	NEC—Article 310	- Identify the correct conductor size and ampacity using the NEC for a given basic application. - Perform conductor ampacity calculations considering conduit fill and ambient temperature.	
Hour 143	Lab/Activity <i>Conductor Ampacity</i>	NEC—Article 310	- Identify the correct conductor size and ampacity using the NEC for a given basic application. - Perform conductor ampacity calculations considering conduit fill and ambient temperature.	
Hour 144	Lab/Activity <i>Conductor Ampacity</i>	NEC—Article 310	- Identify the correct conductor size and ampacity using the NEC for a given basic application. - Perform conductor ampacity calculations considering conduit fill and ambient temperature.	
Hour 145	Content Review	All covered material used.	Review all covered material to prepare for the content exam.	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 146	Content Review	All covered material used.	Review all covered material to prepare for the content exam.	
Hour 147	Content Review	All covered material used.	Review all covered material to prepare for the content exam.	
Hour 148	Content Exam	Open-book exam	Successfully pass the content exam within the program completion requirements.	
Hour 149	Content Exam	Open-book exam	Successfully pass the content exam within the program completion requirements.	
Hour 150	Content Exam	Open-book exam	Successfully pass the content exam within the program completion requirements.	
Hour 151	Level 1 Review	All Level 1 material used.	Review all material from Level 1 utilizing unit summaries (if available) to prepare for the Level 1 Final Exam	

Apprenticeship Program—Level 1				
Hour	Topic	Resources	Learning Focus	Notes
Hour 152	Level 1 Review	All Level 1 material used.	Review all material from Level 1 utilizing unit summaries (if available) to prepare for the Level 1 Final Exam	
Hour 153	Level 1 Review	All Level 1 material used.	Review all material from Level 1 utilizing unit summaries (if available) to prepare for the Level 1 Final Exam	
Hour 154	Level 1 Final Exam	<i>National Electrical Code</i>	Successfully pass the Level 1 Final Exam within the program completion requirements.	
Hour 155	Level 1 Final Exam	<i>National Electrical Code</i>	Successfully pass the Level 1 Final Exam within the program completion requirements.	
Hour 156	Level 1 Final Exam	<i>National Electrical Code</i>	Successfully pass the Level 1 Final Exam within the program completion requirements.	



Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 1	• Introduction, Orientation, Tool Safety	• Institution/Instructor Choice	• Complete any paperwork, distribute books and tools. • Cover policies, procedures, and tool safety.	
Hour 2	• Introduction, Orientation, Tool Safety	• Institution/Instructor Choice	• Complete any paperwork, distribute books and tools. • Cover policies, procedures, and tool safety.	
Hour 3	• Introduction, Orientation, Tool Safety	• Institution/Instructor Choice	• Complete any paperwork, distribute books and tools. • Cover policies, procedures, and tool safety.	
Hour 4	• Construction Safety—Electrical Safety and Personal Protective Equipment	• Textbook—<i>OSHA Construction Safety Handbook</i> <i>Chapters—Electrical Safety and Personal Protective Equipment</i> • Apprenticeship Program Level 2, Safety <i>Slides 5–123</i>	• Cover electrical hazards and safe electrical practices. • Cover the importance of PPE—Your last line of defense against injury.	
Hour 5	• Construction Safety—Electrical Safety and Personal Protective Equipment	• Textbook—<i>OSHA Construction Safety Handbook</i> <i>Chapters—Electrical Safety and Personal Protective Equipment</i> • Apprenticeship Program Level 2, Safety <i>Slides 5–123</i>	• Cover electrical hazards and safe electrical practices. • Cover the importance of PPE—Your last line of defense against injury.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 6	Construction Safety—Electrical Safety and Personal Protective Equipment	- Textbook—<i>OSHA Construction Safety Handbook</i> - Review <i>Electrical Safety and Personal Protective Equipment</i> - Quiz—Capacitor <i>Construction Safety, Electrical Safety and Personal Protective Equipment</i>	- Take this time to review the units. - Successfully pass the unit quiz within the program completion requirements.	
Hour 7	Construction Safety—Confined Space Entry	- Textbook—<i>OSHA Construction Safety Handbook</i> <i>Chapter—Confined Space Entry</i> - Apprenticeship Program Level 2, Safety <i>Slides 124–165</i>	- Learn and understand how to get in and out of confined spaces safely. - Cover how to get in and out of confined spaces safely.	
Hour 8	Construction Safety—Emergency Response	- Textbook—<i>OSHA Construction Safety Handbook</i> <i>Chapter—Emergency Response</i> - Apprenticeship Program Level 2, Safety <i>Slides 166–281</i>	Learn and understand how to deal with incidents on-site.	
Hour 9	Construction Safety—Lockout/Tagout	- Textbook—<i>OSHA Construction Safety Handbook</i> <i>Chapter—Lockout/Tagout</i> - Apprenticeship Program Level 2, Safety <i>Slides 282–321</i> - Review <i>Confined Space Entry, Emergency Response, Lockout/Tagout</i> - Quiz—Capacitor <i>Construction Safety, Confined Space Entry, Emergency Response, and Lockout/Tagout</i>	- Learn and understand how to control hazardous energy. - Review confined space entry, emergency response, and lockout/tagout. - Successfully pass quiz within the program completion requirements.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 10	The <i>National Electrical Code</i>—Article 90, Introduction to the <i>National Electrical Code</i>	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 90 Pages 7–11 - PowerPoint—Article 90 Slides (4–32) (classroom) - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 90 - Apprenticeship Program Level 2, Term 1 Slides 4–36 - Video—General, Art. 90 Sections 90.1–90.2 [0:43:56]	- Understand the intent and purpose of the <i>NEC</i>. - List locations both covered and not covered by the <i>NEC</i>.	
Hour 11	The <i>National Electrical Code</i>—Article 90, Introduction to the <i>National Electrical Code</i>	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 90 Pages 11–14 - PowerPoint—Article 90 Slides (33–62) (classroom) - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 90 - Apprenticeship Program Level 2, Term 1 Slides 37–67 - Video—General, Art. 90 Sections 90.3–90.9 [0:32:46]	- List the general articles and the supplemental and modifying articles as well as communications and tables. - Identify key words that signify mandatory and permissive rules.	
Hour 12	The <i>National Electrical Code</i>—Article 90, Introduction to the <i>National Electrical Code</i>	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 90 Review Pages 7–15 - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 90 Review—Article 90	- Take this time to review the article. - Successfully pass the article quiz within the program completion requirements.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 13	The <i>National Electrical Code</i>—Article 100, Definitions	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 100 <i>Pages 21–64</i> - PowerPoint—Article 100 <i>Slides 2–183 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 1, Article 100 - Apprenticeship Program Level 2, Term 1 <i>Slides 68–251</i> - Video—Chapter 1 <i>Article 100 [1:55:46]</i>	- Study and comprehend the importance of understanding the language of the <i>Code</i> and the meaning of the terms contained within the <i>NEC</i>. - Cover definitions.	
Hour 14	The <i>National Electrical Code</i>—Article 100, Definitions	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 100 <i>Pages 21–64</i> - PowerPoint—Article 100 <i>Slides 184–357 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 1, Article 100 - Apprenticeship Program Level 2, Term 1 <i>Slides 252–426</i> - Video—Chapter 1 <i>Article 100 [1:55:46]</i>	- Study and comprehend the importance of understanding the language of the <i>Code</i> and the meaning of the terms contained within the <i>NEC</i>. - Cover definitions.	
Hour 15	The <i>National Electrical Code</i>—Article 100, Definitions	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 100 <i>Review Pages 21–64</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 1, Review—Article 100	- Take this time to review the article. - Successfully pass the article quiz within the program completion requirements.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 16	The <i>National Electrical Code</i>—Article 110, Requirements for Electrical Installations 1	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 110 <i>Pages 65–68</i> - PowerPoint—Article 110 <i>Slides 2–30 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 1, Article 110 - Apprenticeship Program Level 2, Term 1 <i>Slides 427–458</i> - Video—Chapter 1, Art. 110 <i>Sections 110.1–110.9 [0:36:23]</i>	- Introduce Article 110 by covering the scope. - Understand the significance of 110.3(B). - Study interrupting ratings of overcurrent devices.	
Hour 17	The <i>National Electrical Code</i>—Article 110, Requirements for Electrical Installations 1	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 110 <i>Pages 68–79</i> - PowerPoint—Article 110 <i>Slides 31–100 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 1, Article 110 - Apprenticeship Program Level 2, Term 1 <i>Slides 459–528</i> - Video—Chapter 1, Art. 110 <i>Sections 110.10–110.14 [0:50:48]</i>	- Study short-circuit current and short-circuit current ratings of electrical equipment. - Cover deteriorating agents and mechanical execution of work. - Thoroughly study electrical connections focusing on temperature limitations and equipment provisions.	
Hour 18	The <i>National Electrical Code</i>—Article 110, Requirements for Electrical Installations 1	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 110 <i>Pages 79–84</i> - PowerPoint—Article 110 <i>Slides 101–138 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 1, Article 110 - Apprenticeship Program Level 2, Term 1 <i>Slides 529–566</i> - Video—Chapter 2, Art. 110 <i>Sections 110.15–110.25 [0:44:22]</i>	- Study the requirements for high-leg identification and flash protection warning signs. - Properly select an enclosure for a given installation condition.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 19	The <i>National Electrical Code</i>—Article 110, Requirements for Electrical Installations 2	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 110 <i>Pages 84–92</i> - PowerPoint—Article 110 <i>Slides 139–200 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 1, Article 110 - Apprenticeship Program Level 2, Term 1 <i>Slides 567–627</i> - Video—Chapter 1, Art. 110 <i>Section 110.26 [1:14:04]</i>	- Study and understand spaces about electrical equipment. - Study working depth in relation to voltage and condition as shown in Table 110.26(A)(1). - Also cover working width, height, and clear spaces here.	
Hour 20	The <i>National Electrical Code</i>—Article 110, Requirements for Electrical Installations 2	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 110 <i>Page 92–94</i> - PowerPoint—Article 110 <i>Slides 201–204 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 1, Article 110 - Apprenticeship Program Level 2, Term 1 <i>Slides 628–632</i> - Video—Chapter 1, Art. 110 <i>Sections 110.27–110.28 [0:14:26]</i>	- Lay out electrical equipment with proper clearances along with adequate entrance/egress. - Study the requirements for foreign systems in dedicated electrical space.	
Hour 21	The <i>National Electrical Code</i>—Article 110, Requirements for Electrical Installations	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 110 <i>Review Pages 65–94</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 1, Article 110 <i>Review—Article 110</i>	- Take this time to review the article. - Successfully pass the article quiz within the program completion requirements.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 22	The <i>National Electrical Code</i>—Article 200, Use and Identification of Grounded [Neutral] Conductors	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 200 <i>Pages 103–107</i> - PowerPoint—Article 200 <i>Slides 5–38 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 200 - Apprenticeship Program Level 2, Term 1 <i>Slides 636–671</i> - Video—Chapter 2, Art. 200 <i>Sections 200.1–200.6 [0:32:34]</i>	- Study the article and the neutral conductor's continuity requirements. - Study and demonstrate proper methods of identification for grounded conductors.	
Hour 23	The <i>National Electrical Code</i>—Article 200, Use and Identification of Grounded [Neutral] Conductors	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 200 <i>Pages 107–109</i> - PowerPoint—Article 200 <i>Slides 39–52 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 200 - Apprenticeship Program Level 2, Term 1 <i>Slides 672–686</i> - Video—Chapter 2, Art. 200 <i>Sections 200.7–200.10 [0:17:21]</i>	- Study methods of re-identifying white conductors within multi-conductor cables. - Study terminal identification. - Give examples of the dangers of incorrect polarity of neutral terminals or leads.	
Hour 24	The <i>National Electrical Code</i>—Article 200, Use and Identification of Grounded [Neutral] Conductors	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 200 <i>Review Pages 103–109</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 200 <i>Review–200.1–200.10</i>	- Take this time to review the article. - Successfully pass the article quiz within the program completion requirements.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 25	The <i>National Electrical Code</i>—Article 210, Branch Circuits 1	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 210 <i>Pages 109–114</i> - PowerPoint—Article 210 <i>Slides 2–45 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 210 - Apprenticeship Program Level 2, Term 1 <i>Slides 687–734</i> - Video—Chapter 2, Art. 210 <i>Sections 210.1–210.7 [0:27:21]</i>	- Identify the article and study articles with specific branch-circuit requirements. - Learn what determines a branch-circuit's rating. - Cover multiwire branch-circuit requirements.	
Hour 26	The <i>National Electrical Code</i>—Article 210, Branch Circuits 1	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 210 <i>Pages 114–123</i> - PowerPoint—Article 210 <i>Slides 46–130 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 210 - Apprenticeship Program Level 2, Term 1 <i>Slides 735–818</i> - Video—Chapter 2, Art. 210 <i>Sections 210.8–210.11 [0:50:29]</i>	- Relate prior lessons on ground-fault devices and protection to GFCI branch-circuit requirements. - Study required branch circuits focusing on specific dwelling unit requirements.	
Hour 27	The <i>National Electrical Code</i>—Article 210, Branch Circuits 1	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 210 <i>Pages 123–127</i> - PowerPoint—Article 210 <i>Slides 131–142 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 210 - Apprenticeship Program Level 2, Term 1 <i>Slides 819–854</i> - Video—Chapter 2, Art. 210 <i>Sections 210.12–210.19 [0:14:08]</i>	- Cover AFCI requirements for dwelling unit branch circuits. - Study branch-circuit ratings. - Point out that neutral conductors not terminating on an overcurrent device don't have to be sized at 125% for continuous loads.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 28	The <i>National Electrical Code</i>—Article 210, Branch Circuits 2	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 210 <i>Pages 128–131</i> - PowerPoint—Article 210 <i>Slides 143–188 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 210 - Apprenticeship Program Level 2, Term 1 <i>Slides 854–876</i> - Video—Chapter 2, Art. 210 <i>Sections 210.20–210.50 [0:15:53]</i>	- Cover branch-circuit overcurrent protection. - Study outlet device ratings for branch circuits and cord-and-plug connected loads. - Cover sections on permissible loads, multiple occupancies, and required outlets general requirements.	
Hour 29	The <i>National Electrical Code</i>—Article 210, Branch Circuits 2	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 210 <i>Pages 131–132</i> - PowerPoint—Article 210 <i>Slides 189–212 (classroom)</i> <i>Sections 210.52–210.52(B)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 210 - Apprenticeship Program Level 2, Term 1 <i>Slides 877–900</i> - Video—Chapter 2, Art. 210 <i>Sections 210.52–210.52(B) [0:48:21]</i>	Study what constitutes “wall space” according to the <i>NEC</i> as it pertains to the location of “general-use” receptacle outlets within dwelling occupancies.	
Hour 30	The <i>National Electrical Code</i>—Article 210, Branch Circuits 2	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 210 <i>Pages 133–136</i> - PowerPoint—Article 210 <i>Slides 213–230 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 210 - Apprenticeship Program Level 2, Term 1 <i>Slides 901–918</i> - Video—Chapter 2, Art. 210 <i>Section 210.52(C) [0:48:21]</i>	Study what constitutes “countertop space” according to the <i>NEC</i> as it pertains to the location of receptacles served by small-appliance branch circuits.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 31	The <i>National Electrical Code</i>—Article 210, Branch Circuits 3	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 210 <i>Pages 136–138</i> - PowerPoint—Article 210 <i>Slides 231–255 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 210 - Apprenticeship Program Level 2, Term 1 <i>Slides 919–943</i> - Video—Chapter 2, Art. 210 <i>Sections 210.52(D)–210.52(I)</i>	Study the requirements for dwelling unit bathrooms, garages, basements, outdoors, and hallways.	
Hour 32	The <i>National Electrical Code</i>—Article 210, Branch Circuits 3	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 210 <i>Pages 138–144</i> - PowerPoint—Article 210 <i>Slides 256–304 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 210 - Apprenticeship Program Level 2, Term 1 <i>Slides 944–993</i> - Video—Chapter 2, Art. 210 <i>Sections 210.60–210.70 [0:26:12]</i>	Study permissions for guest rooms, suites, dormitories, and similar occupancies with respect to placement for permanent furniture layout.	
Hour 33	The <i>National Electrical Code</i>—Article 210, Branch Circuits	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 210 <i>Review Pages 109–144</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 210 <i>Review—Article 210</i>	- Take this time to review the article. - Successfully pass the article quiz within the program completion requirements.	
Hour 34	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 35	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 36	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 37	Content Exam	Open-book exam	Successfully pass the covered content exam within the program completion requirements.	
Hour 38	Content Exam	Open-book exam	Successfully pass the covered content exam within the program completion requirements.	
Hour 39	Content Exam	Open-book exam	Successfully pass the covered content exam within the program completion requirements.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 40	The <i>National Electrical Code</i>—Article 215, Feeders	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 215 <i>Pages 145–150</i> - PowerPoint—<i>Understanding the NEC Volume 1</i>, Article 215 <i>Sections 215.1–215.6</i> <i>Slides 2–38 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 215 - Apprenticeship Program Level 2, Term 2 <i>Slides 3–57</i> - Video—Chapter 2 <i>Article 215 [0:08:56]</i>	- Study the scope of the article with practical examples of equipment and illustrations. - Study ampacity calculation for feeder conductors. - Study load calculations for selecting OCPD for feeder conductors. - Study equipment grounding conductor sizing and terminating.	
Hour 41	The <i>National Electrical Code</i>—Article 215, Feeders	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 215 <i>Pages 151–152</i> - PowerPoint—<i>Understanding the NEC Volume 1</i>, Article 215 <i>Sections 215.10–215.12</i> <i>Slides 206–210 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 215 - Apprenticeship Program Level 2, Term 2 <i>Slides 3–57</i> - Video—Chapter 2 <i>Article 215 [0:08:56]</i>	- Study ground-fault protection of equipment. - Study identification for feeder conductors.	
Hour 42	The <i>National Electrical Code</i>—Article 215, Feeders	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 215 <i>Review Pages 145–152</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 215 <i>Review—Article 215</i>	- Take this time to review the article. - Successfully pass the article quiz within the program completion requirements.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 43	The <i>National Electrical Code</i>—Article 220, Branch-Circuit, Feeder, and Service Calculations 1	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 220 <i>Pages 153–154</i> - PowerPoint—Article 220 <i>Sections 220.1–220.11</i> <i>Slides 2–18 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 220 - Apprenticeship Program Level 2, Term 2 <i>Slides 59–77</i> - Video—Chapter 2 Article 220 [0:02:20]	- Calculate branch-circuit loads and selection ampacities. - Select proper OCPD for branch circuits. - Select minimum conductor size for branch circuits.	
Hour 44	The <i>National Electrical Code</i>—Article 220, Branch-Circuit, Feeder, and Service Calculations 1	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 220 <i>Pages 153–160</i> - PowerPoint—Article 220 <i>Sections 220.12–220.18</i> <i>Slides 19–71 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 220 - Apprenticeship Program Level 2, Term 2 <i>Slides 78–125</i>	- Calculate branch-circuit loads and selection ampacities. - Select proper OCPD for branch circuits. - Select minimum conductor size for branch circuits.	
Hour 45	The <i>National Electrical Code</i>—Article 220, Branch-Circuit, Feeder, and Service Calculations 1	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 220 <i>Pages 153–160</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 220	Review covered content. <i>Sections 220.1–220.18</i>	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 46	The <i>National Electrical Code</i>—Article 220, Branch-Circuit, Feeder, and Service Calculations 2	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 220 <i>Pages 160–174</i> - PowerPoint—Article 220 <i>Sections 220.42–220.61</i> <i>Slides 72–148 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 220 - Apprenticeship Program Level 2, Term 2 <i>Slides 131–207</i>	- Calculate service/feeder loads and selection ampacities. - Select proper OCPD for service/feeder loads. - Select minimum conductor size for service/feeders.	
Hour 47	The <i>National Electrical Code</i>—Article 220, Branch-Circuit, Feeder, and Service Calculations 2	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 220 <i>Pages 160–174</i> - PowerPoint—Article 220 <i>Sections 220.82–220.87</i> <i>Slides 149–182 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 220 - Apprenticeship Program Level 2, Term 2 <i>Slides 208–242</i>	- Calculate service/feeder loads and selection ampacities. - Select proper OCPD for service/feeder loads. - Select minimum conductor size for service/feeders.	
Hour 48	The <i>National Electrical Code</i>—Article 220, Branch-Circuit, Feeder, and Service Calculations 2	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 220 <i>Review Pages 153–174</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 220 <i>Review—Article 220</i>	- Take this time to review the article. - Successfully pass the article quiz within the program completion requirements.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 49	The <i>National Electrical Code</i>—Article 225, Outside Branch Circuits and Feeders	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 225 <i>Pages 175–180</i> - PowerPoint—Article 225 <i>Slides (79) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 225 - Apprenticeship Program Level 2, Term 2 <i>Slides 243–325</i> - Video—Chapter 2 <i>Article 225 [0:23:14]</i>	- Cover Article 225 in its entirety. - Exhibit equipment commonly used for outdoor installations. - Exhibit the function and mechanics of equipment commonly used for outdoor installations.	
Hour 50	The <i>National Electrical Code</i>—Article 225, Outside Branch Circuits and Feeders	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 225 <i>Pages 180–182</i> - PowerPoint—Article 225 <i>Slides (79) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 225 - Apprenticeship Program Level 2, Term 2 <i>Slides 243–325</i> - Video—Chapter 2 <i>Article 225 [0:23:14]</i>	- Cover Article 225 in its entirety. - Exhibit equipment commonly used for outdoor installations. - Exhibit the function and mechanics of equipment commonly used for outdoor installations.	
Hour 51	The <i>National Electrical Code</i>—Article 225, Outside Branch Circuits and Feeders	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 225 <i>Review Pages 175–182</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 225 <i>Review—Article 225</i>	- Take this time to review the article. - Successfully pass the article quiz within the program completion requirements.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 52	The <i>National Electrical Code</i>—Article 230, Services—Video	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 230 <i>Pages 183–206</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 230 - Video—Chapter 2 <i>Article 230 [1:30:59]</i>	- Cover Article 230 in its entirety. - Exhibit equipment commonly used for outdoor installations. - Exhibit the function and mechanics of equipment commonly used for outdoor installations.	
Hour 53	The <i>National Electrical Code</i>—Article 230, Services—Part I	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 230 <i>Pages 183–187</i> - PowerPoint—Article 230 <i>Sections 230.1 – 230.10</i> <i>Slides 2–38 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 230 - Apprenticeship Program Level 2, Term 2 <i>Slides 326–364</i> - Video—Chapter 2 <i>Article 230 [1:30:59]</i>	- Cover Article 230 in its entirety. - Exhibit equipment commonly used for outdoor installations. - Exhibit the function and mechanics of equipment commonly used for outdoor installations.	
Hour 54	The <i>National Electrical Code</i>—Article 230, Services—Parts II, III	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 230 <i>Pages 187–190</i> - PowerPoint—Article 230 <i>Sections 230.23 – 230.32</i> <i>Slides 39–82 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 230 - Apprenticeship Program Level 2, Term 2 <i>Slides 365–408</i> - Video—Chapter 2 <i>Article 230 [1:30:59]</i>	- Cover Article 230 in its entirety. - Exhibit equipment commonly used for outdoor installations. - Exhibit the function and mechanics of equipment commonly used for outdoor installations.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 55	The <i>National Electrical Code</i>—Article 230, Services—Parts IV, V	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 230 <i>Pages 191–199</i> - PowerPoint—Article 230 <i>Sections 230.40 – 230.67</i> <i>Slides 83–152 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 230 - Apprenticeship Program Level 2, Term 2 <i>Slides 409–483</i> - Video—Chapter 2 <i>Article 230 [1:30:59]</i>	- Select appropriate equipment for outside wiring. - Assemble appropriate equipment necessary for outdoor wiring installations.	
Hour 56	The <i>National Electrical Code</i>—Article 230, Services—Parts VI, VII	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 230 <i>Pages 200–206</i> - PowerPoint—Article 230 <i>Sections 230.70 – 230.95</i> <i>Slides 158–210 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 230 - Apprenticeship Program Level 2, Term 2 <i>Slides 484–537</i> - Video—Chapter 2 <i>Article 230 [1:30:59]</i>	- Select appropriate equipment for outside wiring. - Assemble appropriate equipment necessary for outdoor wiring installations.	
Hour 57	The <i>National Electrical Code</i>—Article 230, Services	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 230 <i>Review Pages 183–206</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 230 <i>Review—Article 230</i>	- Take this time to review the article. - Successfully pass the article quiz within the program completion requirements.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 58	The <i>National Electrical Code</i>—Article 240, Overcurrent Protection—Part I	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 240 <i>Pages 207–230</i> - PowerPoint—Article 240 <i>Sections 240.1–240.3</i> <i>Slides 2–16 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 240 - Apprenticeship Program Level 2, Term 2 <i>Slides 538–554</i> - Video—Chapter 2 Article 240 [0:41:53]	- Cover definitions in Article 240. - Point out that overcurrent protection for specific appliances should be referenced within the article that governs that type of equipment.	
Hour 59	The <i>National Electrical Code</i>—Article 240, Overcurrent Protection—Part I	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 240 <i>Pages 209–215</i> - PowerPoint—Article 240 <i>Sections 240.4–240.15</i> <i>Slides 17–67 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 240 - Apprenticeship Program Level 2, Term 2 <i>Slides 555–605</i> - Video—Chapter 2 Article 240 [0:41:53]	- Be sure to cover 240.4. - Point out the list of standard OCPD ratings.	
Hour 60	The <i>National Electrical Code</i>—Article 240, Overcurrent Protection—Part II, III	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 240 <i>Pages 215–223</i> - PowerPoint—Article 240 <i>Sections 240.21–240.33</i> <i>Slides 68–127 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 240 - Apprenticeship Program Level 2, Term 2 <i>Slides 606–665</i> - Video—Chapter 2 Article 240 [0:41:53]	Study the location of OCPD in the circuit.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 61	The <i>National Electrical Code</i>—Article 240, Overcurrent Protection—Parts IV, V, VI	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 240 <i>Pages 223–225</i> - PowerPoint—Article 240 <i>Sections 240.40 – 240.67</i> <i>Slides 128–147 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 240 - Apprenticeship Program Level 2, Term 2 <i>Slides 666–685</i> - Video—Chapter 2 <i>Article 240 [0:41:53]</i>	- Make an emphasis on understanding tap conductors. - Utilize tap rules properly where permitted.	
Hour 62	The <i>National Electrical Code</i>—Article 240, Overcurrent Protection—Part VII	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 240 <i>Pages 226–230</i> - PowerPoint—Article 240 <i>Sections 240.81 – 240.88</i> <i>Slides 148–179 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 240 - Apprenticeship Program Level 2, Term 2 <i>Slides 686–719</i> - Video—Chapter 2 <i>Article 240 [0:41:53]</i>	- Cover fuse and circuit breaker types and requirements. - Iterate fuse types and requirements as well as breaker types and requirements.	
Hour 63	The <i>National Electrical Code</i>—Article 240, Overcurrent Protection—Review	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 240 <i>Review Pages 207–229</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 240 <i>Review—Article 240</i>	- Take this time to review the article. - Successfully pass the article quiz within the program completion requirements.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 64	The <i>National Electrical Code</i>—Article 250, Grounding and Bonding	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 250 <i>Pages 235–315</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 250 - Apprenticeship Program Level 2, Term 2 <i>Slides 720–832</i>	Grasp an understanding of equipment grounding and equipment grounding conductors.	
Hour 65	The <i>National Electrical Code</i>—Article 250, Grounding and Bonding	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 250 <i>Pages 235–315</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 250 - Apprenticeship Program Level 2, Term 2 <i>Slides 720–832</i>	Understand the different methods of equipment grounding.	
Hour 66	The <i>National Electrical Code</i>—Article 250, Grounding and Bonding	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 250 <i>Review Pages 235–315</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 250 <i>Review—Article 250</i>	Article 250 is covered more thoroughly in Level 3 of this program.	
Hour 67	Lab/Activity—GFCI Devices	Web Content http://ecmweb.com/content/think-gfci	Select and install proper GFCI protection for given circumstances.	
Hour 68	Lab/Activity—GFCI Devices	Web Content http://ecmweb.com/content/think-gfci	Select and install proper GFCI protection for given circumstances.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 69	Lab/Activity—GFCI Devices	Web Content http://ecmweb.com/content/think-gfci	Select and install proper GFCI protection for given circumstances.	
Hour 70	Flex Training	Institution/Instructor Choice	- Use this day for any of the following: - Make Up Day - Safety Training - Special Event - Study—Practice - Manufacturer's Training - Company Specific Training	
Hour 71	Flex Training	Institution/Instructor Choice	- Use this day for any of the following: - Make Up Day - Safety Training - Special Event - Study—Practice - Manufacturer's Training - Company Specific Training	
Hour 72	Flex Training	Institution/Instructor Choice	- Use this day for any of the following: - Make Up Day - Safety Training - Special Event - Study—Practice - Manufacturer's Training - Company Specific Training	
Hour 73	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 74	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 75	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 76	Content Exam	Open-book exam	Successfully pass the covered content exam within the program completion requirements.	
Hour 77	Content Exam	Open-book exam	Successfully pass the covered content exam within the program completion requirements.	
Hour 78	Content Exam	Open-book exam	Successfully pass the covered content exam within the program completion requirements.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 79	The <i>National Electrical Code</i>—Article 242, Overvoltage Protection [Surge Protective Devices (SPDs)]	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 242 <i>Pages 231–233</i> - PowerPoint—Article 242 <i>Sections 242.1 – 242.10</i> <i>Slides 2–15 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 242 - Apprenticeship Program Level 2, Term 3 <i>Slides 3–18</i>	- Recognize the uses of SPDs. - Recognize the permitted uses of SPDs. - Understand how SPDs are rated.	
Hour 80	The <i>National Electrical Code</i>—Article 242, Overvoltage Protection [Surge Protective Devices (SPDs)]	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 242 <i>Pages 233–234</i> - PowerPoint—Article 242 <i>Sections 242.12 – 242.24</i> <i>Slides 16–30 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 242 - Apprenticeship Program Level 2, Term 3 <i>Slides 19–34</i>	- Understand how to properly install SPDs. - Recognize different types of SPDs along with common applications of the different types.	
Hour 81	The <i>National Electrical Code</i>—Article 242, Overvoltage Protection [Surge Protective Devices (SPDs)]	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 242 <i>Review Pages 231–234</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 2, Article 242 <i>Review—Article 242</i>	- Take this time to review the article. - Successfully pass the article quiz within the program completion requirements.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 82	The <i>National Electrical Code</i>—Article 300, General Requirements for Wiring Methods and Materials 1	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 300 <i>Pages 323–330</i> - PowerPoint—Article 300 <i>Slides 4–30 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 300 - Apprenticeship Program Level 2, Term 3 <i>Slides 35–63</i> - Video—Chapter 3, Article 300 <i>Sections 300.1–300.3 [0:30:58]</i>	- Study general conductor requirements. - Cover protection of physical damage. - Study minimum cover requirements. - Study protection against physical damage.	
Hour 83	The <i>National Electrical Code</i>—Article 300, General Requirements for Wiring Methods and Materials 1	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 300 <i>Pages 331–334</i> - PowerPoint—Article 300 <i>Slides 31–60 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 300 - Apprenticeship Program Level 2, Term 3 <i>Slides 64–93</i> - Video—Chapter 3, Article 300 <i>Section 300.4 [0:12:49]</i>	- Go over raceways exposed to different temperatures. - Cover electrical continuity requirements. - Demonstrate proper securing and supporting. - Study mechanical continuity.	
Hour 84	The <i>National Electrical Code</i>—Article 300, General Requirements for Wiring Methods and Materials 1	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 300 <i>Pages 334–338</i> - PowerPoint—Article 300 <i>Slides 62–96 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 300 - Apprenticeship Program Level 2, Term 3 <i>Slides 94–129</i> - Video—Chapter 3, Article 300 <i>Section 300.5 [0:48:07]</i>	- Cover splices and pigtails. - Study the purpose for a minimum length of free conductors. - Study where boxes and conduit bodies are required.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 85	The <i>National Electrical Code</i>—Article 300, General Requirements for Wiring Methods and Materials 2	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 300 <i>Pages 338–344</i> - PowerPoint—Article 300 <i>Slides 95–146 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 300 - Apprenticeship Program Level 2, Term 3 <i>Slides 130–181</i> - Video—Chapter 3, Article 300 <i>Sections 300.6–300.14 [0:47:36]</i>	- Demonstrate proper methods for installing conductors in raceways. - Study the principles regarding induced currents in metal raceways and enclosures.	
Hour 86	The <i>National Electrical Code</i>—Article 300, General Requirements for Wiring Methods and Materials 2	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 300 <i>Pages 345–355</i> - PowerPoint—Article 300 <i>Slides 147–213 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 300 - Apprenticeship Program Level 2, Term 3 <i>Slides 182–248</i> - Video—Chapter 3, Article 300 <i>Sections 300.15–300.23 [0:45:22]</i>	- Study proper patching techniques to limit the spread of fire. - List acceptable wiring methods for installation in ducts and plenums as well as spaces used for environmental air.	
Hour 87	The <i>National Electrical Code</i>—Article 300, General Requirements for Wiring Methods and Materials 2	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 300 <i>Review Pages 323–355</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 300 <i>Review—Article 300</i>	- Take this time to review the article. - Successfully pass the article quiz within the program completion requirements.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 88	The <i>National Electrical Code</i>—Article 310, Conductors for General Wiring 1	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 310 <i>Pages 357–376</i> - PowerPoint—Article 310 <i>Slides (118) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 310 - Apprenticeship Program Level 2, Term 3 <i>Slides 250–380</i> - Video—Chapter 3 Article 310 [0:36:14]	List the requirements for conductors installed in parallel including minimum size.	
Hour 89	The <i>National Electrical Code</i>—Article 310, Conductors for General Wiring 1	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 310 <i>Pages 357–376</i> - PowerPoint—Article 310 <i>Slides (118) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 310 - Apprenticeship Program Level 2, Term 3 <i>Slides 250–380</i> - Video—Chapter 3 Article 310 [0:36:14]	Identify locations and corrosive conditions affecting conductor selection.	
Hour 90	The <i>National Electrical Code</i>—Article 310, Conductors for General Wiring 1	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 310 <i>Pages 357–376</i> - PowerPoint—Article 310 <i>Slides (118) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 310 - Apprenticeship Program Level 2, Term 3 <i>Slides 250–380</i>	- Study insulation temperature limitations. - Go over methods of conductor identification.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 91	The <i>National Electrical Code</i>—Article 310, Conductors for General Wiring 2	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 310 <i>Pages 357–376</i> - PowerPoint—Article 310 <i>Slides (118) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 310 - Apprenticeship Program Level 2, Term 3 <i>Slides 250–380</i> - Video—Chapter 3 <i>Article 310 [0:36:14]</i>	Study: - Conductor Construction - Conductor Ampacity - Adjustment Factors - Correction Factors	
Hour 92	The <i>National Electrical Code</i>—Article 310, Conductors for General Wiring 2	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 310 <i>Pages 357–376</i> - PowerPoint—Article 310 <i>Slides (118) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 310 - Apprenticeship Program Level 2, Term 3 <i>Slides 250–380</i> - Video—Chapter 3 <i>Article 310 [0:36:14]</i>	Utilize Table 310.16 Conductor Ampacity to select conductors for given installations.	
Hour 93	The <i>National Electrical Code</i>—Article 310, Conductors for General Wiring	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 310 <i>Review Pages 357–376</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 310 <i>Review—Article 310</i>	- Take this time to review the article. - Successfully pass the article quiz within the program completion requirements.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 94	The <i>National Electrical Code</i>—Article 312, Cabinets, Cutout Boxes, and Meter Socket Enclosures	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 312 <i>Pages 377–382</i> - PowerPoint—Article 312 <i>Sections 312.1 – 312.4</i> <i>Slides 2–10 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 312 - Apprenticeship Program Level 2, Term 3 <i>Slides 381–392</i> - Video—Chapter 3 Article 312 [0:26:48]	- Cover installations in damp or wet locations. - Study requirements for enclosures installed in walls. - List methods to properly repair gaps around enclosures.	
Hour 95	The <i>National Electrical Code</i>—Article 312, Cabinets, Cutout Boxes, and Meter Socket Enclosures	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 312 <i>Pages 377–382</i> - PowerPoint—Article 312 <i>Sections 312.5–312.10</i> <i>Slides 11–43 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 312 - Apprenticeship Program Level 2, Term 3 <i>Slides 393–426</i> - Video—Chapter 3 Article 312 [0:26:48]	- Go over conductor protection from abrasion when entering an enclosure. - Study minimum wire-bending space based on Table 312.6(A). - Cover permissions to use enclosures as raceways or for splices.	
Hour 96	The <i>National Electrical Code</i>—Article 312, Cabinets, Cutout Boxes, and Meter Socket Enclosures	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 312 <i>Review Pages 377–382</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 312 <i>Review—Article 312</i>	- Take this time to review the article. - Successfully pass the article quiz within the program completion requirements.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 97	The <i>National Electrical Code</i>—Article 314, Outlet, Device, Pull, and Junction Boxes, Conduit Bodies, and Handhole Enclosures 1	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 314 <i>Pages 383–404</i> - PowerPoint—Article 314 <i>Slides (168) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 314 - Apprenticeship Program Level 2, Term 3 <i>Slides 427–598</i> - Video—Chapter 3 <i>Article 314 [1:03:31]</i>	Identify and Study the differences between nonmetallic and metallic boxes as well as installation requirements associated with them.	
Hour 98	The <i>National Electrical Code</i>—Article 314, Outlet, Device, Pull, and Junction Boxes, Conduit Bodies, and Handhole Enclosures 1	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 314 <i>Pages 383–404</i> - PowerPoint—Article 314 <i>Slides (168) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 314 - Apprenticeship Program Level 2, Term 3 <i>Slides 427–598</i> - Video—Chapter 3 <i>Article 314 [1:03:31]</i>	Identify the differences between nonmetallic and metallic boxes as well as installation requirements associated with them.	
Hour 99	The <i>National Electrical Code</i>—Article 314, Outlet, Device, Pull, and Junction Boxes, Conduit Bodies, and Handhole Enclosures 1	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 314 <i>Pages 383–404</i> - PowerPoint—Article 314 <i>Slides (168) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 314 - Apprenticeship Program Level 2, Term 3 <i>Slides 427–598</i> - Video—Chapter 3, Article 314 <i>Article 314 [1:03:31]</i>	Review box fill calculations.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 100	The <i>National Electrical Code</i>—Article 314, Outlet, Device, Pull, and Junction Boxes, Conduit Bodies, and Handhole Enclosures 2	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 314 <i>Pages 383–404</i> - PowerPoint—Article 314 <i>Slides (168) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 314 - Apprenticeship Program Level 2, Term 3 <i>Slides 427–598</i> - Video—Chapter 3 Article 314 [1:03:31]	- Go over conductors entering boxes or conduit bodies. - Demonstrate how to install boxes recessed in walls or ceilings.	
Hour 101	The <i>National Electrical Code</i>—Article 314, Outlet, Device, Pull, and Junction Boxes, Conduit Bodies, and Handhole Enclosures 2	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 314 <i>Pages 383–404</i> - PowerPoint—Article 314 <i>Slides (168) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 314 - Apprenticeship Program Level 2, Term 3 <i>Slides 427–598</i> - Video—Chapter 3 Article 314 [1:03:31]	Properly select the correct size pull boxes for given raceway sizes and pull type.	
Hour 102	The <i>National Electrical Code</i>—Article 314, Outlet, Device, Pull, and Junction Boxes, Conduit Bodies, and Handhole Enclosures	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 314 <i>Review Pages 383–404</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 314 <i>Review—Article 314</i>	- Take this time to review the article. - Successfully pass the article quiz within the program completion requirements.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 103	The <i>National Electrical Code</i>—Article 320, Armored Cable (Type AC)	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 320 <i>Pages 405–410</i> - PowerPoint—Article 320 <i>Slides (50) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 320 - Apprenticeship Program Level 2, Term 3 <i>Slides 599–649</i> - Video—Chapter 3 Article 320 [0:24:00]	- List the uses permitted and not permitted for the wiring method. - State the securing and supporting intervals or other requirement(s). - Study any ampacity and/or bending radius requirements. - Describe the construction specification.	
Hour 104	The <i>National Electrical Code</i>—Articles 330 Metal-Clad Cable (Type MC)	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 330 <i>Pages 411–418</i> - PowerPoint—Article 330 <i>Slides (51) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 330 - Apprenticeship Program Level 2, Term 3 <i>Slides 650–701</i> - Video—Chapter 3 Article 330 [0:25:41]	- List the uses permitted and not permitted for the wiring method. - State the securing and supporting intervals or other requirement(s). - Study any ampacity and/or bending radius requirements. - Describe the construction specification.	
Hour 105	The <i>National Electrical Code</i>—Articles 320 and 330, Armored Cable and Metal-Clad Cable	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Articles 320 and 330 <i>Review Pages 405–410, 411–416</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Articles 320 and 330 <i>Review—Articles 320 and 330</i>	- Take this time to review the articles. - Successfully pass the article quizzes within the program completion requirements.	
Hour 106	Lab/Activity—Voltage-Drop Calculations	- Textbook—<i>Electrical Exam Preparation</i> and the <i>NEC</i> <i>Unit 8, Pages–273-288</i> - Video—Voltage-Drop Calculations [1:48:27]	Introduction to the application of and method for voltage-drop calculations.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 107	Lab/Activity—Voltage-Drop Calculations	- Textbook—<i>Electrical Exam Preparation and the NEC Unit 8, Pages–273-288</i> - Video—Voltage-Drop Calculations [1:48:27]	Introduction to the application of and method for voltage-drop calculations.	
Hour 108	Lab/Activity—Voltage-Drop Calculations	- Textbook—<i>Electrical Exam Preparation and the NEC Unit 8, Pages–273-288</i> - Video—Voltage-Drop Calculations [1:48:27]	Introduction to the application of and method for voltage-drop calculations.	
Hour 109	Flex Training	Institution/Instructor Choice	- Use this day for any of the following: - Make Up Day - Safety Training - Special Event - Study—Practice - Manufacturer's Training - Company Specific Training	
Hour 110	Flex Training	Institution/Instructor Choice	- Use this day for any of the following: - Make Up Day - Safety Training - Special Event - Study—Practice - Manufacturer's Training - Company Specific Training	
Hour 111	Flex Training	Institution/Instructor Choice	- Use this day for any of the following: - Make Up Day - Safety Training - Special Event - Study—Practice - Manufacturer's Training - Company Specific Training	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 112	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 113	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 114	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 115	Content Exam	Open-book exam	Successfully pass the covered content exam within the program completion requirements.	
Hour 116	Content Exam	Open-book exam	Successfully pass the covered content exam within the program completion requirements.	
Hour 117	Content Exam	Open-book exam	Successfully pass the covered content exam within the program completion requirements.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 118	The <i>National Electrical Code</i>—Articles 334, 336–Nonmetallic-Sheathed Cable (Types, NM and NMC), and Power and Control Tray Cable (Type TC)	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Articles 334, 336 <i>Pages 419–426, 427–428</i> - PowerPoint—Articles 334, 336 <i>Slides (57), (18) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Articles 334, 336 - Apprenticeship Program Level 2, Term 4 <i>Slides 3–63, 64–84</i> - Video—Chapter 3 <i>Articles 334, 336 [0:41:17]</i>	- List the uses permitted and not permitted for the wiring method. - State the securing and supporting intervals or other requirement(s). - Study any ampacity and/or bending radius requirements. - Describe the construction specification.	
Hour 119	The <i>National Electrical Code</i>—Article 338—Service-Entrance Cable (Types, SE and USE)	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 338 <i>Pages 429–432</i> - PowerPoint—Article 338 <i>Slides (30) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 338 - Apprenticeship Program Level 2, Term 4 <i>Slides 85–117</i> - Video—Chapter 3 <i>Article 338 [0:08:16]</i>	- List the uses permitted and not permitted for the wiring method. - State the securing and supporting intervals or other requirement(s). - Study any ampacity and/or bending radius requirements. - Describe the construction specification.	
Hour 120	The <i>National Electrical Code</i>—Articles 334, 336 and 338— Nonmetallic-Sheathed, Power and Control Tray Cable, and Service Entrance Cable	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Articles 334, 336, 338 <i>Review Pages 419–432</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Articles 334, 336, 338 <i>Review—Articles 334, 336, 338</i>	- Take this time to review the articles. - Successfully pass the article quizzes within the program completion requirements.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 121	The <i>National Electrical Code</i>—Article 340, Underground Feeder and Branch-Circuit Cable (Type UF)	- Textbook—<i>Understanding the NEC, Volume 1</i> and the <i>NEC</i>; Article 340 <i>Pages 433–434</i> - PowerPoint—Article 340 <i>Slides (19) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 340 - Apprenticeship Program Level 2, Term 4 <i>Slides 118–140</i> - Video—Chapter 3 Article 340 [0:09:56]	- List the uses permitted and not permitted for the wiring method. - State the securing and supporting intervals or other requirement(s). - Study any ampacity and/or bending radius requirements. - Describe the construction specification.	
Hour 122	The <i>National Electrical Code</i>—Article 342, Intermediate Metal Conduit (Type IMC)	- Textbook—<i>Understanding the NEC, Volume 1</i> and the <i>NEC</i>; Article 342 <i>Pages 435–440</i> - PowerPoint—Article 342 <i>Slides (40) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 342 - Apprenticeship Program Level 2, Term 4 <i>Slides 141–183</i> - Video—Chapter 3 Article 342 [1:13:54]	- List the uses permitted and not permitted for the wiring method. - State the securing and supporting intervals or other requirement(s). - Study any ampacity and/or bending radius requirements. - Describe the construction specification.	
Hour 123	The <i>National Electrical Code</i>—Articles 348, Flexible Metal Conduit (Type FMC)	- Textbook—<i>Understanding the NEC, Volume 1</i> and the <i>NEC</i>; Articles 348 <i>Pages 447–450</i> - PowerPoint—Article 348 <i>Slides (41) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Articles 348 - Apprenticeship Program Level 2, Term 4 <i>Slides 184–227</i> - Video—Chapter 3 Articles 348 [0:31:25]	- List the uses permitted and not permitted for the wiring method. - State the securing and supporting intervals or other requirement(s). - Study any ampacity and/or bending radius requirements. - Describe the construction specification.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 124	The <i>National Electrical Code</i>—Articles 350 and 356, Liquidtight Flexible Metal Conduit (Type LFMC) and Liquidtight Flexible Nonmetallic Conduit (Type LFNC)	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Articles 350 and 356 <i>Pages 451–456, 465–468</i> - PowerPoint—Article 350, and Article 356 <i>Slides (38), (31) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Articles 350 and 356 - Apprenticeship Program Level 2, Term 4 <i>Slides 228–268, 327–360</i> - Video—Chapter 3 <i>Articles 350, 356 [0:40:13]</i>	- List the uses permitted and not permitted for the wiring method. - State the securing and supporting intervals or other requirement(s). - Study any ampacity and/or bending radius requirements. - Describe the construction specification.	
Hour 125	The <i>National Electrical Code</i>—Article 352, Rigid Polyvinyl Chloride Conduit (Type PVC)	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 352 <i>Pages 457–464</i> - PowerPoint—Article 352 <i>Slides (53) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 352 - Apprenticeship Program Level 2, Term 4 <i>Slides 269–326</i> - Video—Chapter 3 <i>Article 352 [0:37:03]</i>	- List the uses permitted and not permitted for the wiring method. - State the securing and supporting intervals or other requirement(s). - Study any ampacity and/or bending radius requirements. - Describe the construction specification.	
Hour 126	The <i>National Electrical Code</i>—Articles 350, 352, 356 Review	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Articles 350–356 <i>Review Pages 433–468</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Articles 350, 352, 356 <i>Review—Articles 340–356</i>	- Take this time to review the articles. - Successfully pass the article quizzes within the program completion requirements.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 127	The <i>National Electrical Code</i>—Articles 344, Rigid Metal Conduit (Type RMC)	- Textbook—<i>Understanding the NEC, Volume 1</i> and the <i>NEC</i>; Articles 344 <i>Pages 441–446</i> - PowerPoint—Article 344 <i>Slides (49) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Articles 344 - Apprenticeship Program Level 2, Term 4 <i>Slides 361–412</i> - Video—Chapter 3 <i>Articles 344 [0:18:01]</i>	- List the uses permitted and not permitted for the wiring method. - State the securing and supporting intervals or other requirement(s). - Study any ampacity and/or bending radius requirements. - Describe the construction specification.	
Hour 128	The <i>National Electrical Code</i>—Article 358, Electrical Metallic Tubing (Type EMT)	- Textbook—<i>Understanding the NEC Volume 1</i> and the 2017 <i>NEC</i>, Article 358 <i>Pages 469–473</i> - PowerPoint—Article 358 <i>Slides (41) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 358 - Apprenticeship Program Level 2, Term 4 <i>Slides 413–457</i> - Video—Chapter 3 <i>Article 358 [0:15:13]</i>	- List the uses permitted and not permitted for the wiring method. - State the securing and supporting intervals or other requirement(s). - Study any ampacity and/or bending radius requirements. - Describe the construction specification.	
Hour 129	The <i>National Electrical Code</i>—Articles 344, 358, Rigid Metal Conduit, Electrical Metallic Tubing	- Textbook—<i>Understanding the NEC Volume 1</i> and the 2017 <i>NEC</i>, Articles 344 and 358 <i>Review Pages 441–446 and 469–473</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Articles 344 and 358 <i>Review—Articles 344, 358</i>	- Take this time to review the articles. - Successfully pass the article quizzes within the program completion requirements.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 130	The <i>National Electrical Code</i>—Article 362, Electrical Nonmetallic Tubing (Type ENT)	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 362 <i>Pages 475–480</i> - PowerPoint—Article 362 <i>Slides (41) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 362 - Apprenticeship Program Level 2, Term 4 <i>Slides 458–501</i> - Video—Chapter 3 Article 362 [0:26:42]	- List the uses permitted and not permitted for the wiring method. - State the securing and supporting intervals or other requirement(s). - Study any ampacity and/or bending radius requirements. - Describe the construction specification.	
Hour 131	The <i>National Electrical Code</i>—Article 376, Metal Wireways	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 376 <i>Pages 481–486</i> - PowerPoint—Article 376 <i>Slides (54) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 376 - Apprenticeship Program Level 2, Term 4 <i>Slides 502–559</i> - Video—Chapter 3 Article 376 [0:33:28]	- List the uses permitted and not permitted for the wiring method. - State the securing and supporting intervals or other requirement(s). - Describe the construction specification.	
Hour 132	The <i>National Electrical Code</i>—Articles 362 and 376, Electrical Nonmetallic Tubing and Metal Wireways	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Articles 362 and 376 <i>Review Pages 475–486</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Articles 362 and 376 <i>Review—Articles 362 and 376</i>	- Take this time to review the articles. - Successfully pass the article quizzes within the program completion requirements.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 133	The <i>National Electrical Code</i>—Articles 380 and 386, Multioutlet Assemblies and Surface Metal Raceways	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Articles 380 and 386 <i>Pages 487–492</i> - PowerPoint—Article 380, and Article 386 <i>Slides (9), (25) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Articles 380 and 386 - Apprenticeship Program Level 2, Term 4 <i>Slides 560–571, 572–599</i> - Video—Chapter 3 <i>Articles 380 and 386 [0:11:08] and [0:06:31]</i>	- List the uses permitted and not permitted for the wiring method. - State the securing and supporting intervals or other requirement(s). - Describe the construction specification.	
Hour 134	The <i>National Electrical Code</i>—Articles 392 Cable Trays	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 392 <i>Pages 493–497</i> - PowerPoint—Article 392 <i>Slides (52) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Article 392 - Apprenticeship Program Level 2, Term 4 <i>Slides 600–656</i> - Video—Chapter 3 <i>Article 392 [0:21:50]</i>	- List the uses permitted and not permitted for the wiring method. - State the securing and supporting intervals or other requirement(s). - Describe the construction specification.	
Hour 135	The <i>National Electrical Code</i>—Articles 380, 386, and 392, Multioutlet Assemblies, Surface Metal Raceways, and Cable Trays	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Articles 380, 386, and 392 <i>Review Pages 487–492 and 493–497</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 3, Articles 380, 386, and 392 <i>Review—Articles 380, 386, 392</i>	- Take this time to review the articles. - Successfully pass the article quizzes within the program completion requirements.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 136	Lab/Activity—Conduit Bending	Web Content—GB Conduit Bending Guide https://file.ecmindustries.com/-/media/inriver/B-0040.pdf	Study methods and techniques for bending/installing different types of raceways.	
Hour 137	Lab/Activity—Conduit Bending	Web Content—GB Conduit Bending Guide https://file.ecmindustries.com/-/media/inriver/B-0040.pdf	Study methods and techniques for bending/installing different types of raceways.	
Hour 138	Lab/Activity—Conduit Bending	Web Content—GB Conduit Bending Guide https://file.ecmindustries.com/-/media/inriver/B-0040.pdf	Study methods and techniques for bending/installing different types of raceways.	
Hour 139	Lab/Activity—Raceway Sizing Calculations	Textbook—Reference <i>Electrical Exam Preparation</i> Unit 5, Part A Pages 187–206	Introduction to the application of, and method for, raceway calculations.	
Hour 140	Lab/Activity—Raceway Sizing Calculations	Textbook—Reference <i>Electrical Exam Preparation</i> Unit 5, Part A Pages 187–206	- Learn the basics of conduit area and fill percentage calculations. - Study sizing a raceway using Annex C.	
Hour 141	Lab/Activity—Raceway Sizing Calculations	Textbook—Reference <i>Electrical Exam Preparation</i> Unit 5, Part A Pages 187–206	Introduction to the application of, and method for, raceway calculations.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 142	Flex Training	Institution/Instructor Choice	- Use this day for any of the following: - Make Up Day - Safety Training - Special Event - Study—Practice - Manufacturer's Training - Company Specific Training	
Hour 143	Flex Training	Institution/Instructor Choice	- Use this day for any of the following: - Make Up Day - Safety Training - Special Event - Study—Practice - Manufacturer's Training - Company Specific Training	
Hour 144	Flex Training	Institution/Instructor Choice	- Use this day for any of the following: - Make Up Day - Safety Training - Special Event - Study—Practice - Manufacturer's Training - Company Specific Training	
Hour 145	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 146	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 147	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 148	Content Exam	Open-book exam	Successfully pass the covered content exam within the program completion requirements.	
Hour 149	Content Exam	Open-book exam	Successfully pass the covered content exam within the program completion requirements.	
Hour 150	Content Exam	Open-book exam	Successfully pass the covered content exam within the program completion requirements.	
Hour 151	Level 2 Review	All Level 2 material used.	Review all material from Level 2 to prepare for the Level 2 Final Exam	
Hour 152	Level 2 Review	All Level 2 material used.	Review all material from Level 2 to prepare for the Level 2 Final Exam	

Apprenticeship Program—Level 2				
Hour	Topic	Resources	Learning Focus	Notes
Hour 153	Level 2 Review	All Level 2 material used.	Review all material from Level 2 to prepare for the Level 2 Final Exam	
Hour 154	Level 2 Final Exam	<i>National Electrical Code</i>	Successfully pass the Level 2 Final Exam within the program completion requirements.	
Hour 155	Level 2 Final Exam	<i>National Electrical Code</i>	Successfully pass the Level 2 Final Exam within the program completion requirements.	
Hour 156	Level 2 Final Exam	<i>National Electrical Code</i>	Successfully pass the Level 2 Final Exam within the program completion requirements.	



Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 1	• Introduction, Orientation, Tool Safety	• Institution/Instructor Choice	• Complete any paperwork, distribute books and tools. • Cover policies, procedures, and tool safety.	
Hour 2	• Introduction, Orientation, Tool Safety	• Institution/Instructor Choice	• Complete any paperwork, distribute books and tools. • Cover policies, procedures, and tool safety.	
Hour 3	• Introduction, Orientation, Tool Safety	• Institution/Instructor Choice	• Complete any paperwork, distribute books and tools. • Cover policies, procedures, and tool safety.	
Hour 4	• Construction Safety—Electrical Safety and Personal Protective Equipment	• Textbook—<i>OSHA Construction Safety Handbook</i> <i>Chapters—Electrical Safety and Personal Protective Equipment</i> • Apprenticeship Program Level 3, Safety <i>Slides 5–124</i>	• Cover electrical hazards and safe electrical practices. • Cover the importance of PPE—Your last line of defense against injury.	
Hour 5	• Construction Safety—Electrical Safety and Personal Protective Equipment	• Textbook—<i>OSHA Construction Safety Handbook</i> <i>Chapters—Electrical Safety and Personal Protective Equipment</i> • Apprenticeship Program Level 3, Safety <i>Slides 5–124</i>	• Cover electrical hazards and safe electrical practices. • Cover the importance of PPE—Your last line of defense against injury.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 6	Construction Safety—Electrical Safety and Personal Protective Equipment Review	- Textbook—<i>OSHA Construction Safety Handbook</i> - Review <i>Electrical Safety and Personal Protective Equipment</i> - Quiz—Capacitor <i>Construction Safety, Electrical Safety and Personal Protective Equipment</i>	- Take this time to review the units. - Successfully pass the unit quiz within the program completion requirements.	
Hour 7	Construction Safety—Excavations	- Textbook—<i>OSHA Construction Safety Handbook</i> <i>Chapter—Excavations</i> - Apprenticeship Program Level 3, Safety <i>Slides 125–188</i>	Learn and understand excavation safety in and around the site.	
Hour 8	Construction Safety—Motor Vehicles	Textbook—<i>OSHA Construction Safety Handbook</i> <i>Chapter—Motor Vehicles</i>	Cover and learn vehicle operations and safety.	
Hour 9	- Construction Safety—Tool Safety - Review	- Textbook—<i>OSHA Construction Safety Handbook</i> <i>Chapter—Tool Safety</i> - Apprenticeship Program Level 3, Safety <i>Slides 189–233</i> - Review <i>Excavations, Motor Vehicles, Tool Safety</i> - Quiz—Capacitor <i>Construction Safety, Excavations, Vehicles, and Tool Safety</i>	- Take this time to review the units - Successfully pass the unit quizzes within the program completion requirements.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 10	The <i>National Electrical Code</i>—Article 400, Flexible Cords and Cables	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 400 <i>Pages 505–512</i> - PowerPoint—Article 400 <i>Slides (31) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 400 - Apprenticeship Program Level 3, Term 1 <i>Slides 4–35</i> - Video—Equipment for General Use Article 400 [0:47:46]	- Go over ampacities for flexible cords and cables. - Study the uses permitted and not permitted. - Show types of flexible cords and cables listed in Table 400.4. - Demonstrate the proper use of strain reliefs and study common types.	
Hour 11	The <i>National Electrical Code</i>—Article 402, Fixture Wires	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 402 <i>Pages 513–517</i> - PowerPoint—Article 402 <i>Slides (18) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 402 - Apprenticeship Program Level 3, Term 1 <i>Slides 36–54</i>	- Select appropriate size fixture wire for given ampacities. - List acceptable uses of fixture wires.	
Hour 12	The <i>National Electrical Code</i>—Articles 400 and 402, Flexible Cords and Cables, and Fixture Wires Review	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Articles 400 and 402 <i>Review Pages 507–517</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Articles 400 and 402 <i>Review—Articles 400 and 402</i>	- Take this time to review the articles. - Successfully pass the article quizzes within the program completion requirements.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 13	The <i>National Electrical Code</i>, Article 404, Switches	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 404 <i>Pages 517–526</i> - PowerPoint—Article 404 <i>Slides (79) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 404 - Apprenticeship Program Level 3, Term 1 <i>Slides 55–136</i> - Video—Equipment for General Use Article 404 [1:06:11]	- Demonstrate the proper switch connections for 3- and 4-way switches and position them correctly. - Properly mount snap switches. - Study acceptable methods for grounding switch plates.	
Hour 14	The <i>National Electrical Code</i>, Article 406, Receptacles, Cord Connectors, and Attachment Plugs (Caps)	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 406 <i>Pages 527–538</i> - PowerPoint—Article 406 <i>Slides (92) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 406 - Apprenticeship Program Level 3, Term 1 <i>Slides 137–229</i> - Video—Equipment for General Use Article 406 [1:09:14]	- Study receptacle ratings and types. - Study the several acceptable replacement methods for nongrounding-type receptacles. - Cover attachment plugs and cord connectors with respect to exposed or energized parts.	
Hour 15	The <i>National Electrical Code</i>, Articles 404 and 406, Switches and Receptacles, Cord Connectors, and Attachment Plugs (Caps) Review	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Articles 404 and 406 <i>Review Pages 517–538</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Articles 404 and 406 <i>Review—Articles 404 and 406</i>	- Take this time to review the articles. - Successfully pass the article quizzes within the program completion requirements.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 16	The <i>National Electrical Code</i>, Article 408, Switchboards, Switchgear, and Panelboards	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 408 <i>Pages 539–544</i> - PowerPoint—Article 408 <i>Slides (49) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 408 - Apprenticeship Program Level 3, Term 1 <i>Slides 230–282</i> - Video—Equipment for General Use Article 408 [0:50:24]	- Go over phase arrangement with respect to “high-leg” systems. - Study the requirements for panel directories. - Cover overcurrent protection requirements.	
Hour 17	The <i>National Electrical Code</i>, Article 408, Switchboards, Switchgear, and Panelboards	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 408 <i>Pages 539–544</i> - PowerPoint—Article 408 <i>Slides (49) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 408 - Apprenticeship Program Level 3, Term 1 <i>Slides 230–282</i> - Video—Equipment for General Use Article 408 [0:50:24]	- List types of enclosures suitable for installing panelboards in damp and wet locations. - Demonstrate proper termination of conductors in panelboards. - Give the proper percent fill for panelboards used as raceways and for splices.	
Hour 18	The <i>National Electrical Code</i>, Article 408, Switchboards, Switchgear, and Panelboards Review	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 408 <i>Review Pages 539–544</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 408 <i>Review—Article 408</i>	- Take this time to review the article. - Successfully pass the article quiz within the program completion requirements.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 19	The <i>National Electrical Code</i>, Article 410, Luminaires, Lampholders, and Lamps	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 410 <i>Pages 545–556</i> - PowerPoint—Article 410 <i>Slides (110) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 410 - Apprenticeship Program Level 3, Term 1 <i>Slides 283–393</i> - Video—Equipment for General Use Article 410 [0:50:27]	- Cover definitions associated with luminaires, lampholders, and lamps. - Study fixtures installed near combustibles. - Demonstrate proper support of luminaires. - Study wiring and grounding of luminaires.	
Hour 20	The <i>National Electrical Code</i>, Article 411, Low-Voltage Lighting	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 411 <i>Pages 557–559</i> - PowerPoint—Article 411 <i>Slides (17) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 411 - Apprenticeship Program Level 3, Term 1 <i>Slides 394–411</i> - Video—Equipment for General Use Article 411 [0:08:48]	Study low-voltage systems as defined by <i>The National Electrical Code</i>, and their uses.	
Hour 21	The <i>National Electrical Code</i>, Articles 410 and 411, Luminaires, Lampholders, and Lamps, and Low-Voltage Lighting Review	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Articles 410 and 411 <i>Review Pages 545–559</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Articles 410 and 411 <i>Review—Articles 410 and 411</i>	- Take this time to review the articles. - Successfully pass the article quizzes within the program completion requirements.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 22	The <i>National Electrical Code</i>, Article 422, Appliances	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 422 <i>Pages 559–566</i> - PowerPoint—Article 422 <i>Slides (65) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 422 - Apprenticeship Program Level 3, Term 1 <i>Slides 412–477</i> - Video—Equipment for General Use <i>Article 422 [0:13:15]</i>	- Cover branch circuit ratings and overcurrent protection. - Go over permitted uses of flexible cords for appliances. - Study proper appliance disconnecting means and types.	
Hour 23	The <i>National Electrical Code</i>, Article 422, Appliances	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 422 <i>Pages 559–566</i> - PowerPoint—Article 422 <i>Slides (65) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 422 - Apprenticeship Program Level 3, Term 1 <i>Slides 412–477</i> - Video—Equipment for General Use <i>Article 422 [0:13:15]</i>	- Determine branch circuit ratings for various appliances. - Select equipment to properly assemble cord-and-plug connections for appliances. - Determine appropriate disconnecting means for various appliances.	
Hour 24	The <i>National Electrical Code</i>, Article 422, Appliances Review	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 422 <i>Review Pages 559–566</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 422 <i>Review—Article 422</i>	- Take this time to review the article. - Successfully pass the article quiz within the program completion requirements.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 25	The <i>National Electrical Code</i>, Article 424, Fixed Electric Space-Heating Equipment	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 424 <i>Pages 567–570</i> - PowerPoint—Article 424 <i>Slides (22) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 424 - Apprenticeship Program Level 3, Term 1 <i>Slides 478–499</i> - Video—Equipment for General Use <i>Article 424 [0:11:28]</i>	- Cover branch circuit ratings, overcurrent protection, and disconnects. - Study requirements for heating conductors installed in concrete and other masonry floors.	
Hour 26	The <i>National Electrical Code</i>, Article 424, Fixed Electric Space-Heating Equipment	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 424 <i>Pages 567–570</i> - PowerPoint—Article 424 <i>Slides (22) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 424 - Apprenticeship Program Level 3, Term 1 <i>Slides 478–499</i> - Video—Equipment for General Use <i>Article 424 [0:11:28]</i>	- Cover branch circuit ratings, overcurrent protection, and disconnects. - Study requirements for heating conductors installed in concrete and other masonry floors.	
Hour 27	The <i>National Electrical Code</i>, Article 424, Fixed Electric Space-Heating Equipment Review	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 424 <i>Review Pages 567–570</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 424 <i>Review—Article 424</i>	- Take this time to review the article. - Successfully pass the article quiz within the program completion requirements.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 28	The <i>National Electrical Code</i>, Article 430, Motors, Motor Circuits, and Controllers—Parts I, II	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 430 <i>Pages 571–576</i> - PowerPoint—Article 430 <i>Slides (155) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 430 - Apprenticeship Program Level 3, Term 1 <i>Slides 500–537</i> - Video—Equipment for General Use Article 430 [0:20:14]	- View video in its entirety. - Competently calculate the minimum conductor required, maximum overload protection rating, and maximum branch-circuit OCPD rating(s) for motor branch circuits.	
Hour 29	The <i>National Electrical Code</i>, Article 430, Motors, Motor Circuits, and Controllers—Parts III, IV, V	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 430 <i>Pages 576–583</i> - PowerPoint—Article 430 <i>Slides (155) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 430 - Apprenticeship Program Level 3, Term 1 <i>Slides 538–590</i> - Video—Equipment for General Use Article 430 [0:20:14]	- Study the rating of overcurrent protection for motor feeders. - Cover protection of motor control circuits and the ratings of motor controllers. - Cover the requirements of disconnecting means. - Study the navigation of relevant tables.	
Hour 30	The <i>National Electrical Code</i>, Article 430, Motors, Motor Circuits, and Controllers Review	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 430 <i>Review Pages 571–583</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 430 <i>Review—Article 430, Parts I–V</i>	Take this time to review the portion of Article 430 covered in this class period.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 31	The <i>National Electrical Code</i>, Article 430, Motors, Motor Circuits, and Controllers—Parts VI, VII	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 430 <i>Pages 584–585</i> - PowerPoint—Article 430 <i>Slides (155) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 430 - Apprenticeship Program Level 3, Term 1 <i>Slides 591–607</i>	- Cover motor nameplate information. - Study conductor sizing. - Study overload protection and how to rate it. - Study overcurrent protection of a motor branch circuit and how to rate this protection.	
Hour 32	The <i>National Electrical Code</i>, Article 430, Motors, Motor Circuits, and Controllers—Parts IX, X, XIV	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 430 <i>Pages 585–590</i> - PowerPoint—Article 430 <i>Slides (155) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 430 - Apprenticeship Program Level 3, Term 1 <i>Slides 608–655</i>	- Competently calculate maximum OCPD for motor feeders. - Reference relevant FLC tables for motors when given necessary nameplate information.	
Hour 33	The <i>National Electrical Code</i>, Article 430, Motors, Motor Circuits, and Controllers Review	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 430 <i>Review Pages 584–590</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 430 - Review <i>Article 430</i>	- Take this time to review the article. - Successfully pass the article quiz within the program completion requirements.	
Hour 34	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 35	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 36	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 37	Content Exam	<i>National Electrical Code</i>	Successfully pass the covered content exam within the program completion requirements.	
Hour 38	Content Exam	<i>National Electrical Code</i>	Successfully pass the covered content exam within the program completion requirements.	
Hour 39	Content Exam	<i>National Electrical Code</i>	Successfully pass the covered content exam within the program completion requirements.	
Hour 40	Activity—Lighting, Ballasts and Transformers	Universal Ballasts Troubleshooting PDFs <i>See instructor resource disks.</i>	Use instructor-provided resources to show wiring, function, and troubleshooting of lighting ballasts and transformers.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 41	Activity—Lighting, Ballasts and Transformers	Universal Ballasts Troubleshooting PDFs <i>See instructor resource disks.</i>	Identify main types of lamps and ballasts and understand the process to troubleshoot and replace them.	
Hour 42	Activity—Lighting, Ballasts and Transformers	Universal Ballasts Troubleshooting PDFs <i>See instructor resource disks.</i>	Use instructor-provided resources to show wiring, function, and troubleshooting of lighting ballasts and transformers.	
Hour 43	The <i>National Electrical Code</i>, Article 440, Air-Conditioning, and Refrigerating Equipment	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 440 <i>Pages 591–598</i> - PowerPoint—Article 440 <i>Slides (46) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 440 - Apprenticeship Program Level 3, Term 2a <i>Slides 3–49</i> - Video—Equipment for General Use Article 440 [0:09:13]	- Cover ampacity and ratings. - Study requirements of disconnecting means. - Study the determination of overcurrent protection. - Study the determination of conductor size. - Cover the requirements for “room air-conditioners.”	
Hour 44	The <i>National Electrical Code</i>, Article 445, Generators and Article 450 Transformers	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Article 445 and 450 <i>Pages 599–602 and 603–606</i> - PowerPoint—Articles 445–450 <i>Slides (23), (24)</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Article 445, and Article 450 - Apprenticeship Program Level 3, Term 2a <i>Slides 50–73, 74–99</i> - Video—Equipment for General Use Articles 445 and 450 [0:17:43] and [0:14:21]	- Demonstrate a working knowledge of the requirements for the installation of generators. - Exhibit competence in calculation of overcurrent protection for transformers.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 45	The <i>National Electrical Code</i>, Articles 440, 445 and 450, Air-Conditioning and Refrigeration Equipment, Generators, and Transformers Review	- Textbook—<i>Understanding the NEC Volume 1</i> and the <i>NEC</i>, Articles 440, 445, 450 <i>Review Pages 591–606</i> - Capacitor—<i>Understanding the NEC Volume 1</i>, Chapter 4 <i>Review—Articles 440, 445, 450</i>	- Take this time to review the articles. - Successfully pass the article quizzes within the program completion requirements.	
Hour 46	Bonding and Grounding—Electrical Fundamentals, Units 1 and 2—Matter and Electron Theory	- Textbook—<i>Understanding NEC Requirements for Bonding and Grounding</i> <i>Pages 7–24</i> - PowerPoint—Units 1 and 2 <i>Slides (59), (15) (classroom)</i> - Capacitor—Bonding and Grounding—Fundamentals <i>Units 1–2</i> - Apprenticeship Program Level 3, Term 2b <i>Slides 8–67, 68–83</i> - Video—Bonding and Grounding Disc 1 <i>Electrical Fundamentals—Units 1 and 2 [0:26:03]</i>	View Electrical Fundamentals part of the video series on “Bonding and Grounding.”	
Hour 47	Bonding and Grounding—Electrical Fundamentals, Unit 3 and 4—Sources, Uses, and Dangers of Electricity and Circuit Protective Devices	- Textbook—<i>Understanding NEC Requirements for Bonding and Grounding</i> <i>Pages 27–42</i> - PowerPoint—Units 3 and 4 <i>Slides (35), (51) (classroom)</i> - Capacitor—Bonding and Grounding—Fundamentals <i>Units 3–4</i> - Apprenticeship Program Level 3, Term 2b <i>Slides 84–119, 120–172</i> - Video—Bonding and Grounding Disc 1 <i>Electrical Fundamentals—Units 3 and 4 [0:43:36]</i>	View Electrical Fundamentals part of the video series on “Bonding and Grounding.”	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 48	Bonding and Grounding—Electrical Fundamentals, Units 1, 2, 3, and 4 Review	Textbook—<i>Understanding NEC Requirements for Bonding and Grounding</i> <i>Review—Pages 7–42</i>	- Take this time to review the units covered. - Successfully pass the unit quizzes within the program completion requirements.	
Hour 49	Bonding and Grounding—<i>NEC</i> Articles 90 and 110, Introduction to the <i>NEC</i> and Requirements for Electrical Installations	- Textbook—<i>Understanding NEC Requirements for Bonding and Grounding</i> <i>Pages 49–55 and 83–90</i> - PowerPoint—Articles 90, 110 <i>Slides (75), (48) (classroom)</i> - Capacitor—<i>Understanding NEC Requirements for Bonding and Grounding</i> <i>Articles 90 and 110</i> - Apprenticeship Program Level 3, Term 2b <i>Slides 173–248, 403–451</i> - Video—Bonding and Grounding Disc 1 <i>Articles 90 and 110 [0:56:42]</i>	View Part 1 of the video series on “Bonding and Grounding.”	
Hour 50	Bonding and Grounding—<i>NEC</i> Article 100, Definitions	- Textbook—<i>Understanding NEC Requirements for Bonding and Grounding</i> <i>Pages 61–82</i> - PowerPoint—Art. 100 <i>Slides (153) (classroom)</i> - Capacitor—<i>Understanding NEC Requirements for Bonding and Grounding</i> <i>Article 100</i> - Apprenticeship Program Level 3, Term 2b <i>Slides 249–402</i> - Video—Bonding and Grounding Disc 1 <i>Article 100 [0:38:03]</i>	Exhibit a strong understanding of bonding and grounding principles and practices.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 51	Bonding and Grounding—NEC Articles 90, 100, and 110 Review	- Textbook—<i>Understanding NEC Requirements for Bonding and Grounding</i> Review Pages 49–90 - Capacitor—<i>Understanding NEC Requirements for Bonding and Grounding</i> Review—Articles 90, 100, 110	- Take this time to review the articles covered. - Successfully pass the chapter quiz within the program completion requirements.	
Hour 52	Bonding and Grounding 2—Video	- Textbook—<i>Understanding NEC Requirements for Bonding and Grounding</i> Pages 99–103 - PowerPoint—Art. 250 Slides 3–52 (classroom) - Capacitor—<i>Understanding NEC Requirements for Bonding and Grounding</i>, Article 250 Sections 250.1–250.4 - Apprenticeship Program Level 3, Term 2b Slides 454–504 - Video—Bonding and Grounding 2 Sections 250.1–250.4 [1:22:06]	View Part 2 of the video series on “Bonding and Grounding.”	
Hour 53	Bonding and Grounding 2—Video	- Textbook—<i>Understanding NEC Requirements for Bonding and Grounding</i> Pages 106–112 - PowerPoint—Art. 250 Slides 53–107 (classroom) - Capacitor—<i>Understanding NEC Requirements for Bonding and Grounding</i>, Article 250 Sections 250.6–250.21 - Apprenticeship Program Level 3, Term 2b Slides 505–561 - Video—Bonding and Grounding 2 Sections 250.6–250.21 [0:48:29]	Exhibit a strong understanding of bonding and grounding principles and practices.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 54	Bonding and Grounding 2—Video	- Textbook—<i>Understanding NEC Requirements for Bonding and Grounding</i> Pages 112–130 - PowerPoint—Art. 250 Slides 108–273 (classroom) - Capacitor—<i>Understanding NEC Requirements for Bonding and Grounding, Article 250</i> Sections 250.24–250.36 - Apprenticeship Program Level 3, Term 2b Slides 562–691 - Video—Bonding and Grounding 2 Sections 250.24–250.36 [1:31:30]	View Part 2 of the video series on “Bonding and Grounding.”	
Hour 55	Bonding and Grounding 2—Video	- Textbook—<i>Understanding NEC Requirements for Bonding and Grounding</i> Pages 131–139 - PowerPoint—Art. 250 Slides 275–346 (classroom) - Capacitor—<i>Understanding NEC Requirements for Bonding and Grounding, Article 250</i> Sections 250.50–250.54 - Apprenticeship Program Level 3, Term 2b Slides 728–802 - Video—Bonding and Grounding 2 Sections 250.50–250.54 [1:03:44]	View Part 2 of the video series on “Bonding and Grounding.”	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 56	Bonding and Grounding 3—Video	- Textbook—<i>Understanding NEC Requirements for Bonding and Grounding</i> Pages 140–154 - PowerPoint—Art. 250 Slides 347–446 (classroom) - Capacitor—<i>Understanding NEC Requirements for Bonding and Grounding</i>, Article 250 Sections 250.58–250.96 - Apprenticeship Program Level 3, Term 2b Slides 803–904 - Video—Bonding and Grounding 2 Sections 250.58–250.96 [2:08:45]	- Begin Part 3 of the video series on “Bonding and Grounding.” - Exhibit a strong understanding of bonding and grounding principles and practices.	
Hour 57	Bonding and Grounding 3—Video	- Textbook—<i>Understanding NEC Requirements for Bonding and Grounding</i> Pages 154–179 - PowerPoint—Art. 250 Slides 447–501 (classroom) - Capacitor—<i>Understanding NEC Requirements for Bonding and Grounding</i>, Article 250 Sections 250.97–250.106 - Apprenticeship Program Level 3, Term 2b Slides 905–1084 - Video—Bonding and Grounding 2 Sections 250.97–250.106 [1:52:10]	View Part 3 of the video series on “Bonding and Grounding.”	
Hour 58	Bonding and Grounding 4—Video	- Textbook—<i>Understanding NEC Requirements for Bonding and Grounding</i> Pages 197–322 - Capacitor—<i>Understanding NEC Requirements for Bonding and Grounding</i>, NEC Chapters 3–8 - Video—Bonding and Grounding 4 Sections 300.1–820.100 [3:10:34]	View Part 4 of the video series on “Bonding and Grounding.”	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 59	Bonding and Grounding 4—Video	- Textbook—<i>Understanding NEC Requirements for Bonding and Grounding</i> <i>Pages 197–322</i> - Capacitor—<i>Understanding NEC Requirements for Bonding and Grounding, NEC Chapters 3–8</i> - Video—Bonding and Grounding 4 <i>Sections 300.1–820.100 [3:10:34]</i>	Exhibit a strong understanding of bonding and grounding principles and practices.	
Hour 60	Bonding and Grounding 4—Video	- Textbook—<i>Understanding NEC Requirements for Bonding and Grounding</i> <i>Pages 197–322</i> - Capacitor—<i>Understanding NEC Requirements for Bonding and Grounding, NEC Chapters 3–8</i> - Video—Bonding and Grounding 4 <i>Sections 300.1–820.100 [3:10:34]</i>	View Part 4 of the video series on “Bonding and Grounding.”	
Hour 61	The <i>National Electrical Code</i>, Articles 500–503, Hazardous (Classified) Locations, Class I, Class II, and Class III Locations	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Articles 500–503 <i>Pages 101–136</i> - PowerPoint—Articles 500–503 <i>Slides (86), (154), (89), (38) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapter 5, Articles 500, 501, 502, and 503 - Apprenticeship Program Level 3, Term 2a <i>Slides 100–478</i> - Video—Chapter 5 <i>Articles 500–503 [2:53:17]</i>	- Study the design of typical electrical systems in relation to intended paths for current. - Utility ground-fault current path, premises neutral current path, and premises ground-fault current path should be studied.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 62	The <i>National Electrical Code</i>, Articles 511 and 514, Commercial Garages, Repair and Storage, and Motor Fuel Dispensing Facilities	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Articles 511 and 514 <i>Pages 137–144</i> - PowerPoint—Articles 511–514 <i>Slides (42), (33) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapter 5, Articles 511 and 514 - Apprenticeship Program Level 3, Term 2a <i>Slides 479–559</i> - Video—Chapter 5 <i>Article 511 [0:18:07]</i>	- Cover wiring and equipment within hazardous locations. - Study sealing, special equipment and GFCI-protected receptacles, underground wiring and raceway seals, and maintenance and service of dispensing equipment.	
Hour 63	The <i>National Electrical Code</i>, Articles 500–503, 511, and 514 Review	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Articles 500–503, 511, and 514 <i>Review Pages 101–144</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapter 5, Articles 500, 501, 502, 503, 511, and 514 <i>Review Articles 500–514</i>	- Take this time to review the articles. - Successfully pass the article quizzes within the program completion requirements.	
Hour 64	The <i>National Electrical Code</i>, Articles 517 and 518, Health Care Facilities and Assembly Occupancies	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Articles 517 and 518 <i>Pages 145–156</i> - PowerPoint—Articles 517–518 <i>Slides (61), (24) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapter 5, Articles 517 and 518 - Apprenticeship Program Level 3, Term 2a <i>Slides 560–650</i> - Video—Chapter 5 <i>Article 517 [0:44:04]</i>	- Recognize requirements for equipment in patient care spaces and the essential electrical systems for hospitals. - Recognize and be familiar with the requirements for assembly occupancies.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 65	The <i>National Electrical Code</i>, Articles 550 and 590, Mobile Home, Manufactured Homes, and Mobile Home Parks, and Temporary Installations	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Articles 550 and 590 <i>Pages 165–168 and 179–184</i> - PowerPoint—Articles 550, 590 <i>Slides (33), (62) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapter 5, Articles 550 and 590 - Apprenticeship Program Level 3, Term 2a <i>Slides 651–751</i> - Video—Chapter 5 <i>Article 590 [0:23:06]</i>	- Determine the minimum feeder necessary for the service. - Be familiar with the requirements of temporary installations. - Recognize the listing of decorative lighting.	
Hour 66	The <i>National Electrical Code</i>, Articles 517, 518, 550, and 590 Review	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Articles 517, 518, 550, and 590 <i>Review Pages 145–156, 165–168 and 179–184</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapter 5, Articles 517, 518, 550, and 590 <i>Review Articles 517, 518, 550, and 590</i>	- Take this time to review the articles. - Successfully pass the article quizzes within the program completion requirements.	
Hour 67	The <i>National Electrical Code</i>, Articles 600 and 604, Electric Signs and Outline Lighting, and Manufactured Wiring Systems	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Articles 600 and 604 <i>Pages 209–222</i> - PowerPoint—Articles 600, 604 <i>Slides (112), (11) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapter 6, Articles 600 and 604 - Apprenticeship Program Level 3, Term 2a <i>Slides 752–880</i> - Video—Chapter 6 <i>Articles 600 and 604 [1:08:19]</i>	- Determine branch-circuit ratings. - Determine necessary equipment and install such equipment. - Adequately construct such systems in compliance with the requirements of relevant <i>Code</i> article sections/subsections.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 68	The <i>National Electrical Code</i>, Article 620, Elevators, Escalators, and Moving Walks	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Article 620 <i>Pages 223–226</i> - PowerPoint—Article 620 <i>Slides (44) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapter 6, Article 620 - Apprenticeship Program Level 3, Term 2a <i>Slides 881–927</i> - Video—Chapter 6 <i>Article 620 [0:24:37]</i>	- Study installation and <i>NEC</i> requirements of equipment. - Cover disconnecting means and control. - Cover machine rooms, control rooms, machinery spaces, and control spaces.	
Hour 69	The <i>National Electrical Code</i>, Articles 600, 604, and 620 Review	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Articles 600, 604, and 620 <i>Review Pages 209–226</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapter 6, Articles 600, 604, and 620 <i>Review Articles 600–620</i>	- Take this time to review the articles. - Successfully pass the article quizzes within the program completion requirements.	
Hour 70	Flex Training	Instructor/Institution Choice	- Use this day for any of the following: <i>Make Up Day</i> <i>Safety Training</i> <i>Special Event</i> <i>Study–Practice</i> <i>Manufacturer's Training</i> <i>Company Specific Training</i>	
Hour 71	Flex Training	Instructor/Institution Choice	- Use this day for any of the following: <i>Make Up Day</i> <i>Safety Training</i> <i>Special Event</i> <i>Study–Practice</i> <i>Manufacturer's Training</i> <i>Company Specific Training</i>	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 72	Flex Training	Instructor/Institution Choice	- Use this day for any of the following: - Make Up Day - Safety Training - Special Event - Study—Practice - Manufacturer's Training - Company Specific Training	
Hour 73	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 74	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 75	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 76	Content Exam	National Electrical Code	Successfully pass the covered content exam within the program completion requirements.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 77	Content Exam	<i>National Electrical Code</i>	Successfully pass the covered content exam within the program completion requirements.	
Hour 78	Content Exam	<i>National Electrical Code</i>	Successfully pass the covered content exam within the program completion requirements.	
Hour 79	The <i>National Electrical Code</i>, Article 625, Electric Vehicle Charging System	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Article 625 <i>Pages 227–230</i> - PowerPoint—Article 625 <i>Slides (37) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapter 6, Article 625 - Apprenticeship Program Level 3, Term 3a <i>Slides 4–43</i> - Video—Chapter 6 <i>Article 625 [0:21:49]</i>	- Adequately reference Article 625. - Be familiar with provisions and installations of this type of equipment.	
Hour 80	The <i>National Electrical Code</i>, Article 630, Electric Welders	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Article 630 <i>Pages 231–236</i> - PowerPoint—Article 630 <i>Slides (47) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapter 6, Article 630 - Apprenticeship Program Level 3, Term 3a <i>Slides 44–93</i>	- Cover the ampacity of supply conductors for welders. - Cover OCPD for welders and for conductors. - Cover the provisions for welding cable.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 81	The <i>National Electrical Code</i>, Articles 625 and 630 Review	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Articles 625 and 630 <i>Review Pages 227–236</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapter 6, Articles 625 and 630 <i>Review Articles 625 and 630</i>	- Take this time to review the articles. - Successfully pass the article quizzes within the program completion requirements.	
Hour 82	The <i>National Electrical Code</i>, Article 640, Audio Signal Processing, Amplification, and Reproduction Equipment	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Article 640 <i>Pages 237–240</i> - PowerPoint—Article 640 <i>Slides (44) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapter 6, Article 640 - Apprenticeship Program Level 3, Term 3a <i>Slides 94–140</i> - Video—Chapter 6 <i>Article 640 [0:32:46]</i>	- Cover the protection of electrical equipment. - Study the mechanical execution of work. - Cover wiring methods and bonding and grounding. - Cover permanent audio system installations.	
Hour 83	The <i>National Electrical Code</i>, Article 645, Information Technology Equipment	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Article 645 <i>Pages 241–246</i> - PowerPoint—Article 645 <i>Slides (53) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapter 6, Article 645 - Apprenticeship Program Level 3, Term 3a <i>Slides 141–195</i> - Video—Chapter 6 <i>Article 645 [1:02:04]</i>	- Adequately reference Article 645. - Be familiar with provisions and installations of this type of equipment.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 84	The <i>National Electrical Code</i>, Articles 640 and 645 Review	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Articles 640 and 645 <i>Review Pages 237–246</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapter 6, Articles 640 and 645 <i>Review Articles 640 and 645</i>	- Take this time to review the articles. - Successfully pass the article quizzes within the program completion requirements.	
Hour 85	The <i>National Electrical Code</i>, Article 680, Swimming Pools, Spas, Hot Tubs, Fountains, and Similar Installations	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Article 680 <i>Pages 247–262</i> - PowerPoint—Article 680 <i>Sections 680.1–680.25</i> <i>Slides 4–160 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapter 6, Article 680 <i>Sections 680.1–680.25</i> - Apprenticeship Program Level 3, Term 3a <i>Slides 196–356</i> - Video—Chapter 6, Article 680 <i>Sections 680.1–680.25 [2:07:36]</i>	- Adequately reference Article 680, Parts I, II, and III. - Be familiar with provisions and installations of this type of equipment.	
Hour 86	The <i>National Electrical Code</i>, Article 680, Swimming Pools, Spas, Hot Tubs, Fountains, and Similar Installations	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Article 680 <i>Pages 262–268</i> - PowerPoint—Article 680 <i>Sections 680.26–680.35</i> <i>Slides 161–221 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapter 6, Article 680 <i>Sections 680.26–680.35</i> - Apprenticeship Program Level 3, Term 3a <i>Slides 357–417</i> - Video—Chapter 6, Article 680 <i>Sections 680.26–680.34 [0:43:35]</i>	- Cover equipotential bonding. - Cover pumps. - Cover GFCI-protected receptacles and receptacle locations.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 87	The <i>National Electrical Code</i>, Article 680 Review	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Article 680 <i>Review Pages 247–268</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapter 6, Article 680 <i>Review—680.1–680.34</i>	- Take this time to review the article. - Successfully pass the article quiz within the program completion requirements.	
Hour 88	The <i>National Electrical Code</i>, Article 700, Emergency Systems	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Article 700 <i>Pages 343–352</i> - PowerPoint—Article 700 <i>Slides (100) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapter 7, Article 700 - Apprenticeship Program Level 3, Term 3a <i>Slides 499–601</i> - Video—Chapters 7-8 <i>Article 700 [1:04:54]</i>	- Cover the general requirements and circuit wiring. - Cover requirements for sources of power. - Cover circuits for lighting and power. - Cover overcurrent protection.	
Hour 89	The <i>National Electrical Code</i>, Articles 701 and 702, Legally Required Standby Systems and Optional Standby Systems	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Articles 701 and 702 <i>Pages 353–364</i> - PowerPoint—Articles 701 and 702 <i>Slides (56) and (49) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapter 7, Articles 701 and 702 - Apprenticeship Program Level 3, Term 3a <i>Slides 602–660, 661–713</i> - Video—Chapters 7-8 <i>Articles 701 and 702 [0:20:17]</i>	- Adequately reference Articles 701 and 702. - Be familiar with provisions and installations of these types of equipment.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 90	The <i>National Electrical Code</i>, Articles 700, 701, and 702 Review	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Articles 700, 701, and 702 <i>Review Pages 343–364</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapter 7, Articles 700, 701, and 702 <i>Review Articles 700–702</i>	- Take this time to review the articles. - Successfully pass the article quizzes within the program completion requirements.	
Hour 91	The <i>National Electrical Code</i>, Article 725, Remote-Control, Signaling, and Power-Limited Circuits	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Article 725 <i>Pages 393–402</i> - PowerPoint—Article 725 <i>Sections 725.1–725.51</i> <i>Slides 3–89 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapter 7, Article 725 <i>Sections 725.1–725.51</i> - Apprenticeship Program Level 3, Term 3a <i>Slides 714–803</i> - Video—Chapters 7-8 <i>Sections 725.1–725.51 [1:13:06]</i>	- Adequately reference Article 725, Parts I and II. - Be familiar with provisions and installations of this type of equipment.	
Hour 92	The <i>National Electrical Code</i>, Article 725, Remote-Control, Signaling, and Power-Limited Circuits	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Article 725 <i>Pages 402–412</i> - PowerPoint—Article 725 <i>Sections 725.121–725.179</i> <i>Slides 90–194 (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapter 7, Article 725 <i>Sections 725.121–725.179</i> - Apprenticeship Program Level 3, Term 3a <i>Slides 804–909</i> - Video—Chapters 7-8 <i>Sections 725.121–725.179</i> <i>[1:30:24]</i>	- Cover class II and III circuit requirements. - Cover listing requirements.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 93	The <i>National Electrical Code</i>, Article 725 Review	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Article 725 <i>Review Pages 393–412</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapter 7, Article 725 <i>Review Article 725</i>	- Take this time to review the article. - Successfully pass the article quiz within the program completion requirements.	
Hour 94	The <i>National Electrical Code</i>, Articles 760, 770, and 800, Fire Alarm Systems, Optical Fiber Cables and Raceways, and Communications Circuits	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Articles 760, 770, and 800 <i>Pages 419–428, 429–434 and 455–466</i> - PowerPoint—Articles 760, 770, 800 <i>Slides (99), (61), (95) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapters 7 and 8, Articles 760, 770, and 800 - Apprenticeship Program Level 3, Term 3a <i>Slides 910–1011, 1012–1075, 1076–1173</i> - Videos—Chapters 7 and 8 <i>Articles 760, 770, 800, 805, 810, and 820 [0:50:58]</i>	- Adequately reference Article 760, Parts I and II. - Adequately reference Article 800. - Be familiar with provisions and installations of these types of equipment.	
Hour 95	The <i>National Electrical Code</i>, Articles 805, 810, and 820, Communications Circuits, Radio and Television Equipment, and Community Antenna Television (CATV) and Radio Distribution Systems	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Articles 805, 810 and 820 <i>Pages 467–478</i> - PowerPoint—Articles 805 810, 820 <i>Slides (56), (38), (26) (classroom)</i> - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapter 8, Articles 805, 810 and 820 - Apprenticeship Program Level 3, Term 3a <i>Slides 1174–1211, 1212–1270, 1271–1298</i> - Video—Chapters 7 and 8 <i>Articles 760, 770, 800, 805, 810, and 820 [0:50:58]</i>	- Adequately reference Articles 805, 810 and 820. - Be familiar with provisions and installations of this type of equipment.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 96	The <i>National Electrical Code</i>, Articles 760, 770, 800, 805, 810 and 820 Review	- Textbook—<i>Understanding the NEC Volume 2</i> and the <i>NEC</i>, Articles 760, 770, 800, 805 810, and 820 Review Pages 419–478 - Capacitor—<i>Understanding the NEC Volume 2</i>, Chapters 7 and 8, Articles 760, 770, 800, 805, 810, and 820 Review Articles 760, 770, and 800, 805, 810, 820	- Take this time to review the articles. - Successfully pass the article quizzes within the program completion requirements.	
Hour 97	The <i>National Electrical Code</i>, Article 690, Solar Photovoltaic (PV) Systems	- Textbook—<i>Solar PV and Energy Storage Systems</i> and the <i>NEC</i>, Article 690 Pages 447–456 - PowerPoint—Solar 13 Sections 690.1–690.6 Slides 5–62 (classroom) - Capacitor—<i>Understanding NEC Requirements for Solar Photovoltaic Systems</i>. Chapter 6, Article 690 Sections 690.1–690.6 - Apprenticeship Program Level 3, Term 3b Slides 3–65 - Video—Solar PV Systems 2 Sections 690.1–690.6 [1:19:47]	- Study how to work safely with solar panels. - Demonstrate proficiency with Code rules pertaining to photovoltaic systems.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 98	The <i>National Electrical Code</i>, Article 690, Solar Photovoltaic (PV) Systems	- Textbook—<i>Solar PV and Energy Storage Systems</i> and the <i>NEC</i>, Article 690 <i>Pages 456–468</i> - PowerPoint—Solar 13 <i>Sections 690.7–690.12</i> <i>Slides 63–179 (classroom)</i> - Capacitor—<i>Understanding NEC Requirements for Solar Photovoltaic Systems</i>. Chapter 6, Article 690 <i>Sections 690.7–690.12</i> - Apprenticeship Program Level 3, Term 3b <i>Slides 66–183</i> - Video—Solar PV Systems 2 <i>Sections 690.7–690.12 [2:24:26]</i>	- Study Code rules associated with photovoltaic systems. - Introduce to some of the dangers of working with solar panels.	
Hour 99	The <i>National Electrical Code</i>, Article 690, Solar Photovoltaic (PV) Systems	- Textbook—<i>Solar PV and Energy Storage Systems</i> and the <i>NEC</i>, Article 690 <i>Pages 469–471</i> - PowerPoint—Solar 13 <i>Sections 690.13–690.15</i> <i>Slides 180–216 (classroom)</i> - Capacitor—<i>Understanding NEC Requirements for Solar Photovoltaic Systems</i>. Chapter 6, Article 690 <i>Sections 690.13–690.15</i> - Apprenticeship Program Level 3, Term 3b <i>Slides 184–218</i> - Video—Solar PV Systems 2 <i>Sections 690.13–690.15 [0:33:38]</i>	- Study Code rules associated with photovoltaic systems. - Introduction to some of the dangers of working with solar panels.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 100	The <i>National Electrical Code</i>, Article 690, Solar Photovoltaic (PV) Systems	- Textbook—<i>Solar PV and Energy Storage Systems</i> and the <i>NEC</i>, Article 690 <i>Pages 472–478</i> - PowerPoint—Solar 13 <i>Sections 690.31–690.34</i> <i>Slides 217–275 (classroom)</i> - Capacitor—<i>Understanding NEC Requirements for Solar Photovoltaic Systems</i>. Chapter 6, Article 690 <i>Sections 690.31–690.34</i> - Apprenticeship Program Level 3, Term 3b <i>Slides 219–278</i> - Video—Solar PV Systems 2 <i>Sections 690.31–690.34 [0:55:51]</i>	- Study how to work safely with solar panels. - Demonstrate proficiency with <i>Code</i> rules pertaining to photovoltaic systems.	
Hour 101	The <i>National Electrical Code</i>, Article 690, Solar Photovoltaic (PV) Systems	- Textbook—<i>Solar PV and Energy Storage Systems</i> and the <i>NEC</i>, Article 690 <i>Pages 478–482</i> - PowerPoint—Solar 13 <i>Sections 690.43–690.56</i> <i>Slides 276–316 (classroom)</i> - Capacitor—<i>Understanding NEC Requirements for Solar Photovoltaic Systems</i>. Chapter 6, Article 690 <i>Sections 690.43–690.56</i> - Apprenticeship Program Level 3, Term 3b <i>Slides 279–322</i> - Video—Solar PV Systems 2 <i>Sections 690.43–690.56 [0:47:38]</i>	- Study <i>Code</i> rules associated with photovoltaic systems. - Introduction to some of the dangers of working with solar panels.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 102	The <i>National Electrical Code</i>, Article 690, Solar Photovoltaic (PV) Systems	- Textbook—<i>Solar PV and Energy Storage Systems</i> and the <i>NEC</i>, Article 690 <i>Pages 483–484</i> - PowerPoint—Solar 13 <i>Sections 690.59–690.72</i> <i>Slides 317–324 (classroom)</i> - Capacitor—<i>Understanding NEC Requirements for Solar Photovoltaic Systems</i>. Chapter 6, Article 690 <i>Sections 690.59–690.72</i> - Apprenticeship Program Level 3, Term 3b <i>Slides 323–332</i> - Video—Solar PV Systems 2 <i>Sections 690.59–690.72 [0:23:11]</i>	- Study how to work safely with solar panels. - Demonstrate proficiency with <i>Code</i> rules pertaining to photovoltaic systems.	
Hour 103	Chapter 4 <i>NEC</i>—Article 480, Storage Batteries	- Textbook—<i>Solar Photovoltaic and Energy Storage Systems</i>, Chapter 4, and the <i>NEC</i> Article 480 <i>Pages 443–446</i> - PowerPoint—Solar 12 <i>Sections 480.1–480.13</i> <i>Slides 221–267 (classroom)</i> - Capacitor—<i>Solar Photovoltaic and Energy Storage Systems</i>, Chapter 4, Article 480 - Apprenticeship Program Level 3, Term 3b <i>Slides 333–381</i>	Review <i>NEC</i> requirements for Storage Batteries	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 104	Chapter 6 <i>NEC</i>—Article 691, Large-Scale Solar Photovoltaic (PV) Electric Supply Stations	- Textbook—<i>Solar Photovoltaic and Energy Storage Systems</i>, Chapter 6, and the <i>NEC</i> Article 691 <i>Pages 485–486</i> - PowerPoint—Solar 13 <i>Slides 328–348 (classroom)</i> - Capacitor—<i>Solar Photovoltaic and Energy Storage Systems</i>, Chapter 6, Article 691 - Apprenticeship Program Level 3, Term 3b <i>Slides 382–406</i> - Video—Solar Disc 3 <i>Sections 691.1–691.11 [0:24:56]</i>	Review <i>NEC</i> requirements for large scale PV systems	
Hour 105	Chapter 7 <i>NEC</i>—Article 705, Interconnected Electric Power Production Sources (IEPPS)	- Textbook—<i>Solar Photovoltaic and Energy Storage Systems</i>, Chapter 7, and the <i>NEC</i> Article 705 <i>Pages 487–492</i> - PowerPoint—Solar 14 <i>Slides 6–44 (classroom)</i> - Capacitor—<i>Solar Photovoltaic and Energy Storage System</i>, Chapter 7, Article 705 - Apprenticeship Program Level 3, Term 3b <i>Slides 407–453</i> - Video—Solar Disc 3 <i>Sections 705.1–705.11 [0:27:08]</i>	Review <i>NEC</i> requirements for Interconnected Electric Power Production Sources (IEPPS)	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 106	Chapter 7 <i>NEC</i>—Article 705, Interconnected Electric Power Production Sources (IEPPS)	- Textbook—<i>Solar Photovoltaic and Energy Storage Systems</i>, Chapter 7, and the <i>NEC</i> Article 705 <i>Pages 493–500</i> - PowerPoint—Solar 14 <i>Sections 705.12–705.16</i> <i>Slides 45–100 (classroom)</i> - Capacitor—<i>Solar Photovoltaic and Energy Storage Systems</i>; Chapter 7, Article 705 - Apprenticeship Program Level 3, Term 3b <i>Slides 454–510</i> - Video—Solar Disc 3 <i>Sections 705.12–705.16 [1:04:32]</i>	Review <i>NEC</i> requirements for Interconnected Electric Power Production Sources (IEPPS)	
Hour 107	Chapter 7 <i>NEC</i>—Article 705, Interconnected Electric Power Production Sources (IEPPS)	- Textbook—<i>Solar Photovoltaic and Energy Storage Systems</i>, Chapter 7, and the <i>NEC</i> Article 705 <i>Pages 500–504</i> - PowerPoint—Solar 14 <i>Sections 705.20–705.60</i> <i>Slides 101–158 (classroom)</i> - Capacitor—<i>Solar Photovoltaic and Energy Storage Systems</i>; Chapter 7, Article 705 - Apprenticeship Program Level 3, Term 3b <i>Slides 511–566</i> - Video—Solar Disc 3 <i>Sections 705.20–705.60 [1:52:56]</i>	Review <i>NEC</i> requirements for Interconnected Electric Power Production Sources (IEPPS)	
Hour 108	Chapter 7 <i>NEC</i>—Article 706, Energy Storage Systems (ESS)	- Textbook—<i>Solar Photovoltaic and Energy Storage Systems</i>, Chapter 7, and the <i>NEC</i> Article 706 <i>Pages 505–512</i> - Capacitor—<i>Solar Photovoltaic and Energy Storage Systems</i>; Chapter 7, Article 706 - Video—Solar Disc 3 <i>Sections 706.1–706.33 [1:00:20]</i>	Review <i>NEC</i> requirements for Energy Storage Systems (ESS)	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 109	Chapter 7 <i>NEC</i>—Article 706, Energy Storage Systems (ESS)	- Textbook—<i>Solar Photovoltaic and Energy Storage Systems</i>, Chapter 7, and the <i>NEC</i> Article 706 <i>Pages 505–512</i> - PowerPoint—Solar 14 <i>Sections 706.1–706.15</i> <i>Slides 164–200 (classroom)</i> - Capacitor—<i>Solar Photovoltaic and Energy Storage Systems</i>, Chapter 7, Article 706 <i>Sections 706.1–706.15</i> - Apprenticeship Program Level 3, Term 3b <i>Slides 567–599</i>	Review <i>NEC</i> requirements for Energy Storage Systems (ESS)	
Hour 110	Chapter 7 <i>NEC</i>—Article 706, Energy Storage Systems (ESS)	- Textbook—<i>Solar Photovoltaic and Energy Storage Systems</i>, Chapter 7, and the <i>NEC</i> Article 706 <i>Pages 505–512</i> - PowerPoint—Solar 14 <i>Sections 706.20–Part V</i> <i>Slides 201–250 (classroom)</i> - Capacitor—<i>Solar Photovoltaic and Energy Storage Systems</i>, Chapter 7, Article 706 <i>Sections 706.20–Part V</i> - Apprenticeship Program Level 3, Term 3b <i>Slides 600–650</i>	Review <i>NEC</i> requirements for Energy Storage Systems (ESS)	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 111	Chapter 7 <i>NEC</i>—Article 710, Stand-Alone Systems	- Textbook—<i>Solar Photovoltaic and Energy Storage Systems</i>, Chapter 3, and the <i>NEC</i> Article 710 <i>Pages 513–516</i> - PowerPoint—Solar 14 <i>Slides 254–275</i> - Capacitor—<i>Solar Photovoltaic and Energy Storage Systems</i>, Chapter 3, Article 710 - Apprenticeship Program Level 3, Term 3b <i>Slides 651–678</i> - Video—Solar Disc 3 <i>Sections 710.1–710.15 [0:28:24]</i>	Review <i>NEC</i> requirements for Stand-Alone Systems	
Hour 112	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 113	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 114	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 115	Content Exam	<i>National Electrical Code</i>	Successfully pass the covered content exam within the program completion requirements.	
Hour 116	Content Exam	<i>National Electrical Code</i>	Successfully pass the covered content exam within the program completion requirements.	
Hour 117	Content Exam	<i>National Electrical Code</i>	Successfully pass the covered content exam within the program completion requirements.	
Hour 118	Introduction to Motor Controls—Basic Principles of Motor Controls, and Definitions, Abbreviations, and Symbols	- Textbook—<i>Understanding Basic Motor Controls</i>, Chapter 1, Units 1 and 2 <i>Pages 3–8 and 11–20</i> - Capacitor—<i>Understanding Basic Motor Controls</i>, Chapter 1, Units 1 and 2 - Apprenticeship Program Level 1, Term 4 <i>Slides 3–21</i> - Video—<i>Understanding Basic Motor Controls 1</i> <i>Units 1 and 2 [0:43:25]</i>	Understand common language, symbols, and abbreviations associated with motors and motor control.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 119	Introduction to Motor Controls—Common Control Equipment, Devices, and Symbols	- Textbook—<i>Understanding Basic Motor Controls</i>, Chapter 1, Unit 3 <i>Pages 23–39</i> - Capacitor—<i>Understanding Basic Motor Controls</i>, Chapter 1, Unit 3 - Apprenticeship Program Level 1, Term 4 <i>Slides 22–60</i> - Video—<i>Understanding Basic Motor Controls 1</i> <i>Unit 3 [0:42:20]</i>	List, define, and learn the operation of common control equipment and devices.	
Hour 120	- Introduction to Motor Controls—Basic Principles of Motor Controls, Definitions, Abbreviations, and Symbols, and Common Control Equipment, Devices, and Symbols - Review and Quizzes	- Textbook—<i>Understanding Basic Motor Controls</i>, Chapter 1, Units 1–3 <i>Review Pages 3–8, 11–20, and 23–39</i> - Capacitor—<i>Understanding Basic Motor Controls</i>, Chapter 1, Units 1, 2, and 3 <i>Review Units 1–3</i>	- Take this time to review the units. - Successfully pass the unit quizzes within the program completion requirements.	
Hour 121	Motor Controls and Schematics—Components of Control Circuit Schematics and Magnetic Control	- Textbook—<i>Understanding Basic Motor Controls</i>, Chapter 2, Units 4 and 5 <i>Pages 45–49 and 53–65</i> - Capacitor—<i>Understanding Basic Motor Controls</i>, Chapter 2, Units 4 and 5 - Apprenticeship Program Level 1, Term 4 <i>Slides 61–104</i> - Video—<i>Understanding Basic Motor Controls 1</i> <i>Units 4 and 5 [0:50:47]</i>	- List common components of schematics. - Study the purpose of various components associated with magnetic control.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 122	Motor Controls and Schematics—Magnetic Motor Starters and Basic Control Circuits	- Textbook—<i>Understanding Basic Motor Controls</i>, Chapter 2, Units 6 and 7 <i>Pages 69–76 and 81–93</i> - Capacitor—<i>Understanding Basic Motor Controls</i>, Chapter 2, Units 6 and 7 - Apprenticeship Program Level 1, Term 4 <i>Slides 105–153</i> - Video—<i>Understanding Basic Motor Controls 1</i> <i>Units 6 and 7 [1:30:30]</i>	- Introduce motor starters, overloads, auxiliary contacts, and accessory devices. - Cover sections on 2- and 3-wire control circuits.	
Hour 123	Motor Controls and Schematics—Overcurrent Protection for Control Circuits	- Textbook—<i>Understanding Basic Motor Controls</i>, Chapter 2, Unit 8 <i>Pages 99–104</i> - Capacitor—<i>Understanding Basic Motor Controls</i>, Chapter 2, Unit 8 - Apprenticeship Program Level 1, Term 4 <i>Slides 154–164</i> - Video—<i>Understanding Basic Motor Controls 1</i> <i>Unit 8 [0:21:12]</i>	- Study overcurrent protection for control circuits. - Compare common and separate control protection. - Go over control transformer protection.	
Hour 124	Motor Controls and Schematics—Indicator (Pilot) Lights and Illuminated Pushbuttons	- Textbook—<i>Understanding Basic Motor Controls</i>, Chapter 2, Unit 9 <i>Pages 107–113</i> - Capacitor—<i>Understanding Basic Motor Controls</i>, Chapter 2, Unit 9 - Apprenticeship Program Level 1, Term 4 <i>Slides 165–183</i> - Video—<i>Understanding Basic Motor Controls 1</i> <i>Unit 9 [0:13:47]</i>	Identify circuit locations that would likely employ the use of indicator lights.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 125	Motor Controls and Schematics—Selector Switches and Truth Tables	- Textbook—<i>Understanding Basic Motor Controls</i>, Chapter 2, Unit 10 <i>Pages 117–123</i> - Capacitor—<i>Understanding Basic Motor Controls</i>, Chapter 2, Unit 10 - Apprenticeship Program Level 1, Term 4 <i>Slides 184–201</i> - Video—<i>Understanding Basic Motor Controls 1</i> <i>Unit 10 [0:18:38]</i>	Properly connect a 2- and 3-position selector switch.	
Hour 126	- Motor Controls and Schematics - Review and Quizzes	- Textbook—<i>Understanding Basic Motor Controls</i>, Chapter 2, Units 4–10 <i>Review Pages 45–48, 53–65, 69–76, 81–93, 99–104, 107–113, and 117–123</i> - Capacitor—<i>Understanding Basic Motor Controls</i>, Chapter 2, Units 4–10 <i>Review Units 4–10</i>	- Take this time to review the units. - Successfully pass the unit quizzes within the program completion requirements.	
Hour 127	Reversing Controls—Reversing Controls for Three-Phase Motors	- Textbook—<i>Understanding Basic Motor Controls</i>, Chapter 3, Unit 11 <i>Pages 129–137</i> - Capacitor—<i>Understanding Basic Motor Controls</i>, Chapter 3, Unit 11 - Apprenticeship Program Level 1, Term 4 <i>Slides 202–225</i> - Video—<i>Understanding Basic Motor Controls 2</i> <i>Unit 11 [0:26:00]</i>	- Introduce the reversing of motors and the components utilized to accomplish it. - Discuss interlocking devices.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 128	Reversing Controls—Reversing Controls for Three-Phase Motors	- Textbook—<i>Understanding Basic Motor Controls</i>, Chapter 3, Unit 11 <i>Pages 129–137</i> - Capacitor—<i>Understanding Basic Motor Controls</i>, Chapter 3, Unit 11 - Apprenticeship Program Level 1, Term 4 <i>Slides 202–225</i> - Video—<i>Understanding Basic Motor Controls 2</i> <i>Unit 11 [0:26:00]</i>	Properly wire a reversing starter or explain how it would be accomplished with given components.	
Hour 129	Reversing Controls—Reversing Controls with Indicator (Pilot) Lights for Three-Phase Motors	- Textbook—<i>Understanding Basic Motor Controls</i>, Chapter 3, Unit 12 <i>Pages 141–143</i> - Capacitor—<i>Understanding Basic Motor Controls</i>, Chapter 3, Unit 12 - Apprenticeship Program Level 1, Term 4 <i>Slides 226–230</i> - Video—<i>Understanding Basic Motor Controls 2</i> <i>Unit 12 [0:14:26]</i>	- Cover adding forward and reverse pilot lights. - Study alternate pilot light connection points.	
Hour 130	Reversing Controls—Reversing Controls with Limit Switches for Three-Phase Motors	- Textbook—<i>Understanding Basic Motor Controls</i>, Chapter 3, Unit 13 <i>Pages 147–153</i> - Capacitor—<i>Understanding Basic Motor Controls</i>, Chapter 3, Unit 13 - Apprenticeship Program Level 1, Term 4 <i>Slides 231–250</i> - Video—<i>Understanding Basic Motor Controls 2</i> <i>Unit 13 [0:19:52]</i>	Cover section pertaining to the use of indicator lights with reversing controls.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 131	Reversing Controls—Reversing Single-Phase Motors	- Textbook—<i>Understanding Basic Motor Controls</i>, Chapter 3, Unit 14 <i>Pages 157–161</i> - Capacitor—<i>Understanding Basic Motor Controls</i>, Chapter 3, Unit 14 - Apprenticeship Program Level 1, Term 4 <i>Slides 251–262</i> - Video—<i>Understanding Basic Motor Controls 2</i> <i>Unit 14 [0:07:40]</i>	- Study how to reverse single-phase motors. - List some common single-phase motor types.	
Hour 132	- Reversing Controls - Review and Quizzes	- Textbook—<i>Understanding Basic Motor Controls</i>, Chapter 3, Units 11–14 <i>Review Pages 129–137, 141–143, 147–153, and 157–161</i> - Capacitor—<i>Understanding Basic Motor Controls</i>, Chapter 3, Units 11–14 <i>Review Units 11–14</i>	- Take this time to review the units. - Successfully pass the unit quizzes within the program completion requirements.	
Hour 133	Controls for Multiple Motors—Sequencing Control	- Textbook—<i>Understanding Basic Motor Controls</i>, Unit 15 <i>Pages 167–173</i> - Capacitor—<i>Understanding Basic Motor Controls</i>, Unit 15 - Apprenticeship Program Level 1, Term 4 <i>Slides 263–283</i> - Video—<i>Understanding Basic Motor Controls 2</i> <i>Unit 15 [0:08:52]</i>	Exhibit an understanding of motor sequencing and the related controls.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 134	Controls for Multiple Motors—Master Stop Function	- Textbook—<i>Understanding Basic Motor Controls</i>, Unit 16 <i>Pages 177–178</i> - Capacitor—<i>Understanding Basic Motor Controls</i>, Unit 16 - Apprenticeship Program Level 1, Term 4 <i>Slides 284–287</i> - Video—<i>Understanding Basic Motor Controls 2</i> <i>Unit 16 [0:01:26]</i>	Cover section on the master stop function.	
Hour 135	- Controls for Multiple Motors - Review and Quizzes	- Textbook—<i>Understanding Basic Motor Controls</i>, Units 15 and 16 <i>Review Pages 167–173 and 177–178</i> - Capacitor—<i>Understanding Basic Motor Controls</i>, Units 15 and 16 <i>Review Units 15 and 16</i>	- Take this time to review the units. - Successfully pass the unit quizzes within the program completion requirements.	
Hour 136	Motor Controls Miscellaneous Requirements—Motor and Controller Disconnecting Means in Schematics, and Miscellaneous Motor Control Circuits	- Textbook—<i>Understanding Basic Motor Controls</i>, Annex A, Units 17 and 18 <i>Pages 183–187 and 191–195</i> - Capacitor—<i>Understanding Basic Motor Controls</i>, Annex A, Units 17 and 18 - Apprenticeship Program Level 1, Term 4 <i>Slides 288–311</i> - Video—<i>Understanding Basic Motor Controls 2</i> <i>Annex “A” [0:24:58]</i>	Size, connect, and protect various control circuits using a variety of components.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 137	Motor Controls Miscellaneous Requirements—Motor Winding Connections, and Miscellaneous Control and Signaling Circuits Annex A	- Textbook—<i>Understanding Basic Motor Controls</i>, Annex A, Units 19 and 20 <i>Pages 199–204 and 209–212</i> - Capacitor—<i>Understanding Basic Motor Controls</i>, Annex A, Units 19 and 20 - Apprenticeship Program Level 1, Term 4 <i>Slides 312–334</i> - Video—<i>Understanding Basic Motor Controls 2</i> <i>Annex “A” [0:24:58]</i>	Wrap up the motor controls section with the last units on winding connections and other circuits.	
Hour 138	- Motor Controls Miscellaneous Requirements - Review and Quizzes	- Textbook—<i>Understanding Basic Motor Controls</i>, Annex A, Units 17–20 <i>Review Pages 183–187, 191–195, 199–204, and 209–212</i> - Capacitor—<i>Understanding Basic Motor Controls</i>, Annex A, Units 17–20 <i>Review Units 17–20</i> - Apprenticeship Program Level 1, Term 4 *BONUS* NEC Article 430 <i>Slides 335–404</i>	- Take this time to review the units. - Successfully pass the unit quizzes within the program completion requirements.	
Hour 139	Lab/Activity	Instructor/Institution Choice	Locate or create a Lab or Activity suitable for the material covered or for the purposes of review.	
Hour 140	Lab/Activity	Instructor/Institution Choice	Locate or create a Lab or Activity suitable for the material covered or for the purposes of review.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 141	• Lab/Activity	• Instructor/Institution Choice	• Locate or create a Lab or Activity suitable for the material covered or for the purposes of review.	
Hour 142	• Flex Training	• Instructor/Institution Choice	• Use this day for any of the following: • <i>Make Up Day</i> • <i>Safety Training</i> • <i>Special Event</i> • <i>Study—Practice</i> • <i>Manufacturer's Training</i> • <i>Company Specific Training</i>	
Hour 143	• Flex Training	• Instructor/Institution Choice	• Use this day for any of the following: • <i>Make Up Day</i> • <i>Safety Training</i> • <i>Special Event</i> • <i>Study—Practice</i> • <i>Manufacturer's Training</i> • <i>Company Specific Training</i>	
Hour 144	• Flex Training	• Instructor/Institution Choice	• Use this day for any of the following: • <i>Make Up Day</i> • <i>Safety Training</i> • <i>Special Event</i> • <i>Study—Practice</i> • <i>Manufacturer's Training</i> • <i>Company Specific Training</i>	
Hour 145	• Content Review	• All covered material used.	• Review all covered material to prepare for the content exam. • Make sure all information that will be on the exam is covered.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 146	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 147	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 148	Content Exam	Only use the <i>NEC</i> for exam	Successfully pass the covered content exam within the program completion requirements.	
Hour 149	Content Exam	Only use the <i>NEC</i> for exam	Successfully pass the covered content exam within the program completion requirements.	
Hour 150	Content Exam	Only use the <i>NEC</i> for exam	Successfully pass the covered content exam within the program completion requirements.	
Hour 151	Level 3 Review	All Level 3 material used	- Review all material from Level 3 to prepare for the Level 3 Final Exam. - Make sure all information that will be on the exam is covered.	

Apprenticeship Program—Level 3				
Hour	Topic	Resources	Learning Focus	Notes
Hour 152	Level 3 Review	All Level 3 material used	- Review all material from Level 3 to prepare for the Level 3 Final Exam. - Make sure all information that will be on the exam is covered.	
Hour 153	Level 3 Review	All Level 3 material used	- Review all material from Level 3 to prepare for the Level 3 Final Exam. - Make sure all information that will be on the exam is covered.	
Hour 154	Level 3 Final Exam	<i>National Electrical Code</i>	Successfully pass the Level 3 Final Exam within the program completion requirements.	
Hour 155	Level 3 Final Exam	<i>National Electrical Code</i>	Successfully pass the Level 3 Final Exam within the program completion requirements.	
Hour 156	Level 3 Final Exam	<i>National Electrical Code</i>	Successfully pass the Level 3 Final Exam within the program completion requirements.	



Apprenticeship Program—Level 4				
Hour	Topic	Resources	Learning Focus	Notes
Hour 1	• Introduction, Orientation, Tool Safety	• Institution/Instructor Choice	• Complete any paperwork, distribute books and tools. • Cover policies, procedures, and tool safety.	
Hour 2	• Introduction, Orientation, Tool Safety	• Institution/Instructor Choice	• Complete any paperwork, distribute books and tools. • Cover policies, procedures, and tool safety.	
Hour 3	• Introduction, Orientation, Tool Safety	• Institution/Instructor Choice	• Complete any paperwork, distribute books and tools. • Cover policies, procedures, and tool safety.	
Hour 4	• Construction Safety—Electrical Safety and Personal Protective Equipment	• Textbook—<i>OSHA Construction Safety Handbook</i> Chapters—Electrical Safety and Personal Protective Equipment • Apprenticeship Level 4, Safety Slides 5–124	• Learn and understand electrical hazards and safe electrical practices.	
Hour 5	• Construction Safety—Electrical Safety and Personal Protective Equipment	• Textbook—<i>OSHA Construction Safety Handbook</i>, Chapters—Electrical Safety and Personal Protective Equipment • Apprenticeship Level 4, Safety Slides 5–124	• Learn and understand electrical hazards and safe electrical practices.	
Hour 6	• Construction Safety—Electrical Safety and Personal Protective Equipment	• Textbook—<i>OSHA Construction Safety Handbook</i> Chapters—Electrical Safety and Personal Protective Equipment • Quiz—Capacitor <i>Construction Safety, Electrical Safety and Personal Protective Equipment</i>	• Take this time to review the unit. • Successfully pass the unit quiz within the program completion requirements.	

Apprenticeship Program—Level 4				
Hour	Topic	Resources	Learning Focus	Notes
Hour 7	Construction Safety—Hazard Communication	- Textbook—<i>OSHA Construction Safety Handbook</i> Chapter—Hazard Communication - Apprenticeship Level 4, Safety Slides 125–194	Learn and understand physical, chemical, and health hazards.	
Hour 8	Construction Safety—Jobsite Exposures	- Textbook—<i>OSHA Construction Safety Handbook</i> Chapter—Jobsite Exposures - Apprenticeship Level 4, Safety Slides 195–231	Learn and understand jobsite hazards and protective measures.	
Hour 9	Construction Safety—Work Zone Safety	- Textbook—<i>OSHA Construction Safety Handbook</i> Chapter—Work Zone Safety - Apprenticeship Level 4, Safety Slides 232–256 - Review <i>Hazard Communication, Jobsite Exposure, Work Zone Safety</i> - Quizzes—Capacitor <i>Hazard Communication, Jobsite Exposures, and Work Zone Safety</i>	- Take this time to review the units - Successfully pass the unit quizzes within the program completion requirements.	
Hour 10	Understanding Electrical Estimating—Chapter 1, Introduction to Estimating	- Textbook—<i>Understanding Electrical Estimating</i>, Chapter 1 Pages 1–22 - PowerPoint—Understanding Electrical Estimating, Chapter 1 Slides (121) - Video—Understanding Electrical Estimating 1 Chapter 1 [2:42:38]	- Course material may be supplemented using program videos where available at individual discretion. - Cover: - The purpose of an estimate - Various types of estimates - Developing and estimating system - Difference between estimating and bidding - How the market can affect estimating	

Apprenticeship Program—Level 4				
Hour	Topic	Resources	Learning Focus	Notes
Hour 11	Understanding Electrical Estimating—Chapter 2, Qualities of an Estimator	- Textbook—<i>Understanding Electrical Estimating</i>, Chapter 2 Pages 35–42 - PowerPoint—Understanding Electrical Estimating, Chapter 2 Slides (43) - Video—Understanding Electrical Estimating 1 Chapter 2 [0:45:04]	- Explore the qualities and responsibilities of an estimator - Discuss the importance of field experience	
Hour 12	Understanding Electrical Estimating—Chapters 1 and 2, Introduction and About Estimating Review	Textbook—<i>Understanding Electrical Estimating</i>, Chapters 1 and 2 Review—Chapters 1–2	Take this time to review the chapters and complete chapter review questions.	
Hour 13	Understanding Electrical Estimating—Chapter 3, The Estimating Process	- Textbook—<i>Understanding Understanding Electrical Estimating</i>, Chapter 3 Pages 47–61 - PowerPoint—Understanding Electrical Estimating, Chapter 3 Slides (87) - Video—Understanding Electrical Estimating 1 Chapter 3 [1:27:54]	- Discuss the importance of an adequate estimating workspace and its components - Recognize what might affect the accuracy of an estimate - Cover various estimating techniques	
Hour 14	Understanding Electrical Estimating—Chapter 3, The Estimating Process	- Textbook—<i>Understanding Electrical Estimating</i>, Chapter 3 Pages 47–61 - PowerPoint—Understanding Electrical Estimating, Chapter 3 Slides (87) - Video—Understanding Electrical Estimating 1 Chapter 3 [1:27:54]	- Discuss the importance of an adequate estimating workspace and its components - Recognize what might affect the accuracy of an estimate - Cover various estimating techniques	

Apprenticeship Program—Level 4

Hour	Topic	Resources	Learning Focus	Notes
Hour 15	Understanding Electrical Estimating—Chapter 3, The Estimating Process Review	Textbook—<i>Understanding Electrical Estimating</i>, Chapter 3 Review—Chapter 3	Take this time to review the chapters and complete chapter review questions.	
Hour 16	Understanding Electrical Estimating—Chapter 4, The Takeoff	- Textbook—<i>Understanding Electrical Estimating</i>, Chapter 4 Pages 69–104 - PowerPoint—Understanding Electrical Estimating, Chapter 4 Slides (143) - Video—Understanding Electrical Estimating 1 Chapter 4 [2:05:01]	- Recognize how and why the takeoff is the foundation for everything that follows in developing an accurate estimate. - Cover: - the takeoff sequence - takeoff systems - the bill of material (BOM) - determining and pricing labor and material - Explain how historical data can promote more accurate estimating	
Hour 17	Understanding Electrical Estimating—Chapter 4, The Takeoff	- Textbook—<i>Understanding Electrical Estimating</i>, Chapter 4 Pages 69–104 - PowerPoint—Understanding Electrical Estimating, Chapter 4 Slides (143) - Video—Understanding Electrical Estimating 1 Chapter 4 [2:05:01]	- Recognize how and why the takeoff is the foundation for everything that follows in developing an accurate estimate. - Cover: - the takeoff sequence - takeoff systems - the bill of material (BOM) - determining and pricing labor and material - Explain how historical data can promote more accurate estimating	

Apprenticeship Program—Level 4				
Hour	Topic	Resources	Learning Focus	Notes
Hour 18	- Understanding Electrical Estimating—Chapter 4, The Takeoff - Review	Textbook—<i>Understanding Electrical Estimating</i>, Chapter 4 Review—Chapter 4	Take this time to review the chapters and complete chapter review questions.	
Hour 19	Understanding Electrical Estimating—Chapter 5, Determining Labor Costs	- Textbook—<i>Understanding Electrical Estimating</i>, Chapter 5 Pages 113–143 - PowerPoint—Understanding Electrical Estimating, Chapter 5 Slides (176) - Video—Understanding Electrical Estimating 2 Chapter 5 [3:41:45]	- Cover the following for determining labor costs: - how labor units are expressed and why - what makes up a labor unit - the benefits of labor unit manuals - what adjustments might be necessary - labor unit variables	
Hour 20	Understanding Electrical Estimating—Chapter 5, Determining Labor Costs	- Textbook—<i>Understanding Electrical Estimating</i>, Chapter 5 Pages 113–143 - PowerPoint—Understanding Electrical Estimating, Chapter 5 Slides (176) - Video—Understanding Electrical Estimating 2 Chapter 5 [3:41:45]	- Cover the following for determining labor costs: - how labor units are expressed and why - what makes up a labor unit - the benefits of labor unit manuals - what adjustments might be necessary - labor unit variables	
Hour 21	- Understanding Electrical Estimating—Chapter 5, Determining Labor Costs - Review	Textbook—<i>Understanding Electrical Estimating</i>, Chapter 5 Review—Chapter 5	Take this time to review the chapters and complete chapter review questions.	

Apprenticeship Program—Level 4

Hour	Topic	Resources	Learning Focus	Notes
Hour 22	Understanding Electrical Estimating—Chapter 6, Unit Pricing	- Textbook—<i>Understanding Electrical Estimating</i>, Chapter 6 Pages 153–157 - PowerPoint—Understanding Electrical Estimating, Chapter 6 Slides (17) - Video—Understanding Electrical Estimating 2 Chapter 6 [0:30:04]	Understand unit pricing and how it is applied.	
Hour 23	Understanding Electrical Estimating—Chapter 7, Determining Break-Even Cost	- Textbook—<i>Understanding Electrical Estimating</i>, Chapter 7 Pages 161–189 - PowerPoint—Understanding Electrical Estimating, Chapter 7 Slides (141) - Video—Understanding Electrical Estimating 2 Chapter 7 [1:23:09]	- Explain what is meant by “break-even cost”. - Discuss all of the expenses that might contribute to the break-even cost on any given job	
Hour 24	Understanding Electrical Estimating—Chapters 6 and 7 Review	Textbook—<i>Understanding Electrical Estimating</i>, Chapters 6 and 7 Review—Chapters 6 and 7	Take this time to review the chapters and complete chapter review questions.	
Hour 25	Lab/Activity—Blueprint Takeoff	Bonus Material contained on Disk 4 of Electrical Estimating covers software-based estimating.	Understand the process and methods used to do a complete takeoff on paper blueprints.	
Hour 26	Lab/Activity—Blueprint Takeoff	Bonus Material contained on Disk 4 of Electrical Estimating covers software-based estimating.	- Use this day for the following: - Provide instruction on takeoffs - Learn about common takeoff errors - Have guest estimator come in to describe his job and the process	

Apprenticeship Program—Level 4				
Hour	Topic	Resources	Learning Focus	Notes
Hour 27	Lab/Activity—Blueprint Takeoff	Bonus Material contained on Disk 4 of Electrical Estimating covers software-based estimating.	- Use this day for the following: - Provide instruction on takeoffs - Learn about common takeoff errors - Have guest estimator come in to describe his job and the process	
Hour 28	Leadership Part 1	- Textbook—<i>Leadership Skills, Taking Your Career to the Next Level</i>, Introduction and Section 1, Personal Branding <i>Pages 1–12</i> - Capacitor—Leadership Skills, Section 1	Go over and grasp concepts on Personal Branding and Basic Leadership Skills.	
Hour 29	Leadership Part 1	- Textbook—<i>Leadership Skills, Taking Your Career to the Next Level</i>, Section 2, Developing Basic Skills <i>Pages 13–31</i> - Capacitor—Leadership Skills, Section 2	Go over and grasp concepts on Personal Branding and Basic Leadership Skills.	
Hour 30	Leadership Part 1	- Textbook—<i>Leadership Skills, Taking Your Career to the Next Level</i>, Section 2, Developing Basic Skills <i>Pages 13–31</i> - Capacitor—Leadership Skills, Section 2	Go over and grasp concepts on Personal Branding and Basic Leadership Skills.	
Hour 31	Leadership Part 2	- Textbook—<i>Leadership Skills, Taking Your Career to the Next Level</i>, Section 3, Raising Your Game <i>Pages 33–52</i> - Capacitor—Leadership Skills, Section 3	Go over and grasp concepts on what it takes to get to the next level.	

Apprenticeship Program—Level 4

Hour	Topic	Resources	Learning Focus	Notes
Hour 32	Leadership Part 2	- Textbook—<i>Leadership Skills, Taking Your Career to the Next Level</i>, Section 4, Developing Others <i>Pages 53–63</i> - Capacitor—Leadership Skills, Section 4	Go over and grasp concepts on what it takes to be a team player and develop others.	
Hour 33	Leadership Part 2	- Textbook—<i>Leadership Skills, Taking Your Career to the Next Level</i>, Section 5, Staying On Top Of Your Game <i>Pages 65–85</i> - Capacitor—Leadership Skills, Section 5	Go over and grasp concepts on what it takes to stay at the top of your game.	
Hour 34	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 35	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 36	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 37	Content Exam	Textbook—<i>Electrical Estimating and Leadership Skills</i>	Successfully pass the covered content exam within the program completion requirements.	

Apprenticeship Program—Level 4				
Hour	Topic	Resources	Learning Focus	Notes
Hour 38	Content Exam	Textbook—<i>Electrical Estimating and Leadership Skills</i>	Successfully pass the covered content exam within the program completion requirements.	
Hour 39	Content Exam	Textbook—<i>Electrical Estimating and Leadership Skills</i>	Successfully pass the covered content exam within the program completion requirements.	
Hour 40	Code Review, Articles 90-110	Textbook—<i>Understanding the National Electrical Code Volume 1 and the NEC</i>	- Review <i>Code</i> rules from last year. (This is a refresher. You should have already mastered this material.) - Begin preparation for Journeyman Practice Exam.	
Hour 41	Code Review, Articles 200-240	Textbook—<i>Understanding the National Electrical Code Volume 1 and the NEC</i>	- Review <i>Code</i> rules from last year. (This is a refresher. You should have already mastered this material.) - Begin preparation for Journeyman Practice Exam.	
Hour 42	Code Review, Articles 200-240	Textbook—<i>Understanding the National Electrical Code Volume 1 and the NEC</i>	- Review <i>Code</i> rules from last year. (This is a refresher. You should have already mastered this material.) - Begin preparation for Journeyman Practice Exam.	

Apprenticeship Program—Level 4

Hour	Topic	Resources	Learning Focus	Notes
Hour 43	• <i>Code</i> Review, Articles 300–314	• Textbook—<i>Understanding the National Electrical Code Volume 1</i> and the <i>NEC</i>	• Review <i>Code</i> rules from last year. (This is a refresher. You should have already mastered this material.) • Begin preparation for Journeyman Practice Exam.	
Hour 44	• <i>Code</i> Review, Articles 300–314	• Textbook—<i>Understanding the National Electrical Code Volume 1</i> and the <i>NEC</i>	• Review <i>Code</i> rules from last year. (This is a refresher. You should have already mastered this material.) • Begin preparation for Journeyman Practice Exam.	
Hour 45	• <i>Code</i> Review, Articles 300–314	• Textbook—<i>Understanding the National Electrical Code Volume 1</i> and the <i>NEC</i>	• Review <i>Code</i> rules from last year. (This is a refresher. You should have already mastered this material.) • Begin preparation for Journeyman Practice Exam.	
Hour 46	• <i>Code</i> Review, Articles 400–480	• Textbook—<i>Understanding the National Electrical Code Volume 1</i> and the <i>NEC</i>	• Review <i>Code</i> rules from last year. (This is a refresher. You should have already mastered this material.) • Begin preparation for Journeyman Practice Exam.	
Hour 47	• <i>Code</i> Review, Articles 400–480	• Textbook—<i>Understanding the National Electrical Code Volume 1</i> and the <i>NEC</i>	• Review <i>Code</i> rules from last year. (This is a refresher. You should have already mastered this material.) • Begin preparation for Journeyman Practice Exam.	

Apprenticeship Program—Level 4				
Hour	Topic	Resources	Learning Focus	Notes
Hour 48	Code Review, Articles 400–480	Textbook—<i>Understanding the National Electrical Code Volume 1 and the NEC</i>	- Review <i>Code</i> rules from last year. (This is a refresher. You should have already mastered this material.) - Begin preparation for Journeyman Practice Exam.	
Hour 49	- Fundamentals Review - Electrical Theory—Chapter 1, Unit 1—Part A, Basic Math	- Textbook—<i>Exam Preparation</i>, Chapter 1, Unit 1 Part A Pages 9–17 - PowerPoint—Unit 1, Part A Slides (72) (classroom) - Capacitor—Exam Preparation, Chapter 1, Unit 1 Sections 1.1–1.13 - Apprenticeship Level 4, Term 2 Slides 6–77	Utilize Chapter 1 of the <i>Exam Preparation</i> textbook to give additional practice with math and formulas pertaining to the electrical field and circuits.	
Hour 50	- Fundamentals Review - Electrical Theory—Chapter 1, Unit 1—Part B, Advanced Math, Part C, Electrical Circuits and Ohm’s Law	- Textbook—<i>Exam Preparation</i>, Chapter 1, Unit 1 Parts B, C Pages 17–27 - PowerPoint—Unit 1, Parts B, C Slides (46), (26) (classroom) - Capacitor—Exam Preparation, Chapter 1, Unit 1 Sections 1.14–1.22 - Apprenticeship Level 4, Term 2 Slides 78–149	Utilize Chapter 1 of the <i>Exam Preparation</i> textbook to give additional practice with math and formulas pertaining to the electrical field and circuits.	
Hour 51	- Fundamentals Review - Electrical Theory—Chapter 1, Unit 1—Parts A, B, and C	- Textbook—<i>Exam Preparation</i>, Chapter 1, Unit 1 Review—Pages 9–27 - Capacitor—Exam Preparation, Chapter 1, Unit 1 Review—Parts A–C	- Take this time to review the unit - Successfully pass the unit quiz within the program completion requirements.	

Apprenticeship Program—Level 4

Hour	Topic	Resources	Learning Focus	Notes
Hour 52	- Fundamentals Review - Electrical Theory—Chapter 1, Unit 2—Part A, Series Circuits and Part B, Parallel Circuits	- Textbook—<i>Exam Preparation</i>, Chapter 1, Unit 2 Parts A, B Pages 35–47 - PowerPoint—Unit 2, Parts A, B Slides (35), (49) (classroom) - Capacitor—<i>Exam Preparation</i>, Chapter 1, Unit 2 Sections 2.1–2.9 - Apprenticeship Level 4, Term 2 Slides 154–237	Utilize Chapter 1 of the <i>Exam Preparation</i> textbook to give additional practice with math and formulas pertaining to the electrical field and circuits.	
Hour 53	- Fundamentals Review - Electrical Theory—Chapter 1, Unit 2—Part C, Series-Parallel Circuits and Part D, Multiwire Branch Circuits	- Textbook—<i>Exam Preparation</i>, Chapter 1, Unit 2 Parts C, D Pages 47–56 - PowerPoint—Unit 2, Parts C, D Slides (30), (45) (classroom) - Capacitor—<i>Exam Preparation</i>, Chapter 1, Unit 2 Sections 2.13–2.23 - Apprenticeship Level 4, Term 2 Slides 238–311	Utilize Chapter 1 of the <i>Exam Preparation</i> textbook to give additional practice with math and formulas pertaining to the electrical field and circuits.	
Hour 54	- Fundamentals Review - Electrical Theory—Chapter 1, Unit 2—Parts A–D	- Textbook—<i>Exam Preparation</i>, Chapter 1, Unit 2 Review—Pages 35–56 - Capacitor—<i>Exam Preparation</i>, Chapter 1, Unit 2 Review—Parts A–D	- Take this time to review the unit. - Successfully pass the unit quiz within the program completion requirements.	
Hour 55	- Fundamentals Review - Electrical Theory—Chapter 1, Unit 3—Part A, Understanding AC, Part B, Capacitance, and Part C, Induction	- Textbook—<i>Exam Preparation</i>, Chapter 1, Unit 3 Parts A–C Pages 63–79 - PowerPoint—Unit 3, Parts A–C Slides (50), (36), (37) (classroom) - Capacitor—<i>Exam Preparation</i>, Chapter 1, Unit 3 Sections 3.1–3.14 - Apprenticeship Level 4, Term 2 Slides 318–440	- Review concepts and sine waves of alternating current. - Review capacitance and capacitive reactance. - Review induction, inductance, and inductive reactance.	

Apprenticeship Program—Level 4				
Hour	Topic	Resources	Learning Focus	Notes
Hour 56	- Fundamentals Review - Electrical Theory—Chapter 1, Unit 3—Part D, Power Factor and Efficiency	- Textbook—<i>Exam Preparation</i>, Chapter 1, Unit 3 Part D Pages 80–91 - PowerPoint—Unit 3, Part D Slides (80) (classroom) - Capacitor—<i>Exam Preparation</i>, Chapter 1, Unit 3 Sections 3.27–3.34 - Apprenticeship Level 4, Term 2 Slides 441–518	- Review the concepts of power factor in relation to inductance, capacitance, and resistance within a circuit. - Review the efficiency of such loads or appliances as to how they affect circuit equipment.	
Hour 57	- Fundamentals Review - Electrical Theory—Chapter 1, Unit 3—Parts A–D	- Textbook—<i>Exam Preparation</i>, Chapter 1, Unit 3 Review—Pages 63–91 - Capacitor—<i>Exam Preparation</i>, Chapter 1, Unit 3 Review—Sections 3.1–3.34	- Take this time to review the unit. - Successfully pass the unit quiz within the program completion requirements.	
Hour 58	- Fundamentals Review - Electrical Theory—Chapter 1, Unit 4—Part A, Motor Basics	- Textbook—<i>Exam Preparation</i>, Chapter 1, Unit 4 Pages 101–107 - PowerPoint—Unit 4, Part A Sections 4.1–4.8 Slides 4–43 (classroom) - Capacitor—<i>Exam Preparation</i>, Unit 4 Sections 4.1–4.8 - Apprenticeship Level 4, Term 2 Slides 527–566	- Explain the principles of motor operation. - Discuss mechanical power versus electrical power. - Explain motor current ratings and FLA.	
Hour 59	- Fundamentals Review - Electrical Theory—Chapter 1, Unit 4—Part A, Motor Basics	- Textbook—<i>Exam Preparation</i>, Chapter 1, Unit 4 Pages 101–107 - PowerPoint—Unit 4, Part A Sections 4.1–4.8 Slides 4–43 (classroom) - Capacitor—<i>Exam Preparation</i>, Unit 4 Sections 4.1–4.8 - Apprenticeship Level 4, Term 2 Slides 527–566	- Explain motor-starting current, running current, and locked-rotor current. - Explain overcurrent protection. - Explain overload protection.	

Apprenticeship Program—Level 4

Hour	Topic	Resources	Learning Focus	Notes
Hour 60	- Fundamentals Review - Electrical Theory—Chapter 1, Unit 4—Part A	- Textbook—<i>Exam Preparation</i>, Chapter 1, Unit 4 <i>Review—Pages 101–107</i> - Capacitor—<i>Exam Preparation</i>, Unit 4 <i>Review—Sections 4.1–4.8</i>	Take this time to review Part A.	
Hour 61	- Fundamentals Review - Electrical Theory—Chapter 1, Unit 4—Part B, Transformers	- Textbook—<i>Exam Preparation</i>, Chapter 1, Unit 4 <i>Pages 108–116</i> - PowerPoint—Unit 4, Part B <i>Sections 4.9–4.19</i> <i>Slides 44–106 (classroom)</i> - Capacitor—<i>Exam Preparation</i>, Unit 4 <i>Sections 4.9–4.19</i> - Apprenticeship Level 4, Term 2 <i>Slides 567–630</i>	- Explain the basic construction of transformers. - Explain induced voltage and efficiency. - Explain power ratings, current flow, and current rating.	
Hour 62	- Fundamentals Review - Electrical Theory—Chapter 1, Unit 4—Part B, Transformers	- Textbook—<i>Exam Preparation</i>, Chapter 1, Unit 4 <i>Pages 108–116</i> - PowerPoint—Unit 4, Part B <i>Sections 4.9–4.19</i> <i>Slides 44–106 (classroom)</i> - Capacitor—<i>Exam Preparation</i>, Unit 4 <i>Sections 4.9–4.19</i> - Apprenticeship Level 4, Term 2 <i>Slides 567–630</i>	- Explain the structure of transformers. - Explain the science of induction. - Determine loads on various components of a transformer or three-phase transformer bank.	
Hour 63	- Fundamentals Review - Electrical Theory—Chapter 1, Unit 4—Part B	- Textbook—<i>Exam Preparation</i>, Chapter 1, Unit 4 <i>Review Pages 108–116</i> - Capacitor—<i>Exam Preparation</i>, Unit 4 <i>Review Sections 4.9–4.19</i>	Take this time to review Part B.	

Apprenticeship Program—Level 4				
Hour	Topic	Resources	Learning Focus	Notes
Hour 64	- Fundamentals Final Review - Units 1–4	- Textbook—<i>Exam Preparation</i>, Chapter 1, Units 1–4 - Capacitor—<i>Exam Preparation</i>, Units 1–4	Use the time to review all Fundamentals Units in preparation for Program Final Exam paying particular attention to any weaknesses.	
Hour 65	- Fundamentals Final Review - Units 1–4	- Textbook—<i>Exam Preparation</i>, Chapter 1, Units 1–4 - Capacitor—<i>Exam Preparation</i>, Units 1–4	Use the time to review all Fundamentals Units in preparation for Program Final Exam paying particular attention to any weaknesses.	
Hour 66	- Fundamentals Final Review - Units 1–4	- Textbook—<i>Exam Preparation</i>, Chapter 1, Units 1–4 - Capacitor—<i>Exam Preparation</i>, Units 1–4	Use the time to review all Fundamentals Units in preparation for Program Final Exam paying particular attention to any weaknesses.	
Hour 67	Flex Training	Instructor/Institution Choice	- Use this day for any of the following: - Make Up Day - Safety Training - Special Event - Study–Practice - Manufacturer's Training - Company Specific Training	
Hour 68	Flex Training	Instructor/Institution Choice	- Use this day for any of the following: - Make Up Day - Safety Training - Special Event - Study–Practice - Manufacturer's Training - Company Specific Training	

Apprenticeship Program—Level 4				
Hour	Topic	Resources	Learning Focus	Notes
Hour 69	Flex Training	Instructor/Institution Choice	- Use this day for any of the following: - Makxny Specific Training	
Hour 70	- NEC Calculations—Unit 5 - Raceway and Box Calculations—Part A, Raceway Sizing	- Textbook—<i>Exam Preparation</i>, Chapter 2, Unit 5 <i>Pages 125–143</i> - PowerPoint—Unit 5, Part A <i>Slides (139) (classroom)</i> - Capacitor Exam Preparation, Chapter 2, Unit 5 <i>Sections 5.1–5.11</i> - Apprenticeship Level 4, Term 2 <i>Slides 639–775</i> - Video—Raceway and Box Calculations <i>Sections 5.1–5.11 [2:05:47]</i>	- Study the information referenced in the tables for conduit fill and conductor CSA. - Study the application of data from the tables in the process of determining raceway size. - Study the determination of minimum wireway CSA	
Hour 71	- NEC Calculations—Unit 5 - Raceway and Box Calculations—Part B, Outlet Box Fill and Part C, Pull Boxes, Junction Boxes, and Conduit Bodies	- Textbook—<i>Exam Preparation</i>, Chapter 2, Unit 5 <i>Pages 143–157</i> - PowerPoint—Unit 5, Parts B, C <i>Slides (58), (45) (classroom)</i> - Capacitor—Exam Preparation, Chapter 2, Unit 5 <i>Sections 5.12–5.17</i> - Apprenticeship Level 4, Term 2 <i>Slides 776–876</i> - Video—Raceway and Box Calculations <i>Sections 5.12–5.17 [1:37:39]</i>	- Cover sizing boxes that contain the same size conductors. - Identify conductor equivalents. - Study outlet box sizing.	
Hour 72	- NEC Calculations—Unit 5 - Raceway and Box Calculations, Chapter 2, Unit 5	- Textbook—<i>Exam Preparation</i>, Chapter 2, Unit 5 <i>Review—Pages 125–157</i> - Capacitor—Exam Preparation, Chapter 2, Unit 5 <i>Review—Sections 5.1–5.17</i>	- Take this time to review the unit. - Successfully pass the unit quiz within the program completion requirements.	

Apprenticeship Program—Level 4				
Hour	Topic	Resources	Learning Focus	Notes
Hour 73	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 74	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 75	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 76	Content Exam	<i>National Electrical Code</i>	Successfully pass the covered content exam within the program completion requirements.	
Hour 77	Content Exam	<i>National Electrical Code</i>	Successfully pass the covered content exam within the program completion requirements.	
Hour 78	Content Exam	<i>National Electrical Code</i>	Successfully pass the covered content exam within the program completion requirements.	

Apprenticeship Program—Level 4

Hour	Topic	Resources	Learning Focus	Notes
Hour 79	• NEC Calculations—Unit 6 • Conductor Sizing and Protection Calculations 1—Part A, Conductor Requirements	• Textbook—<i>Exam Preparation</i>, Chapter 2, Unit 6 and the NEC Pages 167–170 • PowerPoint—Unit 6, Part A Slides 6–23 (classroom) • Capacitor—Exam Preparation, Unit 6 Sections 6.1–6.2 • Apprenticeship Level 4, Term 3 Slides 9–28 • Video—Conductor Sizing and Protection Calculations Sections 6.1–6.2 [0:31:13]	• Study conductor insulation types. • Study terminal temperature ratings. • Cover conductor sizing.	
Hour 80	• NEC Calculations—Unit 6 • Conductor Sizing and Protection Calculations 1—Part A, Conductor Requirements	• Textbook—<i>Exam Preparation</i>, Chapter 2, Unit 6 and the NEC Pages 170–173 • PowerPoint—Unit 6, Part A Slides 24–53 (classroom) • Capacitor—Exam Preparation, Unit 6 Sections 6.3–6.4 • Apprenticeship Level 4, Term 3 Slides 29–58 • Video—Conductor Sizing and Protection Calculations Sections 6.3–6.4 [0:38:50]	• Study minimum size conductors, stranded conductors, and insulated vs. bare conductors. • Cover conductor size based on equipment terminal rating.	
Hour 81	• NEC Calculations—Unit 6 • Conductor Sizing and Protection Calculations 1—Part A, Conductor Requirements	• Textbook—<i>Exam Preparation</i>, Chapter 2, Unit 6 and the NEC Pages 173–176 • PowerPoint—Unit 6, Part A Slides 54–78 (classroom) • Capacitor—Exam Preparation, Unit 6 Section 6.5 • Apprenticeship Level 4, Term 3 Slides 59–84 • Video—Conductor Sizing and Protection Calculations Section 6.5 [0:34:32]	• Study the overcurrent protection general requirements of Article 240. • Cover overcurrent protection of conductors for specific requirements.	

Apprenticeship Program—Level 4				
Hour	Topic	Resources	Learning Focus	Notes
Hour 82	• NEC Calculations—Unit 6 • Conductor Sizing and Protection Calculations 2—Part B, Conductor Ampacity	• Textbook—<i>Exam Preparation</i>, Chapter 2, Unit 6 and the NEC Pages 177–186 • PowerPoint—Unit 6, Part B Slides 82–145 (classroom) • Capacitor—Exam Preparation, Unit 6 Sections 6.6–6.12 • Apprenticeship Level 4, Term 3 Slides 85–156 • Video—Conductor Sizing and Protection Calculations Sections 6.6–6.12 [1:20:25]	• Study the listed ampacity of conductors in Table 310.16. • Study how adjustment factors are applied to conductors given conditions mentioned in the title of Table 310.16 vary.	
Hour 83	• NEC Calculations—Unit 6 • Conductor Sizing and Protection Calculations 2—Part B, Conductor Ampacity	• Textbook—<i>Exam Preparation</i>, Chapter 2, Unit 6 and the NEC Pages 187–202 • PowerPoint—Unit 6, Part A Slides 146–255 (classroom) • Capacitor—Exam Preparation, Unit 6 Sections 6.13–6.15 • Apprenticeship Level 4, Term 3 Slides 157–261 • Video—Conductor Sizing and Protection Calculations Sections 6.13–6.14 [1:40:50]	• Study how current-carrying conductors are counted. • Study and exhibit the calculation and determination of selection ampacity. • Cover conductor sizing and feeder tap rules.	
Hour 84	• NEC Calculations—Unit 6 • Conductor Sizing and Protection Calculations, Chapter 2, Unit 6	• Textbook—<i>Exam Preparation</i>, Chapter 2, Unit 6 Review—Pages 167–202 • Chapter 2, Unit 6 Conclusion Page 203 • Capacitor—Exam Preparation, Unit 6 Review—Sections 6.1–6.15	• Take this time to review the unit. • Successfully pass the unit quiz within the program completion requirements.	

Apprenticeship Program—Level 4

Hour	Topic	Resources	Learning Focus	Notes
Hour 85	• NEC Calculations—Unit 7 • Motor and Air-Conditioning Calculations—Part A, Motor Calculations	• Textbook—<i>Exam Preparation</i>, Chapter 2, Unit 7 and the NEC Pages 215–218 • PowerPoint—Unit 7, Part A Slides 6–36 (classroom) • Capacitor—Exam Preparation, Unit 7 Sections 7.1–7.3 • Apprenticeship Level 4, Term 3 Slides 272–302 • Video—Motor and Air-Conditioning Calculations Sections 7.1–7.3 [0:56:29]	• Cover the scope of Article 430. • Study nameplate current ratings and FLC referenced in the NEC. • Study motor nameplate full load amperes (FLA).	
Hour 86	• NEC Calculations—Unit 7 • Motor and Air-Conditioning Calculations—Part A, Motor Calculations	• Textbook—<i>Exam Preparation</i>, Chapter 2, Unit 7 and the NEC Pages 218–223 • PowerPoint—Unit 7, Part A Slides 37–66 (classroom) • Capacitor—Exam Preparation, Unit 7 Sections 7.4–7.5 • Apprenticeship Level 4, Term 3 Slides 303–332 • Video—Motor and Air-Conditioning Calculations Sections 7.4–7.5 [0:28:49]	• Study the determination of branch-circuit conductors. • Study the determination of feeder conductors.	
Hour 87	• NEC Calculations—Unit 7 • Motor and Air-Conditioning Calculations—Part A, Motor Calculations	• Textbook—<i>Exam Preparation</i>, Chapter 2, Unit 7 and the NEC Pages 223–233 • PowerPoint—Unit 7, Part A Slides 67–146 (classroom) • Capacitor—Exam Preparation, Unit 7 Sections 7.6–7.10 • Apprenticeship Level 4, Term 3 Slides 333–412 • Video—Motor and Air-Conditioning Calculations Sections 7.6–7.10 [1:01:13]	• Study the determination of the overload protection rating. • Study the determination of the branch-circuit protection.	

Apprenticeship Program—Level 4				
Hour	Topic	Resources	Learning Focus	Notes
Hour 88	• NEC Calculations—Unit 7 • Motor and Air-Conditioning Calculations—Part A, Motor Calculations	• Textbook—<i>Exam Preparation</i>, Chapter 2, Unit 7 and the NEC Pages 233–240 • PowerPoint—Unit 7, Part A Slides 147–211 (classroom) • Capacitor—Exam Preparation, Unit 7 Sections 7.11–7.14 • Apprenticeship Level 4, Term 3 Slides 413–477 • Video—Motor and Air-Conditioning Calculations Sections 7.11–7.14 [0:47:56]	• Determine the appropriate feeder protection rating for feeders that serve motor branch circuits. • Exhibit understanding of motor load calculations.	
Hour 89	• NEC Calculations—Unit 7 • Motor and Air-Conditioning Calculations—Part B, Air-Conditioning Calculations and Part C, Transformers	• Textbook—<i>Exam Preparation</i>, Chapter 2, Unit 7 and the NEC Pages 241–252 • PowerPoint—Unit 7, Part B, C Slides 212–288 (classroom) • Capacitor—Exam Preparation, Unit 7 Sections 7.15–7.20 • Apprenticeship Level 4, Term 3 Slides 478–555 • Video—Motor and Air-Conditioning Calculations Sections 7.15–7.20 [1:15:29]	• Determine appropriate OCPD for air-conditioning loads. • Determine the adequate conductor size for air-conditioning loads.	
Hour 90	• NEC Calculations—Unit 7 • Motor and Air-Conditioning Calculations, Chapter 2, Unit 7	• Textbook—<i>Exam Preparation</i>, Chapter 2, Unit 7 and the NEC Review Pages 215–252 Conclusion Page 253 • Capacitor—Exam Preparation, Chapter 2, Unit 7 Review Chapter 2, Unit 7 Conclusion	• Take this time to review the unit. • Successfully pass the unit quiz within the program completion requirements.	

Apprenticeship Program—Level 4

Hour	Topic	Resources	Learning Focus	Notes
Hour 91	• <i>NEC</i> Calculations—Unit 8 • Voltage-Drop Calculations—Part A, Conductor Resistance Calculations	• Textbook—<i>Exam Preparation</i>, Chapter 2, Unit 8 and the <i>NEC</i> Pages 265–273 • PowerPoint—Unit 8, Part A Slides 4–61 (classroom) • Capacitor—Exam Preparation, Unit 8 Sections 8.1–8.5 • Apprenticeship Level 4, Term 3 Slides 559–618 • Video—Voltage-Drop Calculations Sections 8.1–8.5 [1:33:00]	• Study and understand the factors that affect the resistance of conductors. • Demonstrate proficiency in the use of Tables 8 and 9 of Chapter 9 in the <i>NEC</i>.	
Hour 92	• <i>NEC</i> Calculations—Unit 8 • Voltage-Drop Calculations—Part B, Voltage Drop Considerations	• Textbook—<i>Exam Preparation</i>, Chapter 2, Unit 8 and the <i>NEC</i> Pages 273–288 • PowerPoint—Unit 8, Part B Slides 61–164 (classroom) • Capacitor—Exam Preparation, Unit 8 Slides 61–164 • Apprenticeship Level 4, Term 3 Slides 619–721 • Video—Voltage-Drop Calculations Sections 8.6–8.11 [1:48:27]	• Apply the theory to practical calculations. • Determine if a circuit or feeder conductor is sufficient to limit voltage drop.	
Hour 93	• <i>NEC</i> Calculations—Unit 8 • Voltage-Drop Calculations, Chapter 2, Unit 8	• Textbook—<i>Exam Preparation</i>, Chapter 2, Unit 8 Review Pages 265–288 Conclusion Page 289 • Capacitor—Exam Preparation, Chapter 2, Unit 8 Review Chapter 2, Unit 8 Conclusion	• Take this time to review the unit. • Successfully pass the unit quiz within the program completion requirements.	

Apprenticeship Program—Level 4				
Hour	Topic	Resources	Learning Focus	Notes
Hour 94	• NEC Calculations—Unit 9 • Dwelling Unit Calculations—Part A, Optional Method Load Calculations [Article 220, Part IV]	• Textbook—<i>Exam Preparation</i>, Chapter 2, Unit 9 and the NEC Pages 299–303 • PowerPoint—Unit 9, Part A Slides 2–28 (classroom) • Capacitor—Exam Preparation, Unit 9 Sections 9.1–9.4 • Apprenticeship Level 4, Term 3 Slides 730–754 • Video—Dwelling Unit Calculations Sections 9.1–9.4 [1:18:17]	• Properly and adequately calculate the demand loads covered and select proper equipment for their circuits in a single-family dwelling occupancy.	
Hour 95	• NEC Calculations—Unit 9 • Dwelling Unit Calculations—Part B, Standard Method Load Calculations [Article 220, Part III]	• Textbook—<i>Exam Preparation</i>, Chapter 2, Unit 9 and the NEC Pages 304–305 • PowerPoint—Unit 9, Part B Slides 30–51 (classroom) • Capacitor—Exam Preparation, Unit 9 Sections 9.5–9.6 • Apprenticeship Level 4, Term 3 Slides 755–776 • Video—Dwelling Unit Calculations Sections 9.5–9.6 [0:24:56]	• Properly and adequately calculate the demand loads covered and select proper equipment for their circuits in a single-family dwelling. • Properly and adequately calculate service conductor sizing for single-family dwellings.	
Hour 96	• NEC Calculations—Unit 9 • Dwelling Unit Calculations—Part B, Standard Method Load Calculations [Article 220, Part III]	• Textbook—<i>Exam Preparation</i>, Chapter 2, Unit 9 and the NEC Pages 306–311 • PowerPoint—Unit 9, Part B Slides 52–96 (classroom) • Capacitor—Exam Preparation, Unit 9 Section 9.7–9.10 • Apprenticeship Level 4, Term 3 Slides 777–821 • Video—Dwelling Unit Calculations Section 9.7–9.10 [0:34:53]	• Apply the standard method of load calculations to single-family dwellings.	

Apprenticeship Program—Level 4

Hour	Topic	Resources	Learning Focus	Notes
Hour 97	• NEC Calculations—Unit 9 • Dwelling Unit Calculations—Part B, Standard Method Load Calculations [Article 220, Part III]	• Textbook—<i>Exam Preparation</i>, Chapter 2, Unit 9 and the NEC Pages 312–316 • PowerPoint—Unit 9, Part B Slides 97–121 (classroom) • Capacitor—Exam Preparation, Unit 9 Sections 9.11–9.12 • Apprenticeship Level 4, Term 3 Slides 822–847 • Video—Dwelling Unit Calculations Sections 9.11–9.12 [0:13:29]	• Apply the optional method of load calculations to single-family dwellings.	
Hour 98	• NEC Calculations—Unit 9 • Dwelling Unit Calculations—Part C, Neutral Load Calculations	• Textbook—<i>Exam Preparation</i>, Chapter 2, Unit 9 and the NEC Pages 317–318 • PowerPoint—Unit 9, Part C Slides 124–139 (classroom) • Capacitor—Exam Preparation, Unit 9 Sections 9.13–9.15 • Apprenticeship Level 4, Term 3 Slides 848–865 • Video—Dwelling Unit Calculations Sections 9.13–9.15 [0:21:11]	• Apply reductions to neutral demand loads for dryers and ranges where permitted. • Properly and adequately calculate the neutral demand load for single-family dwellings.	
Hour 99	• NEC Calculations—Unit 9 • Dwelling Unit Calculations, Chapter 2, Unit 9	• Textbook—<i>Exam Preparation</i>, Chapter 2, Unit 9 Review Pages 299–318 • Capacitor—Exam Preparation, Chapter 2, Unit 9 Review Chapter 2, Unit 9 Conclusion	• Take this time to review the unit. • Successfully pass the unit quiz within the program completion requirements.	
Hour 100	• Lab/Activity—Dwelling Units	• Textbook—<i>Exam Preparation and the NEC</i> Pages 299–318 • Video—Dwelling Unit Calculations	• Using instructor provided resources, review and complete various dwelling calculations using all methods for calculating the service.	

Apprenticeship Program—Level 4				
Hour	Topic	Resources	Learning Focus	Notes
Hour 101	Lab/Activity—Dwelling Units	- Textbook—<i>Exam Preparation and the NEC</i> <i>Pages 299–318</i> - Video—Dwelling Unit Calculations	Using instructor provided resources, review and complete various dwelling calculations using all methods for calculating the service.	
Hour 102	Lab/Activity—Dwelling Units	- Textbook—<i>Exam Preparation and the NEC</i> <i>Pages 299–318</i> - Video—Dwelling Unit Calculations	Using instructor provided resources, review and complete various dwelling calculations using all methods for calculating the service.	
Hour 103	- Advanced <i>NEC</i> Calculations—Unit 10 - Multifamily Dwelling Calculations—Part A, Standard Method Load Calculations [Article 220, Part III]	- Textbook—<i>Exam Preparation, Chapter 3, Unit 10 and the NEC</i> <i>Pages 335–339</i> - PowerPoint—Unit 10, Part A <i>Slides 4–36 (classroom)</i> - Capacitor—Exam Preparation, Unit 10 <i>Sections 10.1–10.2</i> - Apprenticeship Level 4, Term 3 <i>Slides 875–906</i> - Video—Multifamily Dwelling Calculations <i>Sections 10.1–10.2 [0:24:41]</i>	Properly and adequately calculate the demand loads covered and select proper equipment for their circuits in multifamily dwellings.	
Hour 104	- Advanced <i>NEC</i> Calculations—Unit 10 - Multifamily Dwelling Calculations—Part B, Standard Method Load Calculations [Article 220, Part III]	- Textbook—<i>Exam Preparation, Chapter 3, Unit 10 and the NEC</i> <i>Pages 339–350</i> - PowerPoint—Unit 10, Part B <i>Slides 39–118 (classroom)</i> - Capacitor—Exam Preparation, Unit 10 <i>Sections 10.3–10.6</i> - Apprenticeship Level 4, Term 3 <i>Slides 907–987</i> - Video—Multifamily Dwelling Calculations <i>Sections 10.3–10.6 [0:46:19]</i>	- Properly and adequately calculate the demand loads covered and select proper equipment for their circuits in multifamily dwellings. - Properly and adequately calculate service conductor sizing for multifamily dwellings.	

Apprenticeship Program—Level 4

Hour	Topic	Resources	Learning Focus	Notes
Hour 105	- Advanced <i>NEC</i> Calculations—Unit 10 - Multifamily Dwelling Calculations—Part B, Standard Method Load Calculations [Article 220, Part III]	- Textbook—<i>Exam Preparation</i>, Chapter 3, Unit 10 and the <i>NEC</i> Pages 350–356 - PowerPoint—Unit 10, Part B Slides 119–133 (classroom) - Capacitor—<i>Exam Preparation</i>, Unit 10 Section 10.7 - Apprenticeship Level 4, Term 3 Slides 988–1002 - Video—Multifamily Dwelling Calculations Section 10.7 [0:14:39]	Apply the standard method of load calculations to multifamily dwellings.	
Hour 106	- Advanced <i>NEC</i> Calculations—Unit 10 - Multifamily Dwelling Calculations—Part B, Optional Method Load Calculations [Article 220, Part IV]	- Textbook—<i>Exam Preparation</i>, Chapter 3, Unit 10 and the <i>NEC</i> Pages 354–359 - PowerPoint—Unit 10, Part B Slides 134–166 (classroom) - Capacitor—<i>Exam Preparation</i>, Chapter 3, Unit 10 Sections 10.8–10.10 - Apprenticeship Level 4, Term 3 Slides 1003–1036 - Video—Multifamily Dwelling Calculations Sections 10.8–10.10 [0:40:02]	Apply the optional calculation methods to practical examples of multifamily dwelling service loads.	
Hour 107	- Advanced <i>NEC</i> Calculations—Unit 10 - Multifamily Dwelling Calculations—Part C, Neutral Load Calculations	- Textbook—<i>Exam Preparation</i>, Chapter 3, Unit 10 and the <i>NEC</i> Pages 359–360 - PowerPoint—Unit 10, Part C Slides 169–182 (classroom) - Capacitor—<i>Exam Preparation</i>, Chapter 3, Unit 10 Sections 10.11–10.12 - Apprenticeship Level 4, Term 3 Slides 1037–1052 - Video—Multifamily Dwelling Calculations Sections 10.11–10.12 [0:42:29]	- Apply reductions to neutral demand loads for dryers and cooking equipment where permitted. - Properly and adequately calculate the neutral demand load for multifamily dwellings.	

Apprenticeship Program—Level 4				
Hour	Topic	Resources	Learning Focus	Notes
Hour 108	- Advanced <i>NEC</i> Calculations—Unit 10 - Multifamily Dwelling Calculations, Chapter 3, Unit 10	- Textbook—<i>Exam Preparation</i>, Chapter 3, Unit 10 <i>Review Pages 335–360</i> <i>Conclusion Page 466</i> - Capacitor—<i>Exam Preparation</i>, Chapter 3, Unit 10 <i>Review Chapter 3, Unit 10</i> - Conclusion	- Take this time to review the unit. - Successfully pass the unit quiz within the program completion requirements.	
Hour 109	Lab/Activity <i>Fire Alarm Systems</i>	A Practical Guide to Fire Alarm Systems (3rd Edition) <i>Located in Instructor Resource Folder</i>	Identify the basic components of a fire alarm system and now they operate.	
Hour 110	Lab/Activity <i>Fire Alarm Systems</i>	A Practical Guide to Fire Alarm Systems (3rd Edition) <i>Located in Instructor Resource Folder</i>	Identify the basic components of a fire alarm system and now they operate.	
Hour 111	Lab/Activity <i>Fire Alarm Systems</i>	A Practical Guide to Fire Alarm Systems (3rd Edition) <i>Located in Instructor Resource Folder</i>	Identify the basic components of a fire alarm system and now they operate.	
Hour 112	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	

Apprenticeship Program—Level 4				
Hour	Topic	Resources	Learning Focus	Notes
Hour 113	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 114	Content Review	All covered material used.	- Review all covered material to prepare for the content exam. - Make sure all information that will be on the exam is covered.	
Hour 115	Content Exam	<i>National Electrical Code</i>	Successfully pass the covered content exam within the program completion requirements.	
Hour 116	Content Exam	<i>National Electrical Code</i>	Successfully pass the covered content exam within the program completion requirements.	
Hour 117	Content Exam	<i>National Electrical Code</i>	Successfully pass the covered content exam within the program completion requirements.	

Apprenticeship Program—Level 4				
Hour	Topic	Resources	Learning Focus	Notes
Hour 118	- Advanced <i>NEC</i> Calculations—Unit 11 - Commercial Calculations—Part A, General	- Textbook—<i>Exam Preparation</i>, Chapter 3, Unit 11 and the <i>NEC</i> Pages 375–380 - PowerPoint—Unit 11, Part A Slides 4–42 (classroom) - Capacitor—Exam Preparation, Unit 11 Sections 11.1–11.4 - Apprenticeship Level 4, Term 4 Slides 7–48 - Video—Commercial Calculations Sections 11.1–11.4 [0:58:45]	- Review general requirements for calculations, nominal voltages, fractions of an ampere, conductor ampacity, and overcurrent protection. - Cover demand factors for lighting. - Study sign circuits and show-window lighting.	
Hour 119	- Advanced <i>NEC</i> Calculations—Unit 11 - Commercial Calculations—Part A, General	- Textbook—<i>Exam Preparation</i>, Chapter 3, Unit 11 and the <i>NEC</i> Pages 380–384 - PowerPoint—Unit 11, Part A Slides 43–84 (classroom) - Capacitor—Exam Preparation, Unit 11 Sections 11.5–11.8 - Apprenticeship Level 4, Term 4 Slides 49–89 - Video—Commercial Calculations Sections 11.5–11.8 [0:44:16]	- Review general requirements for calculations, nominal voltages, fractions of an ampere, conductor ampacity, and overcurrent protection. - Cover demand factors for lighting. - Study sign circuits and show-window lighting.	
Hour 120	- Advanced <i>NEC</i> Calculations—Unit 11 - Commercial Calculations—Part B, Examples	- Textbook—<i>Exam Preparation</i>, Chapter 3, Unit 11 and the <i>NEC</i> Pages 385–389 - PowerPoint—Unit 11, Part B Slides 87–111 (classroom) - Capacitor—Exam Preparation, Unit 11 Section 11.9–11.11 - Apprenticeship Level 4, Term 4 Slides 90–115 - Video—Commercial Calculations Section 11.9–11.11 [0:15:53]	Complete calculations mentioned throughout unit when examples have some degree of varying scenarios.	

Apprenticeship Program—Level 4

Hour	Topic	Resources	Learning Focus	Notes
Hour 121	- Advanced <i>NEC</i> Calculations—Unit 11 - Commercial Calculations—Part B, Examples and Part C, Optional Method—Feeder/Service Load Calculations	- Textbook—<i>Exam Preparation</i>, Chapter 3, Unit 11 and the <i>NEC</i> Pages 388–391 - PowerPoint—Unit 11, Part B, C Slides 112–143 (classroom) - Capacitor—Exam Preparation, Unit 11 Sections 11.12–11.13 - Apprenticeship Level 4, Term 4 Slides 116–148 - Video—Commercial Calculations Sections 11.12–11.13 [0:29:45]	- Review demand load calculations for marinas. - Review the optional method of calculation for new restaurants.	
Hour 122	- Advanced <i>NEC</i> Calculations—Unit 11 - Commercial Calculations—Parts D and E, Welders and Light Industrial Calculations	- Textbook—<i>Exam Preparation</i>, Chapter 3, Unit 11 and the <i>NEC</i> Pages 392–398 - PowerPoint—Unit 11, Part D, E Slides 146–214 (classroom) - Capacitor—Exam Preparation, Unit 11 Sections 11.14–11.17 - Apprenticeship Level 4, Term 4 Slides 149–219 - Video—Commercial Calculations Sections 11.14–11.17 [0:24:47]	Examine accurate load calculation results for welders and light industrial manufacturing and school buildings.	
Hour 123	- Advanced <i>NEC</i> Calculations—Unit 11 - Commercial Calculations, Chapter 3, Unit 11	- Textbook—<i>Exam Preparation</i>, Chapter 3, Unit 11 Review Pages 375–398 - Capacitor—Exam Preparation, Chapter 3, Unit 11 Conclusion Review Chapter 3, Unit 11	- Take this time to review the unit - Successfully pass the unit quiz within the program completion requirements.	
Hour 124	<i>NEC</i> Practice Quiz 16 Sections 90.1–680.25	Textbook—<i>Exam Preparation</i>, Chapter 4, and the <i>NEC</i> Pages 493–497	- Practice navigating the <i>NEC</i> to prepare for final exams - Complete practice exam within the allotted time	

Apprenticeship Program—Level 4				
Hour	Topic	Resources	Learning Focus	Notes
Hour 125	• <i>NEC Practice Quiz 16 Sections 90.1–680.25</i>	• <i>Textbook—Exam Preparation, Chapter 4, and the NEC Pages 493–497</i>	• Practice navigating the <i>NEC</i> to prepare for final exams • Complete practice exam within the allotted time	
Hour 126	• <i>NEC Practice Quiz 16 Sections 90.1–680.25</i>	• <i>Textbook—Exam Preparation, Chapter 4, and the NEC Pages 493–497</i> • Review <i>NEC Practice Quiz 16</i>	• Practice navigating the <i>NEC</i> to prepare for final exams	
Hour 127	• <i>NEC Practice Quiz 17 Sections 680.26–701.12</i>	• <i>Textbook—Exam Preparation, Chapter 4, and the NEC Pages 498–502</i>	• Practice navigating the <i>NEC</i> to prepare for final exams. • Complete practice exam within the allotted time.	
Hour 128	• <i>NEC Practice Quiz 17 Sections 680.26–701.12</i>	• <i>Textbook—Exam Preparation, Chapter 4, and the NEC Pages 498–502</i>	• Practice navigating the <i>NEC</i> to prepare for final exams. • Complete practice exam within the allotted time.	
Hour 129	• <i>NEC Practice Quiz 17 Sections 680.26–701.12</i>	• <i>Textbook—Exam Preparation, Chapter 4, and the NEC Pages 498–502</i> • Review <i>NEC Practice Quiz 17</i>	• Practice navigating the <i>NEC</i> to prepare for final exams.	
Hour 130	• <i>OSHA Construction Safety Handbook</i> • Review	• All safety-related material	• Review all material pertaining to safety rules and practice.	

Apprenticeship Program—Level 4

Hour	Topic	Resources	Learning Focus	Notes
Hour 131	• <i>OSHA Construction Safety Handbook</i> • Review	• All safety-related material	• Review all material pertaining to safety rules and practices.	
Hour 132	• <i>OSHA Construction Safety Handbook</i> • Review	• All safety-related material	• Review all material pertaining to safety rules and practices.	
Hour 133	• Electrical Theory • Review	• All Theory-related material.	• Review all material pertaining to electrical theory using unit summaries to prepare for the Journeyman Practice Exam.	
Hour 134	• Electrical Theory • Review	• All Theory-related material.	• Review all material pertaining to electrical theory using unit summaries to prepare for the Journeyman Practice Exam.	
Hour 135	• Electrical Theory • Review	• All Theory-related material.	• Review all material pertaining to electrical theory using unit summaries to prepare for the Journeyman Practice Exam.	
Hour 136	• Level 4 Final Exam • Journeyman Practice Exam 1 • Theory	• <i>National Electrical Code</i>	• Successfully pass the theory section of the Journeyman Practice Exam within the program completion requirements.	

Apprenticeship Program—Level 4				
Hour	Topic	Resources	Learning Focus	Notes
Hour 137	• Level 4 Final Exam • Journeyman Practice Exam 1 • Theory	• <i>National Electrical Code</i>	• Successfully pass the theory section of the Journeyman Practice Exam within the program completion requirements.	
Hour 138	• Level 4 Final Exam • Journeyman Practice Exam 1 • Theory	• <i>National Electrical Code</i>	• Successfully pass the theory section of the Journeyman Practice Exam within the program completion requirements.	
Hour 139	• <i>National Electrical Code</i> • Review	• All <i>Code</i>-related material.	• Review all material pertaining to understanding the <i>NEC</i> to prepare for the <i>Journeyman Practice Exam</i>.	
Hour 140	• <i>National Electrical Code</i> • Review	• All <i>Code</i>-related material.	• Review all material pertaining to understanding the <i>NEC</i> to prepare for the <i>Journeyman Practice Exam</i>.	
Hour 141	• <i>National Electrical Code</i> • Review	• All <i>Code</i>-related material.	• Review all material pertaining to understanding the <i>NEC</i> to prepare for the <i>Journeyman Practice Exam</i>.	
Hour 142	• Level 4 Final Exam • Journeyman Practice Exam 2 • <i>National Electrical Code</i>	• <i>National Electrical Code</i>	• Successfully pass the <i>Code</i> section of the <i>Journeyman Practice Exam</i> within the program completion requirements.	

Apprenticeship Program—Level 4				
Hour	Topic	Resources	Learning Focus	Notes
Hour 143	- Level 4 Final Exam - Journeyman Practice Exam 2 <i>National Electrical Code</i>	<i>National Electrical Code</i>	Successfully pass the <i>Code</i> section of the <i>Journeyman Practice Exam</i> within the program completion requirements.	
Hour 144	- Level 4 Final Exam - Journeyman Practice Exam 2 <i>National Electrical Code</i>	<i>National Electrical Code</i>	Successfully pass the <i>Code</i> section of the <i>Journeyman Practice Exam</i> within the program completion requirements.	
Hour 145	- Electrical Calculations - Review	All calculations-related material.	Review all material pertaining to electrical calculations to prepare for the Journeyman Practice Exam.	
Hour 146	- Electrical Calculations - Review	All calculations-related material.	Review all material pertaining to electrical calculations to prepare for the Journeyman Practice Exam.	
Hour 147	- Electrical Calculations - Review	All calculations-related material.	Review all material pertaining to electrical calculations to prepare for the Journeyman Practice Exam.	
Hour 148	- Level 4 Final Exam - Journeyman Practice Exam 3 - Calculations	<i>National Electrical Code</i>	Successfully pass the calculations section of the Journeyman Practice Exam within the program completion requirements.	

Apprenticeship Program—Level 4				
Hour	Topic	Resources	Learning Focus	Notes
Hour 149	• Level 4 Final Exam • Journeyman Practice Exam 3 • Calculations	• <i>National Electrical Code</i>	• Successfully pass the calculations section of the Journeyman Practice Exam within the program completion requirements.	
Hour 150	• Level 4 Final Exam • Journeyman Practice Exam 3 • Calculations	• <i>National Electrical Code</i>	• Successfully pass the calculations section of the Journeyman Practice Exam within the program completion requirements.	
Hour 151	• Examination Review	• N/A	• Hand out graded exams. • Go over the exam questions and answers. • Collect the exams and file them in accordance with school policy.	
Hour 152	• Examination Review	• N/A	• Identify questions that were answered incorrectly and where the mistakes were made. • Review deficient areas.	
Hour 153	• Examination Review	• N/A	• Identify questions that were answered incorrectly and where the mistakes were made. • Review deficient areas.	
Hour 154	• Final Processing, Graduation Documents	• N/A	• Final Grade(s)	

Apprenticeship Program—Level 4

Hour	Topic	Resources	Learning Focus	Notes
Hour 155	• Final Processing, Graduation Documents	• N/A	• Certificate of Completion	
Hour 156	• Final Processing, Graduation Documents	• N/A	• Any institutional functions if applicable	

Apprenticeship Program—Level 4				
Hour	Topic	Resources	Learning Focus	Notes
Hour 155	Final Processing, Graduation Documents	N/A	Certificate of Completion	
Hour 156	Final Processing, Graduation Documents	N/A	Any institutional functions if applicable	

