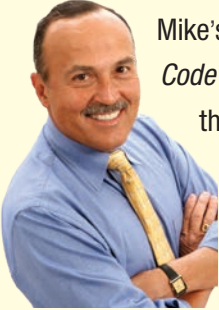


Mike Holt's

ELECTRICAL APPRENTICESHIP PROGRAM

Based on the 2020 NEC®

ABOUT MIKE HOLT ENTERPRISES



Mike's passion for the electrical industry and for 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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LEVEL 3



LESSON PLAN

Based on the 2020 NEC®



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ABOUT THIS PROGRAM

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 PROGRAM

This program is organized into separate study sessions 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. The program covers the *National Electrical Code®* and Safety in a manner relevant to today's apprentices, preparing them for their journeyman's exam and the job site.

Level 1—The first level begins with the study of some 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 the level students will be introduced to, and begin utilizing, the *National Electrical Code*.

Level 2—This level continues the study of OSHA's construction safety rules and then focuses on the first three chapters of the *National Electrical Code*. Some equipment specific to alternating current will be introduced. Residential and commercial wiring methods and practices will also be covered in depth during this training level.

Level 3—This training level covers additional OSHA construction safety rules and Chapter 4 of the *NEC*, then focuses on 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—This final level of the program covers advanced *Code* calculations in great detail. Electrical estimating is discussed in the first part of the level as well as a review of electrical theory and motor controls. Additional OSHA construction safety rules will be covered as well.

HOW TO USE THIS PROGRAM

This lesson plan considers that not all individuals and institutions operate on the same calendar schedule and is organized into time-flexible sessions and should be used as a guide for personal or class scheduling. This flexibility is intended to help guide

both classroom instructors and self-paced online learners, successfully through this course regardless of individual calendars. References to PowerPoint® and video presentations for classroom instruction are included along with the references to online presentations in the 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, and that time overlap is expected and will help to balance out individual learning pace ensuring that all course outcomes and objectives are met. Please make notes during the semester and provide us with your feedback so we can make this schedule better each year. Instructor led course quizzes and 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 individual. Instructors should be aware of the differences in learning styles as you present this material to the class. Some students learn better visually and need to see diagrams and illustrations. Others learn from audible input 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 job-site rather than in the classroom. However, when it's feasible, do 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 control pushbuttons 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. PowerPoint® 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 books and whiteboards.

It's crucial that online (Capacitor®) self-paced or asynchronous learners take advantage and make use of all included presentations, videos, and extraneous links as part of their learning experience to enhance comprehension and reinforce retention of the material being presented.

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 try and incorporate what your students might already be doing in the field and spend some time involving everyone in the discussion.

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—explain that you can't always know all the answers, but that 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. Let them know that learning is a life-long process, and there are always new things to learn in the electrical field.

You'll be successful as an instructor if you remember that we all started here and empathize with your students by providing encouragement and reassurance while they strive to achieve their personal goals and develop a respect for the electrical profession and a love for learning essential to a successful career in our ever changing industry.



LEVEL 3 OUTLINE

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 RESOURCES

Mike Holt's Apprenticeship Training Program is designed to use textbooks, PowerPoint® 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 textbook(s) (or viewed in their entirety) to provide a practical viewpoint of the material being (or to be) covered. If something isn't understood or misinterpreted, stop, go back, and play that section again until the topic being discussed 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.

PowerPoint® Presentations

Also included in this instruction package are PowerPoint® presentations containing hundreds of slides that are synchronized with the textbook(s). 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 getting your hands on mechanical parts such as, meters, wire, magnets, coils, light bulbs, switches, fuses, circuit breakers, receptacles, GFCIs, AFCIs, and 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 taught. Seeing a mechanical concept in action makes it easier to understand the lesson being taught.

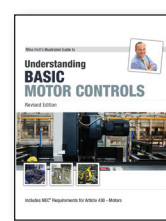
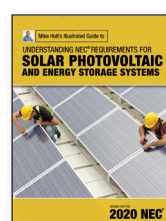
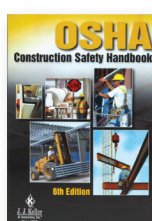
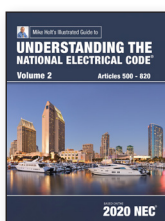
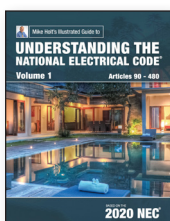
Textbook Questions. Our textbooks contain review questions and exams designed to reinforce the learning process when the online testing tools aren't used. We encourage you to have your students complete the textbook tests before taking the online tests to further reinforce their learning process.

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, 6th Edition*
J.J. Keller & Associates,
ISBN 978-1-60287-891-4, 2010
- ▶ *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 PLAN—AT A GLANCE

Session	Quarter 1	Session	Quarter 2
1	Introduction Orientation Tools <i>Level 3</i>	1	Lab/Activity <i>Lighting—Ballasts and Transformers</i>
2	OSHA Construction Safety <i>Electrical Safety and PPE</i>	2	NEC—Articles 440, 445, and 450 <i>Air-Conditioning/Refrigeration Equipment and Transformers</i>
3	OSHA Construction Safety <i>Excavation/Motor Vehicles/Tool Safety</i>	3	Bonding and Grounding—Fundamentals <i>Units 1, 2, 3, and 4</i>
4	NEC—Articles 400 and 402 <i>Flexible Cords and Cables, and Fixture Wires</i>	4	Bonding and Grounding—NEC <i>Articles, 90, 100, and 110</i>
5	NEC—Articles 404 and 406 <i>Switches and Receptacles</i>	5	Bonding and Grounding—NEC <i>Article 250</i>
6	NEC—Article 408 <i>Switchboards, Switchgear, and Panelboards</i>	6	Bonding and Grounding—NEC <i>Article 250</i>
7	NEC—Articles 410 and 411 <i>Luminaires and Low-Voltage Lighting Systems</i>	7	Bonding and Grounding—NEC <i>Article 250</i>
8	NEC—Article 422 <i>Appliances</i>	8	NEC—Articles 500-503, 511, and 514 <i>Hazardous Locations, Commercial Garages, and Motor Fuel Dispensing</i>
9	NEC—Article 424 <i>Fixed Electric Space-Heating Equipment</i>	9	NEC—Articles 517, 518, 550, and 590 <i>Health Care Facilities, Assembly Occupancies, Mobile/Manufactured Homes, and Temporary Installations</i>
10	NEC—Article 430 <i>Motors, Motor Circuits, and Controllers 1</i>	10	NEC—Articles 600, 604, and 620 <i>Electric Signs, Manufactured Wiring Systems, and Elevators</i>
11	NEC—Article 430 <i>Motors, Motor Circuits, and Controllers 2</i>	11	Flex Training <i>Institution/Instructor Choice</i>
12	Quarter 1 Review	12	Quarter 2 Review
13	Quarter 1 Exam	13	Quarter 2 Exam

LEVEL 3 LESSON PLAN—AT A GLANCE

Session	Quarter 3	Session	Quarter 4
1	NEC—Articles 625 and 630 <i>Electric Vehicle Charging System and Electric Welders</i>	1	Motor Controls—Units 1–3 <i>Introduction to Motor Controls</i>
2	NEC—Articles 640 and 645 <i>Audio Signal Processing and Information Technology Equipment</i>	2	Motor Controls— Units 4–8 <i>Motor Controls and Schematics 1</i>
3	NEC—Article 680 <i>Swimming Pools, Spas, Hot Tubs, Fountains, and Similar Installations</i>	3	Motor Controls—Units 9–10 <i>Motor Controls and Schematics 2</i>
4	NEC—Articles 700, 701, and 702 <i>Emergency, Legally Required, and Optional Standby Systems</i>	4	Motor Controls— Units 11–12 <i>Reversing Controls 1</i>
5	NEC—Article 725 <i>Remote-Control, Signaling, and Power-Limited Circuits</i>	5	Motor Controls—Units 13–14 <i>Reversing Controls 2</i>
6	NEC—Articles 760, 770, 800, 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>	6	Motor Controls—Units 15–16 <i>Controls for Multiple Motors</i>
7	NEC—Article 690 <i>Solar Photovoltaic (PV) Systems 1</i>	7	Motor Controls—Units 17–20 <i>Miscellaneous Requirements</i>
8	NEC—Article 690 <i>Solar Photovoltaic (PV) Systems 2</i>	8	Lab/Activity <i>Variable Speed Drives</i>
9	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>	9	Flex Day <i>School/Instructor Choice</i>
10	NEC—Articles 705 and 706 <i>Interconnected Electric Power Production Sources (IEPPS) and Energy Storage Systems</i>	10	Quarter 4 Review
11	NEC—Articles 706 and 710 <i>Energy Storage and Stand-Alone Systems</i>	11	Quarter 4 Exam
12	Quarter 3 Review	12	Level 3 Review
13	Quarter 3 Exam	13	Level 3 Final Exam