

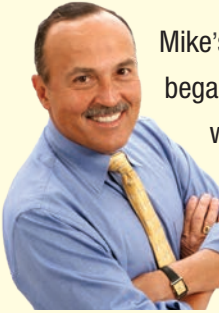
Mike Holt's

# **ELECTRICAL APPRENTICESHIP PROGRAM**

**LEVEL 3**

**Based on the 2023 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.

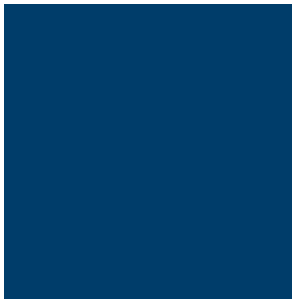
Our primary goal as a company is to change the lives of electrical professionals through our products. We genuinely care about helping our instructors and schools prepare the next generation of electrical professionals with the skills and knowledge they need to succeed.

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.

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# TABLE OF CONTENTS

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**ABOUT THIS LESSON PLAN** ..... V

**LEVEL 3**

Level 3—Outline ..... xxix

Level 3—Lesson Plans At-a-Glance ..... xxxi

Level 3—Objectives ..... xxxiii

**LESSON PLANS—LEVEL 3**

Module I—Hours 1-39	(Term 1—Sessions 1-13).....	3-1
Module II—Hours 40-78	(Term 2—Sessions 1-13).....	3-14
Module III—Hours 79-117	(Term 3—Sessions 1-13).....	3-27
Module IV—Hours 118-156	(Term 4—Sessions 1-13).....	3-40



# ABOUT THIS LESSON PLAN

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*Mike Holt's Electrical Apprenticeship Program Based on the 2023 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 motor controls are a major area of focus, 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 2023 Apprenticeship Program are as follows:

<b>Level 1</b>	156 hours
<b>Level 2</b>	156 hours
<b>Level 3</b>	156 hours
<b>Level 4</b>	156 hours
<b>Total</b>	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 3 OUTLINE

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## 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.

NOTE: You may want to take a look here <https://www.electriclab.org/> for some lab ideas.

### 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®.



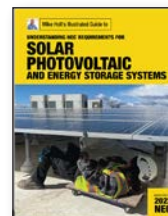
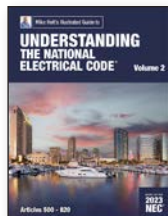
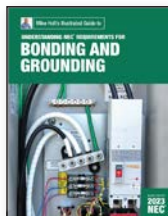
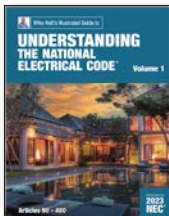
**Textbook Questions.** Our textbooks contain review questions and exams designed to reinforce the learning process when the online testing tools aren't used. We encourage you to have your students complete the textbook tests before taking the online tests to further reinforce their learning process.

**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

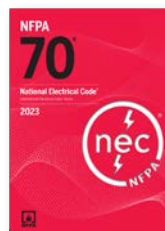
You'll be using the following books or textbooks and we suggest you take a few moments to review the layout of each. Pay attention to the table of contents, the layout of the units and chapters, and the review questions.

- ▶ *Mike Holt's Understanding the National Electrical Code, Volume 1*  
Mike Holt Enterprises  
ISBN 978-1-950431-77-9, 2023
- ▶ *OSHA Construction Safety Training Handbook, 6th Edition*  
J.J. Keller & Associates,  
ISBN 978-1-60287-891-4, 2010
- ▶ *Mike Holt's Understanding NEC Requirements for Bonding and Grounding*  
Mike Holt Enterprises  
ISBN 978-1-950431-74-8, 2023
- ▶ *Mike Holt's Understanding NEC Requirements for Solar Photovoltaic (PV) and Energy Storage Systems*  
Mike Holt Enterprises  
ISBN 978-1-950431-75-5, 2023
- ▶ *Mike Holt's Understanding the National Electrical Code, Volume 2*  
Mike Holt Enterprises  
ISBN 978-1-950431-78-6, 2023
- ▶ *Mike Holt's Understanding Basic Motor Controls*  
Mike Holt Enterprises  
ISBN 978-0-9992038-4-2, Revised Edition



## Suggested Additional Resources\*

- ▶ *National Electrical Code, 2023 Edition*  
National Fire Protection Association  
ISBN 978-145592936-8, 2022



*\*Sold separately.*

# LEVEL 3 LESSON PLANS— AT-A-GLANCE

Hours (Session)	Module I (Term 1)	Hours (Session)	Module II (Term 2)
1-3 (1)	Introduction   Orientation   Tool Safety <i>Level 3</i>	40-42 (1)	Bonding and Grounding—Electrical Theory <i>Units 1–4, 6, and 25</i>
4-6 (2)	OSHA Construction Safety <i>Electrical Safety and PPE</i>	43-45 (2)	Bonding and Grounding—NEC <i>Article 250—Part I</i>
7-9 (3)	OSHA Construction Safety <i>Excavation/Motor Vehicles/Tool Safety</i>	46-48 (3)	Bonding and Grounding—NEC <i>Article 250—Part II</i>
10-12 (4)	NEC—Articles 400 and 402 <i>Flexible Cords and Cables, and Fixture Wires</i>	49-51 (4)	Bonding and Grounding—NEC <i>Article 250—Part III</i>
13-15 (5)	NEC—Articles 404 and 406 <i>Switches and Receptacles</i>	52-54 (5)	Bonding and Grounding—NEC <i>Article 250—Part IV</i>
16-18 (6)	NEC—Article 408 <i>Switchboards, Switchgear, and Panelboards</i>	55-57 (6)	Bonding and Grounding—NEC <i>Article 250—Part V</i>
19-21 (7)	NEC—Articles 410 and 411 <i>Luminaires and Low-Voltage Lighting Systems</i>	58-60 (7)	Bonding and Grounding—NEC <i>Article 250—Parts VI, VII</i>
22-24 (8)	NEC—Articles 410 and 411 <i>Luminaires and Low-Voltage Lighting Systems</i>	61-63 (8)	NEC—Articles 500-502, 511, and 514 <i>Hazardous Locations, Commercial Garages, and Motor Fuel Dispensing</i>
25-27 (9)	NEC—Article 422 <i>Appliances</i>	64-66 (9)	NEC—Articles 517, 518, 525, and 547 <i>Health Care Facilities, Assembly Occupancies, Carnivals, Circuses, Fairs, and Similar Events and Agricultural Buildings</i>
28-30 (10)	NEC—Articles 424 440 <i>Electric Space-Heating and AC Equipment</i>	67-69 (10)	NEC—Article 555 <i>Marinas and Boatyards</i>
31-33 (11)	NEC—Articles 445, 450 <i>Generators, Transformers</i>	70-72 (11)	NEC—Article 590 <i>Temporary Installations</i>
34-36 (12)	Module Review	73-75 (12)	Module Review
37-39 (13)	Module Quiz	76-78 (13)	Module Quiz



Hours (Session)	Module III (Term 3)	Hours (Session)	Module IV (Term 4)
79-81 (1)	<b>NEC—Articles 600, 604, and 620</b> <i>Electric Signs, Manufactured Wiring Systems, Elevators</i>	118-120 (1)	<b>Motor Controls—Units 1-3</b> <i>Introduction to Motor Controls</i>
82-84 (2)	<b>NEC—Articles 630, 640 and 645</b> <i>Electric Welders, Audio Signal Processing and Information Technology Equipment</i>	121-123 (2)	<b>Motor Controls—Units 4-8</b> <i>Motor Controls and Schematics 1</i>
85-87 (3)	<b>NEC—Article 680</b> <i>Swimming Pools, Spas, Hot Tubs, etc.</i>	124-126 (3)	<b>Motor Controls—Units 9-10</b> <i>Motor Controls and Schematics 2</i>
88-90 (4)	<b>NEC—Articles 700, 701, and 702</b> <i>Emergency, Legally Required, and Optional Standby Systems</i>	127-129 (4)	<b>Motor Controls—Units 11-12</b> <i>Reversing Controls 1</i>
91-93 (5)	<b>NEC—Articles 722, 724, 725, 760, 770</b> <i>Cables for Power-Limited Circuits, Class 1 and 2 Power-Limited Circuits, Fire Alarm Systems, Optical Fiber Cables</i>	130-132 (5)	<b>Motor Controls—Units 13-14</b> <i>Reversing Controls 2</i>
94-96 (6)	<b>NEC—Articles 800, 810</b> <b><i>Communications Systems, Antenna Systems</i></b>	133-135 (6)	<b>Motor Controls—Units 15-16</b> <i>Controls for Multiple Motors</i>
97-99 (7)	<b>NEC—Articles 625, 690</b> <i>Electric Vehicle Power Transfer Systems, Solar Photovoltaic (PV) Systems 1</i>	136-138 (7)	<b>Motor Controls—Units 17-20</b> <i>Miscellaneous Requirements</i>
100-102 (8)	<b>NEC—Article 690</b> <i>Solar Photovoltaic (PV) Systems 2</i>	139-141 (8)	<b>NEC—Article 430</b> <i>Parts I–V</i>
103-105 (9)	<b>NEC—Article 691, 705</b> <i>Large Scale Solar Photovoltaic (PV) Systems, Interconnected Electric Power Production Sources (IEPPS)</i>	142-144 (9)	<b>NEC—Article 430</b> <i>Parts VI, VII, IX, X, XIV</i>
106-108 (10)	<b>NEC—Articles 705 480, and 706</b> <i>IEPPS, Storage Batteries, and Energy Storage Systems (ESS)</i>	145-147 (10)	<b>Module Review</b>
109-111 (11)	<b>NEC—Articles 706, 710, and 750</b> <i>Energy Storage, Stand-Alone, and Energy Management Systems</i>	148-150 (11)	<b>Module Quiz</b>
112-114 (12)	<b>Module Review</b>	151-153 (12)	<b>Level 3 Review</b>
115-117 (13)	<b>Module Quiz</b>	154-156 (13)	<b>Level 3 Exam</b>