Mike Holt’s

Apprenticeship Training Program

2015 Edition: Year 3

Revised Date: 10/15
Program Description

Mike Holt’s Apprenticeship Training Program

Mike Holt’s Apprenticeship Training Program has been developed to provide apprentices with the knowledge required to become journeyman electricians.

This program utilizes Mike’s industry leading electrical training products that are proven to produce some of the best electricians in the industry today. Supplemented with Mike’s instructional support material such as presentations, videos, and simulated exams, the program is tailored to meet the needs of various types of learners.

This program is 624 contact hours designed to deliver a logical flow of material. From day one strong emphasis is placed on safe work practices and is maintained throughout the program. The first year covers electrical fundamentals that are essential to understanding specific electrical equipment operation as well as complex Code requirements. Calculations, NEC requirements, and wiring methods are discussed in each subsequent year. Estimating and industrial applications are covered in detail in the final year.

Upon successful completion of the program, students will have the knowledge necessary to safely perform the job duties of a journeyman electrician. The program provides students with a strong foundation in electrical concepts, Code requirements, and safe work practices.

Journeyman electricians play a vital role in the electrical industry. They perform a wide variety of electrical tasks in many different environments. They’ll be leaders in the field and oversee and train apprentices for years to come.
To the Instructor:

This lesson plan is intended as an outline to help you schedule the semester. You’ll find that every class is different. Some sessions may require more time than allowed while others go quickly. Please make notes during the semester and provide us with your feedback so we can evaluate this schedule for future application.

Please read the forward information in each book used for additional help in understanding the material covered in each lesson. Students learn differently, and the same methods of presentation and study don’t necessarily bring the same results for each individual. 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, lectures, and class group discussions.

Hands-on learning is an important component of education, and much of it will be done on the job-site rather than in the classroom. Due to the limitations of classroom facilities, there’s little opportunity for hands-on experiments. When it’s feasible, do bring equipment and material in to show the class. Just a little “show and tell” of components 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 presentations using an LCD projector can be very beneficial, but it’s understood the necessary equipment isn’t always available. In some cases, the available facilities may limit the presentation to the use of student books and blackboards.

Make use of student discussion and involvement as much as possible. For instance, in many cases there are workbook questions that are assigned. After completing the questions, have the students take turns reading the question and their answer 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 involve your students in discussion and allow their input.

Answer questions honestly, and don’t be afraid to tell them if you don’t know the answer, but do take time to look it up. Let your students know you don’t know all the answers, but you’re there to help them in the learning process.

Make your students responsible for 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 have a heart for your students and help them develop a respect for the electrical profession and a love for learning.
Resources

Year 3 Program Presentations

- Electrical Safety and PPE
- Excavation
- Motor Vehicles
- Tool Safety

Understanding the NEC Vol. 1
- Chapter 4, 400 – 450

Understanding the NEC Vol. 2
- Chapter 5, 501 – 590
- Chapter 6, 600 – 695
- Chapter 7, 700 – 770
- Chapter 8, 800 – 820

Grounding vs Bonding

- Chapter 1
- Chapter 2
- Chapter 3
- Chapter 4
- Chapter 5
- Chapter 6
- Chapter 7
- Chapter 8
- Chapter 9
- Chapter 10

Understanding Basic Motor Controls
- Chapter 1
- Chapter 2
- Chapter 3
- Chapter 4

Power Quality
- Chapter 1
- Chapter 2
- Chapter 3
- Chapter 4
- Chapter 5
- Chapter 6
- Chapter 7
- Chapter 8
- Chapter 9
- Chapter 10
## Resources

### Year 3 Program Videos

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<thead>
<tr>
<th>Topic</th>
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<tr>
<td>Power Quality</td>
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<td>Special Occupancies 500-590</td>
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<td>Special Occupancies 600-702</td>
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<tr>
<td>Limited Energy &amp; Communications Systems 725-820</td>
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<td>Grounding vs Bonding</td>
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<td>Solar Photovoltaic Systems</td>
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<tr>
<td>Basic Motor Controls</td>
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</table>
Description: This training year focuses on common industrial applications, methods, and requirements. While motors and controls are the major focus area, hazardous locations, special applications, Solar Photovoltaic Systems and Power Quality are also introduced.

Upon successful completion students should be able to:

- Read prints on industrial and hazardous locations
- Perform work correctly from blueprints
- Wire control circuits from schematics
- Discuss the basic principles of motors and controls
- Identify variable frequency drives and programmable logic controllers
- Connect various two- and three-wire control circuits
- Show an understanding of control circuit components and their operation
- Define harmonics and explain their effects on electrical systems
- Understand The hazards of portable electric tools
- Understand the basic NEC Rules that apply to Solar PV
- Identify conductor and circuit parts as it pertains to NFPA 70E
Textbooks


Teaching Strategies

Teaching strategies could include lecture, board work, demonstration, lab activity, classroom exercises, discussion, practice questions, examination, reading assignments, field trips, guest lectures, group projects, and presentations.

Assessment

Methods of assessment may include projects, quizzes, exams, in or out of class activities, and class participation.

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<thead>
<tr>
<th>Item</th>
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<tr>
<td>Participation</td>
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<td>Projects &amp; Assignments</td>
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<td>Quizzes</td>
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Topical Outline

- OSHA Construction Safety Handbook
  - Electrical Safety and PPE
  - Excavations
  - Motor Vehicles
  - Tool Safety

- Power Quality
- Flexible Cords
- Fixture Wires
- Switches
- Receptacles
- Switchboards
- Panelboards
- Luminaires
- Low Voltage Lighting Systems
- Appliances
- Fixed Electric Space Heaters
- Motors
- Motor Circuits
- Controllers
- Air Conditioning
- Transformers
- Grounding versus Bonding
- CPR
- Hazardous Locations
- Garages
- Fuel Dispensing
- Healthcare

- Assembly
- Mobile
- Manufactured
- Temporary
- Electric Signs
- Manufactured Wiring Systems
- Office Furnishings
- Elevators
- Vehicle Chargers
- Welders
- Audio
- TI Equipment
- Swimming Pools
- Emergency
- Standby Systems
- Remote Control
- Signaling
- Power Limited Circuits
- Fire Alarm
- Limited Energy
- Communications
- Industrial Locations
- Hazardous Locations
- Intro to Motor Controls
- Motor Controls
- Schematics
- Reversing Controls
- Multiple Motors
<table>
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<tr>
<th>Topic</th>
<th>Text/Resources</th>
<th>Learning Objectives</th>
<th>Important Focus</th>
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<tr>
<td><strong>Hour 1</strong></td>
<td>Orientation</td>
<td>• N/A</td>
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<td>• Sign Off</td>
<td>• Review Policies and Procedures</td>
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<td>• Book Slip</td>
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<td>• Policies &amp; Procedures</td>
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<td>• Complete Documentation</td>
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<td><strong>Hour 2</strong></td>
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<td>• N/A</td>
<td>• Complete Student Information Forms</td>
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<td>• Sign Off</td>
<td>• Community College Forms</td>
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</table>
| 1    | OSHA Construction Safety Handbook  
• Electrical Safety and Personal Protective Equipment | • Text - OSHA Construction Safety Handbook  
Pages 39-50 and 205-226 | • Learn and Understand Electrical Hazards and safe electrical practices  
• Learn and Understand the Importance of PPE - Your last line of defense against injury | • Cover Electrical Hazards, safe electrical practices  
• Cover the Importance of PPE - Your last line of defense against injury |
| 2    | OSHA Construction Safety Handbook  
• Electrical Safety and Personal Protective Equipment | • Text - OSHA Construction Safety Handbook  
Pages 39-50 and 205-226 | • Learn and Understand Electrical Hazards and safe electrical practices  
• Learn and Understand the Importance of PPE - Your last line of defense against injury | • Cover Electrical Hazards, safe electrical practices  
• Cover the Importance of PPE - Your last line of defense against injury |
| 3    | OSHA Construction Safety Handbook  
• Electrical Safety and Personal Protective Equipment  
• Review and Quiz | • Text - OSHA Construction Safety Handbook  
Pages 39-50 and 205-226  
• Review and Quiz | • Review - Elec. Safety and Personal Protective Equipment  
• Successfully pass quiz within the program completion requirements | • Take this time to review the chapters  
• Direct students to take the quiz |

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<thead>
<tr>
<th>Hour 1</th>
<th>OSHA Construction Safety Handbook • Excavations</th>
<th>• Text - OSHA Construction Safety Handbook Pages 75-80</th>
<th>• Learn and Understand excavation safety, in and around the site</th>
<th>• Cover excavation safety, in and around the site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hour 2</td>
<td>OSHA Construction Safety Handbook • Motor Vehicles</td>
<td>• Text - OSHA Construction Safety Handbook Pages 195-201</td>
<td>• Learn and Understand vehicle operations and safety</td>
<td>• Cover vehicle operations and safety</td>
</tr>
<tr>
<td>Hour 3</td>
<td>OSHA Construction Safety Handbook • Tool Safety • Review and Quiz</td>
<td>• Text - OSHA Construction Safety Handbook Pages 271-283 • Review 75-80, 195-201, 271-283 • Quiz</td>
<td>• Learn and Understand tools and general precautions • Review Excavations, Motor Vehicles and Tool Safety • Successfully pass quiz within the program completion requirements</td>
<td>• Take this time to review the chapters • Direct students to take the quiz</td>
</tr>
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Notes
# Year 3 Lesson Plan

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<tr>
<td><strong>Hour 1</strong></td>
<td>Power Quality • Ch. 1- Introduction • Ch. 2- Electrical Theory</td>
<td>• Text- Power Quality Pages 1-9 • PowerPoint- Power Quality Slides 1-20 • Ch.- 1 &amp; 2</td>
<td>• Demonstrate a strong understanding of electrical theory after covering this review material</td>
</tr>
<tr>
<td><strong>Hour 2</strong></td>
<td>Power Quality • Ch. 3- Alternating Current</td>
<td>• Text- Power Quality Pages 11-29 • PowerPoint- Power Quality Slides 21-79 • Ch.- 3</td>
<td>• Demonstrate a strong understanding of electrical theory after covering this review material</td>
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<tr>
<td><strong>Hour 3</strong></td>
<td>Power Quality • Ch. 4- Neutral Conductor • Ch. 1-4 Review and Quiz</td>
<td>• Text- Power Quality Pages 33-39 • PowerPoint- Power Quality Slides 80-90 • Ch.- 4 • Quiz</td>
<td>• Demonstrate a strong understanding of electrical theory after covering this review material • Successfully pass the quiz within the program completion requirements</td>
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**Notes**
# Year 3 Lesson Plan

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<th>Class 5</th>
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<th>Topic</th>
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<th>Learning Objectives</th>
<th>Important Focus</th>
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</thead>
</table>
|        | Power Quality | • Text- Power Quality Pages- 41-50  
• PowerPoint- Power Quality Slides 91-112  
• Ch.- 5 | • Show familiarity with the material covered in the section  
• Demonstrate an ability to apply the knowledge learned to real-life scenarios | • Cover the unit and discuss material  
• Go over review questions in class to ensure students’ understanding of the material |
|        |        | • Text- Power Quality Pages- 53-63  
• PowerPoint- Power Quality Slides 113-147  
• Ch.- 6 | • Show familiarity with the material covered in the section  
• Demonstrate an ability to apply the knowledge learned to real-life scenarios | • Cover the unit and discuss material  
• Go over review questions in class to ensure students’ understanding of the material |
|        | Power Quality | • Text- Power Quality Pages- 65-68  
• PowerPoint- Power Quality Slides 148-156  
• Ch.- 7  
• Quiz | • Show familiarity with the material covered in the section  
• Demonstrate an ability to apply the knowledge learned to real-life scenarios  
• Successfully pass the quiz within the program completion requirements | • Cover the unit and discuss material  
• Go over review questions in class to ensure students’ understanding of the material  
• Direct students to take the article quizzes |

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<tr>
<td>1</td>
<td>Power Quality</td>
<td>• Text- Power Quality Pages- 69-74</td>
<td>• Show familiarity with the material covered in the section</td>
<td>• Cover the unit and discuss material</td>
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<td>• Electrical Noise</td>
<td>• PowerPoint- Power Quality Slides 157-171</td>
<td>• Demonstrate an ability to apply the knowledge learned to real-life scenarios</td>
<td>• Go over review questions in class to ensure students’ understanding of the material</td>
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<td>• Ch.- 8</td>
<td>• Ch.- 8</td>
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<td>2</td>
<td>Power Quality</td>
<td>• Text- Power Quality Pages 77-93</td>
<td>• Show familiarity with the material covered in the section</td>
<td>• Cover the unit and discuss material</td>
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<td>• Grounding and Bonding</td>
<td>• PowerPoint- Power Quality Slides 172-223</td>
<td>• Demonstrate an ability to apply the knowledge learned to real-life scenarios</td>
<td>• Go over review questions in class to ensure students’ understanding of the material</td>
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<td>• Ch. - 9</td>
<td>• Ch.- 9</td>
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<td>3</td>
<td>Power Quality</td>
<td>• Text- Power Quality Pages 95-111</td>
<td>• Show familiarity with the material covered in the section</td>
<td>• Cover the unit and discuss material</td>
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<td>• Power Quality Issues</td>
<td>• PowerPoint- Power Quality Slides 224-271</td>
<td>• Demonstrate an ability to apply the knowledge learned to real-life scenarios</td>
<td>• Go over review questions in class to ensure students’ understanding of the material</td>
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<td>• Ch. 10</td>
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<td>• Ch. 8-10 Review and Quiz</td>
<td>• Quiz</td>
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<td>• Direct students to take the article quizzes</td>
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<tr>
<td><strong>Hour 1</strong></td>
<td>Instructor Led • Lighting Ballasts/Transformers</td>
<td>• Identify main types of lamps and ballasts and understand the process to troubleshoot and replace them.</td>
<td>• Use Instructor provided resources to show wiring, function and troubleshooting of lighting ballasts and transformers</td>
</tr>
<tr>
<td></td>
<td>• Universal Ballast Troubleshooting PDFs located on Instructor resource disks</td>
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<tr>
<td><strong>Hour 2</strong></td>
<td>Instructor Led • Lighting Ballasts/Transformers</td>
<td>• Identify main types of lamps and ballasts and understand the process to troubleshoot and replace them.</td>
<td>• Use Instructor provided resources to show wiring, function and troubleshooting of lighting ballasts and transformers</td>
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<td>Instructor Led • Lighting Ballasts/Transformers</td>
<td>• Identify main types of lamps and ballasts and understand the process to troubleshoot and replace them.</td>
<td>• Use Instructor provided resources to show wiring, function and troubleshooting of lighting ballasts and transformers</td>
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**Notes**
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| Hour 1 | The National Electrical Code  
| • Flexible Cords & Flexible Cables  
<table>
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<th>Article- 400</th>
<th>Topic</th>
<th>Text/Resources</th>
<th>Learning Objectives</th>
<th>Important Focus</th>
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</table>
| | | • Text- Understanding the NEC Vol. 1 & The NEC 2014 Pages-469-473  
| | | • PowerPoint- UNEC Vol 1, 400-450 Slides 1-26  
| | | • Video- Equipment for General Use Section- Article-400 | • List the applications permitted when utilizing flexible cables and cords  
| | | | • Reference the table for ampacities and be familiar with adjustments  
| | | | • Perform a proper installation using strain relief supports for cables and cords | • Go over ampacities for flexible cords and cables  
| | | | • Discuss the uses permitted and not permitted  
| | | | • Show types of flexible cords and cables listed in Table 400.4  
| | | • Discuss the uses permitted and not permitted  
| | | | • Cover polarity and neutral terminal identification | **Notes** |
| Hour 2 | The National Electrical Code  
| • Fixture Wires  
| • Article- 402 | | Text- Understanding the NEC Vol. 1 & The NEC 2014 Pages- 475-476  
| | | • PowerPoint- UNEC Vol 1, 400-450 Slides 27-35  
| | | • Video- Equipment for General Use Section- Article-402 | • Select appropriate size fixture wire for given ampacities  
| | | | • List acceptable uses of fixture wires | **Notes** |
| Hour 3 | The National Electrical Code  
| • Flexible Cords & Flexible Cables, and Fixture Wires  
| • Articles 400 and 402 | Text- Understanding the NEC Vol. 1 & The NEC 2014 Pages 469-473  
| | | • Review-Articles 400 & 402 Pages 469-473 | • List the applications permitted when utilizing flexible cables and cords  
| | | | • Reference the table for ampacities and be familiar with adjustments  
| | | | • Perform a proper installation using strain relief supports for cables and cords | **Notes** |

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</table>
| 1    | The National Electrical Code  
  • Switches  
  • Article- 404 | • Text- Understanding the NEC Vol. 1 & The NEC 2014  
  Pages-479-488  
  • PowerPoint- UNEC Vol 1, 400-450  
  Slides 36-82  
  • Video- Equipment for General Use  
  Section- Article-404 | • Demonstrate the proper switch connections for 3-and 4-way switches and position them correctly  
  • Properly mount snap switches  
  • Explain acceptable methods for grounding switch plates | • Discuss switch connections for 3- and 4-way switching  
  • Identify damp and wet locations with respect to installation requirements for switches  
  • Cover switching breakers and switch ratings and markings |
| 2    | The National Electrical Code  
  • Receptacles, Cord Connectors, & Attachment Plugs (Caps)  
  • Article- 406 | • Text- Understanding the NEC Vol. 1 & The NEC 2014  
  Pages-489-499  
  • PowerPoint- UNEC Vol 1, 400-450  
  Slides 83-139  
  • Video- Equipment for General Use  
  Section- Article-406 | • Properly mount and wire receptacles  
  • Select proper size receptacles for given installations  
  • Identify and use proper receptacle covers for wet locations | • Discuss receptacle ratings and types  
  • Explain the several acceptable replacement methods for non-grounding-type receptacles  
  • Cover attachment plugs and cord connectors with respect to exposed or energized parts |
| 3    | The National Electrical Code  
  • Switches and Receptacles, Cord Connectors, & Attachment Plugs (Caps)  
  • Articles 404 & 406 | • Text- Understanding the NEC Vol. 1 & The NEC 2014  
  • Review-Articles 404 &406  
  Pages 479-499 | • Demonstrate the proper switch connections for 3-and 4-way switches and position them correctly  
  • Properly mount snap switches  
  • Explain acceptable methods for grounding switch plates | • Discuss switch connections for 3- and 4-way switching  
  • Identify damp and wet locations with respect to installation requirements for switches  
  • Cover switching breakers and switch ratings and markings |

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</table>
| Hour 1 | The National Electrical Code  
• Switchboards, Switchgear, & Panelboards  
• Article- 408 | • Text- Understanding the NEC Vol. 1 & The NEC 2014 Pages-501-507  
• PowerPoint- UNEC Vol 1, 400-450 Slides 140-176  
• Video- Equipment for General Use Section- Article-408 | • Select the proper location to terminate the high leg in a panelboard  
• Identify the proper location of protection for panelboards | • Go over phase arrangement with respect to “high leg” systems  
• Discuss the requirements for panel directories  
• Cover overcurrent protection requirements |
| Hour 2 | The National Electrical Code  
• Switchboards, Switchgear, & Panelboards  
• Article- 408 | • Text- Understanding the NEC Vol. 1 & The NEC 2014 Pages-501-507  
• PowerPoint- UNEC Vol 1, 400-450 Slides 140-176  
• Video- Equipment for General Use Section- Article-408 | • 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 | • Cover requirements for panelboards in damp and wet locations  
• Discuss neutral conductor terminations  
• Give a detailed explanation of the maximum number of overcurrent devices permitted in a panelboard |
| Hour 3 | The National Electrical Code  
• Switchboards, Switchgear, & Panelboards  
• Article- 408 | • Text- Understanding the NEC Vol. 1 & The NEC 2014 Pages 501-507  
• Review- Article 408 Pages 501-507 | • 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 | • Cover requirements for panelboards in damp and wet locations  
• Discuss neutral conductor terminations  
• Give a detailed explanation of the maximum number of overcurrent devices permitted in a panelboard |

Notes
| Hour 1 | The National Electrical Code  
• Luminaires, Lampholders, & Lamps  
• Article- 410 | • Text- Understanding the NEC Vol. 1 & The NEC 2014  
Pages-509-523  
• PowerPoint- UNEC Vol 1, 400-450 Slides 177-255  
• Video- Equipment for General Use Section- Article-410 | • Show an understanding of the requirements associated with the wiring and supporting of luminaires as well as acceptable types for given locations | • Cover definition associated with luminaires, lampholders, & lamps  
• Discuss fixtures installed near combustibles  
• Demonstrate proper support of luminaires  
• Explain wiring and grounding of luminaires |
| Hour 2 | The National Electrical Code  
• Lighting Systems Operating at 30V or Less & Lighting Equipment Connected to Class 2 Power Sources  
• Article- 411 | • Text- Understanding the NEC Vol. 1 & The NEC 2014  
Pages-525-527  
• PowerPoint- UNEC Vol 1, 400-450 Slides 256-264  
• Video- Equipment for General Use Section- Article-411 | • Explain low voltage systems, as defined by the National Electrical Code, and their uses | • Use some time here to wrap up previous article if necessary  
• State the definition of a low voltage lighting system  
• Cover locations and secondary circuits |
| Hour 3 | The National Electrical Code  
• Luminaires, Lampholders, & Lamps, and Lighting Systems Operating at 30V or Less & Lighting Equipment Connected to Class 2 Power Sources  
• Articles 410 & 411 | • Text- Understanding the NEC Vol. 1 & The NEC 2014  
Pages 509-527  
• Review-Articles 410 & 411 Pages 509-527 | • Show an understanding of the requirements associated with the wiring and supporting of luminaires as well as acceptable types for given locations | • Cover definition associated with luminaires, lampholders, & lamps  
• Discuss fixtures installed near combustibles  
• Demonstrate proper support of luminaires  
• Explain wiring and grounding of luminaires |
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1</td>
<td>1st Quarter Review</td>
<td>All quarter material used</td>
<td>N/A</td>
<td>Review all material from the 1st quarter utilizing unit summaries to prepare students for the quarter final examination. Make sure all of the information that will be on the exam is covered.</td>
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<tr>
<td>2</td>
<td>1st Quarter Review</td>
<td>All quarter material used</td>
<td>N/A</td>
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<td>1st Quarter Review</td>
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# Year 3 Lesson Plan

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<td>1st Quarter</td>
<td>Not an open book exam</td>
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<td>N/A</td>
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<td>2</td>
<td>1st Quarter</td>
<td>Not an open book exam</td>
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<td>1st Quarter</td>
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<td>1</td>
<td>The National Electrical Code</td>
<td>• Text- Understanding the NEC Vol. 1 &amp; The NEC 2014 Pages-529-537</td>
<td>• Determine branch circuit ratings for various appliances</td>
<td>• Cover branch circuit ratings and overcurrent protection</td>
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<tr>
<td></td>
<td>• Appliances</td>
<td>• PowerPoint- UNEC Vol 1, 400-450 Slides 265-309</td>
<td>• Select equipment to properly assemble cord-and-plug connections for appliances</td>
<td>• Go over permitted uses of flexible cords for appliances</td>
</tr>
<tr>
<td></td>
<td>• Article- 422</td>
<td>• Video- Equipment for General Use Section- Article-422</td>
<td>• Determine appropriate disconnecting means for various appliances</td>
<td>• Discuss proper appliance disconnecting means and types</td>
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<td>The National Electrical Code</td>
<td>• Text- Understanding the NEC Vol. 1 &amp; The NEC 2014 Pages-529-537</td>
<td>• Determine branch circuit ratings for various appliances</td>
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<td>The National Electrical Code</td>
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| **Hour 1** | The National Electrical Code  
• Fixed Electric Space-Heating Equipment  
• Article- 424 | • Text- Understanding the NEC Vol. 1 & The NEC 2014 Pages-539-542  
• PowerPoint- UNEC Vol 1, 400-450 Slides 310-324  
• Video- Equipment for General Use  
• Section- Article-424 | • Determine branch circuit rating and conductor size for these loads  
• Recognize requirements for electric space-heating conductors installed in masonry floors | • Cover branch circuit ratings, overcurrent protection, and disconnects  
• Explain requirements for heating conductors installed in concrete and other masonry floors |
| **Hour 2** | The National Electrical Code  
• Fixed Electric Space-Heating Equipment  
• Article- 424 | • Text- Understanding the NEC Vol. 1 & The NEC 2014 Pages-539-542  
• PowerPoint- UNEC Vol 1, 400-450 Slides 310-324  
• Video- Equipment for General Use  
• Section- Article-424 | • Determine branch circuit rating and conductor size for these loads  
• Recognize requirements for electric space-heating conductors installed in masonry floors | • Cover branch circuit ratings, overcurrent protection, and disconnects  
• Explain requirements for heating conductors installed in concrete and other masonry floors |
| **Hour 3** | The National Electrical Code  
• Fixed Electric Space-Heating Equipment  
• Article- 424 | • Text- Understanding the NEC Vol. 1 & The NEC 2014  
• Review- Article 424 Pages 539-542 | • Determine branch circuit rating and conductor size for these loads  
• Recognize requirements for electric space-heating conductors installed in masonry floors | • Cover branch circuit ratings, overcurrent protection, and disconnects  
• Explain requirements for heating conductors installed in concrete and other masonry floors |

### Notes
| Hour 1 | The National Electrical Code  
• Motors, Motor Circuits, & Controllers  
• Article- 430 | • Text- Understanding the NEC Vol. 1 & The NEC 2014  
Pages-543-560  
• PowerPoint- UNEC Vol 1, 400-450  
Slides 325-394  
• Video- Equipment for General Use  
Section- Article-430 | • Competently calculate minimum conductor required, maximum overload protection rating, and maximum branch-circuit OCPD rating for motor branch circuits | • Cover motor nameplate information  
• Explain conductor sizing  
• Explain overload protection & how to rate overload protection  
Explain overcurrent protection of a motor branch circuit and how to rate this protection |
| --- | --- | --- | --- | --- |
| Hour 2 | The National Electrical Code  
• Motors, Motor Circuits, & Controllers  
• Article- 430 | • Text- Understanding the NEC Vol. 1 & The NEC 2014  
Pages-543-560  
• PowerPoint- UNEC Vol 1, 400-450  
Slides 325-394  
• Video- Equipment for General Use  
Section- Article-430 | • Competently calculate maximum OCPD for motor feeders  
• Reference relevant FLC tables for motors when given necessary nameplate information | • Explain the rating of overcurrent protection for motor feeders  
• Cover protection of motor control circuits & the ratings of motor controllers  
• Cover the requirements of disconnecting means  
• Explain the navigation of relevant tables |
| Hour 3 | The National Electrical Code  
• Motors, Motor Circuits, & Controllers  
• Article- 430 | • Text- Understanding the NEC Vol. 1 & The NEC 2014  
• Review- Article 430  
Pages 543-560 | • Take this time to review the portion of Article 430 Covered in this class period. | • Take this time to review the portion of Article 430 Covered in this class period. |
| Hour 1 | The National Electrical Code  
|• Motors, Motor Circuits, & Controllers 2  
|• Article- 430 | **Text/Resources** | **Learning Objectives** | **Important Focus** |
| | • Text- Understanding the NEC Vol. 1 & The NEC 2014  
| | | Pages-543-560 | • Competently calculate minimum conductor required, maximum overload protection rating, and maximum branch-circuit OCPD rating for motor branch circuits | • Cover motor nameplate information  
| | | • PowerPoint- UNEC Vol 1, 400-450 Slides 325-394 | | • Explain conductor sizing  
| | | • Video- Equipment for General Use Section- Article-430 | | • Explain overload protection & how to rate overload protection  
| | | | | • Explain overcurrent protection of a motor branch circuit and how to rate this protection |
| Hour 2 | The National Electrical Code  
|• Motors, Motor Circuits, & Controllers 2  
|• Article- 430 | **Text/Resources** | **Learning Objectives** | **Important Focus** |
| | • Text- Understanding the NEC Vol. 1 & The NEC 2014  
| | | Pages-543-560 | • Competently calculate maximum OCPD for motor feeders  
| | | • PowerPoint- UNEC Vol 1, 400-450 Slides 325-394 | • Reference relevant FLC tables for motors when given necessary nameplate information | • Explain the rating of overcurrent protection for motor feeders  
| | | • Video- Equipment for General Use Section- Article-430 | | • Cover protection of motor control circuits & the ratings of motor controllers  
| | | | | • Cover the requirements of disconnecting means  
| | | | | • Explain the navigation of relevant tables |
| Hour 3 | The National Electrical Code  
|• Motors, Motor Circuits, & Controllers 2  
|• Article- 430 | **Text/Resources** | **Learning Objectives** | **Important Focus** |
| | • Text- Understanding the NEC Vol. 1 & The NEC 2014  
| | | Review-Article 430 Pages 543-560 | • Take this time to review the portion of Article 430 Covered in this class period. | • Take this time to review the portion of Article 430 Covered in this class period. |

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| **Hour 1** | The National Electrical Code  
• Air-Conditioning & Refrigeration Equipment  
• Article- 440 |  
- Text- Understanding the NEC Vol. 1 & The NEC 2014 Pages- 561-566  
- PowerPoint- UNEC Vol 1, 400-450 Slides 395-418  
- Video- Equipment for General Use Section- Article-440 |  
- Exhibit adequacy in referencing Article 440 for information on OCPD rating and conductor sizing  
- Determine the minimum equipment necessary for air-conditioning equipment |  
- Cover ampacity & ratings  
- Discuss requirements of disconnecting means  
- Explain the determination of overcurrent protection  
- Explain the determination of conductor size  
- Cover the requirements for “room air-conditioners” |
| **Hour 2** | The National Electrical Code  
• Transformers  
• Article- 440 & 450 |  
- Text- Understanding the NEC Vol. 1 & The NEC 2014 Pages- 567-574  
- PowerPoint- UNEC Vol 1, 400-450 Slides 419-448  
- Video- Equipment for General Use Section- Article-445 & 450 |  
- Show adequacy in referencing information in Articles 445 & 450  
- Exhibit knowledge of installation requirements for both articles |  
- Explain the determination of overcurrent protection  
- Discuss the requirements for ventilation  
- Cover marking requirements & accessibility of transformers |
| **Hour 3** | The National Electrical Code  
• Air-Conditioning & Refrigeration Equipment, and Transformers  
• Articles 440 & 450 |  
- Text- Understanding the NEC Vol. 1 & The NEC 2014  
- Review- Articles 440- 450 Pages 561-566 & 571-574 |  
- Exhibit adequacy in referencing Article 440 for information on OCPD rating and conductor sizing  
- Show adequacy in referencing information in Article 450 |  
- Explain the determination of overcurrent protection  
- Discuss the requirements for ventilation  
- Cover marking requirements & accessibility of transformers |

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<td>Grounding vs. Bonding</td>
<td>• Video                          • Part 1</td>
<td>• Exhibit a strong understanding of grounding and bonding principles and practices</td>
<td>• Show part one of the video series on “Grounding vs. Bonding”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Text- Understanding NEC requirements for Grounding vs. Bonding</td>
<td></td>
<td>• Teach these sections with the presentations if desired</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Grounding vs. Bonding Slides- 1-218</td>
<td></td>
<td>• Discuss topics contained in today’s video section</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Video- Grounding vs. Bonding Part 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Grounding vs. Bonding</td>
<td>• Video                          • Part 1</td>
<td>• Exhibit a strong understanding of grounding and bonding principles and practices</td>
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<td>• Video- Grounding vs. Bonding Part 1</td>
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<td>Grounding vs. Bonding</td>
<td>• Video                          • Part 1</td>
<td>• Exhibit a strong understanding of grounding and bonding principles and practices</td>
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<td></td>
<td>• Video- Grounding vs. Bonding Part 1</td>
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<td>Topic</td>
<td>Text/Resources</td>
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</table>
| 1    | Grounding vs. Bonding • Video  
• Part 2 | • Text- Understanding NEC requirements for Grounding vs. Bonding  
• Grounding vs. Bonding Slides- 1-218  
• Video- Grounding vs. Bonding Part 1 | • Exhibit a strong understanding of grounding and bonding principles and practices | • Show part one of the video series on “Grounding vs. Bonding”  
• Teach these sections with the presentations if desired  
• Discuss topics contained in today’s video section |
| 2    | Grounding vs. Bonding • Video  
• Part 2 | • Text- Understanding NEC requirements for Grounding vs. Bonding  
• Grounding vs. Bonding Slides- 1-218  
• Video- Grounding vs. Bonding Part 1 | • Exhibit a strong understanding of grounding and bonding principles and practices | • Show part one of the video series on “Grounding vs. Bonding”  
• Teach these sections with the presentations if desired  
• Discuss topics contained in today’s video section |
| 3    | Grounding vs. Bonding • Video  
• Part 2 | • Text- Understanding NEC requirements for Grounding vs. Bonding  
• Grounding vs. Bonding Slides- 1-218  
• Video- Grounding vs. Bonding Part 1 | • Exhibit a strong understanding of grounding and bonding principles and practices | • Show part one of the video series on “Grounding vs. Bonding”  
• Teach these sections with the presentations if desired  
• Discuss topics contained in today’s video section |
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<th>Text/Resources</th>
<th>Learning Objectives</th>
<th>Important Focus</th>
</tr>
</thead>
</table>
| Grounding vs. Bonding | • Video  
• Part 3 | • Text- Understanding NEC requirements for Grounding vs. Bonding  
• Grounding vs. Bonding Slides- 219-656  
• Video- Grounding vs. Bonding Part 2 | • Exhibit a strong understanding of grounding and bonding principles and practices | • Show part two of the video series on “Grounding vs. Bonding”  
• Teach these sections with the presentations if desired  
• Discuss topics contained in today’s video section |

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<tr>
<th>Hour 2</th>
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• Part 3 | • Text- Understanding NEC requirements for Grounding vs. Bonding  
• Grounding vs. Bonding Slides- 219-656  
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• Part 3 | • Text- Understanding NEC requirements for Grounding vs. Bonding  
• Grounding vs. Bonding Slides- 219-656  
• Video- Grounding vs. Bonding Part 2 | • Exhibit a strong understanding of grounding and bonding principles and practices | • Show part two of the video series on “Grounding vs. Bonding”  
• Teach these sections with the presentations if desired  
• Discuss topics contained in today’s video section |
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<td>• Exhibit a strong understanding of grounding and bonding principles and practices</td>
<td>• Show part two of the video series on “Grounding vs. Bonding” • Teach these sections with the presentations if desired Discuss topics contained in today’s video section</td>
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<td>Grounding vs. Bonding • Video • Part 4</td>
<td>• Text- Understanding NEC requirements for Grounding vs. Bonding • Grounding vs. Bonding Slides- 219-656 • Video- Grounding vs. Bonding Part 2</td>
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<th>Learning Objectives</th>
<th>Important Focus</th>
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</table>
| 1    | Study Period
• Code Article Report | • All | • Prepare a report for presentation in the following class period | • Use this day for a study period for student to research a Code article for a report |
| 2    | Study Period
• Code Article Report | • All | • Prepare a report for presentation in the following class period | • Use this day for a study period for student to research a Code article for a report |
| 3    | Study Period
• Code Article Report | • All | • Prepare a report for presentation in the following class period | • Use this day for a study period for student to research a Code article for a report |

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<td>Student Presentation</td>
<td>N/A</td>
<td>• Provide a clear summary and application of the Code article selected in the previous class period</td>
<td>• Use this day for students to present a report on their selected Code article</td>
</tr>
<tr>
<td></td>
<td>• Code Article Report</td>
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<td></td>
<td></td>
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<tr>
<td>2</td>
<td>Student Presentation</td>
<td>N/A</td>
<td>• Provide a clear summary and application of the Code article selected in the previous class period</td>
<td>• Use this day for students to present a report on their selected Code article</td>
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<td>• Code Article Report</td>
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<td>• All quarter material used</td>
<td>• N/A</td>
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<td>Hour 2</td>
<td>2nd Quarter</td>
<td>• All quarter material used</td>
<td>• N/A</td>
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<tr>
<td>Hour 3</td>
<td>2nd Quarter</td>
<td>• All quarter material used</td>
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<td><strong>Hour 1</strong></td>
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<td><strong>N/A</strong></td>
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<tr>
<td>2nd Quarter</td>
<td>NEC 2014</td>
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<tr>
<td>• Final Examination</td>
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<td><strong>Hour 2</strong></td>
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<td><strong>Successfully pass the 2nd quarter final exam within the program completion requirements</strong></td>
<td><strong>N/A</strong></td>
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<td></td>
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<td>• Final Examination</td>
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<td><strong>Hour 3</strong></td>
<td></td>
<td><strong>Successfully pass the 2nd quarter final exam within the program completion requirements</strong></td>
<td><strong>N/A</strong></td>
</tr>
<tr>
<td>2nd Quarter</td>
<td>NEC 2014</td>
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<tr>
<td>• Final Examination</td>
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# Year 3 Lesson Plan

<table>
<thead>
<tr>
<th>Hour</th>
<th>Topic</th>
<th>Text/Resources</th>
<th>Learning Objectives</th>
<th>Important Focus</th>
</tr>
</thead>
</table>
| 1    | The National Electrical Code  
• Hazardous (Classified) Locations, Class I, Class II & Class III Locations  
• Articles- 500 – 503 | • Text- Understanding the NEC Volume 2 & The NEC 2014 Pages 13-57  
• PowerPoint- UNEC Vol 2, 500-590 Slides 1-164  
• Video- Special Occupancies Section- Articles- 500 – 503 | • Exhibit adequate skills in classification and recognition of existing occupancies  
• Exhibit adequate skills in equipment selection and installation requirements | • Explain the classification system of hazardous locations  
• Discuss the equipment associated with these locations  
• Define and clarify Class I, II, & III, Division I and II locations  
Cover the wiring and equipment provisions for Class I locations |
| 2    | The National Electrical Code  
• Garages & Fuel Dispensing  
• Articles- 511 & 514 | • Text- Understanding the NEC Volume 2 & The NEC 2014 Pages 59-71  
• PowerPoint- UNEC Vol 2, 500-590 Slides 165-220  
• Video- Special Occupancies Section- Articles- 511-514 | • Exhibit adequate skills in classification and recognition of existing occupancies  
• Exhibit adequate skills in equipment selection and installation requirements | • Cover wiring & equipment within hazardous locations  
• Discuss sealing, special equipment & GFCI-protected receptacles  
• Discuss underground wiring and raceway seals  
• Discuss maintenance and service of dispensing equipment |
| 3    | The National Electrical Code  
• Hazardous (Classified) Locations, Garages, & Fuel Dispensing  
• Articles 500 – 503, 511 & 514 | • Text- Understanding the NEC Vol. 2 & The NEC 2014  
• Review-Articles 500-503, 511 & 514 Pages13-71 | • Take this time to review the portion of Articles 500, 503, 511 & 514 Covered in this class period. | • Take this time to review the portion of Articles 500, 503, 511 & 514 Covered in this class period. |
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<tr>
<td></td>
<td>The National Electrical Code</td>
<td>• Text - Understanding the NEC Volume 2 &amp; The NEC 2014 Pages 73-82</td>
<td>• Recognize requirements for equipment in patient care spaces and the essential electrical systems for hospitals&lt;br&gt;• Recognize and be familiar with the requirements for assembly occupancies</td>
<td>• Explain the general classifications&lt;br&gt;• Discuss wiring methods&lt;br&gt;• Cover grounding in patient care areas&lt;br&gt;• Discuss essential electrical systems for hospitals</td>
</tr>
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<td></td>
<td>• Healthcare Facilities &amp; Assembly Occupancies&lt;br&gt;• Articles - 517 &amp; 518</td>
<td>• PowerPoint - UNEC Vol 2, 500-590 Slides - 221-264&lt;br&gt;• Video - Special Occupancies Section - Articles - 517-518</td>
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<tr>
<td>Hour 2</td>
<td>The National Electrical Code</td>
<td>• Text - Understanding the NEC Volume 2 &amp; The NEC 2014 Pages 95-115</td>
<td>• Determine the minimum feeder necessary for the service&lt;br&gt;• Be familiar with the requirements of temporary installations&lt;br&gt;• Recognize the listing of decorative lighting</td>
<td>• Discuss required electrical equipment for these occupancies&lt;br&gt;• Explain the requirements for services and determination of feeders&lt;br&gt;• Cover the listing of decorative lighting&lt;br&gt;• Cover GFCI protection for personnel</td>
</tr>
<tr>
<td></td>
<td>• Mobile Homes, Manufactured Homes, &amp; Mobile Home Parks, and Temporary Installations&lt;br&gt;• Article - 550 &amp; 590</td>
<td>• PowerPoint - UNEC Vol 2, 500-590 Slides 308-401&lt;br&gt;• Video - Special Occupancies Section - Articles - 550-590</td>
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<tr>
<td>Hour 3</td>
<td>The National Electrical Code</td>
<td>• Text - Understanding the NEC Vol. 2 &amp; The NEC 2014&lt;br&gt;• Review - Articles 517, 518, 550 &amp; 590 Pages 73-82, 95-115</td>
<td>• Take this time to review the portion of Articles 517, 18, 550 &amp; 590 Covered in this class period.</td>
<td>• Take this time to review the portion of Articles 517, 18, 550 &amp; 590 Covered in this class period.</td>
</tr>
<tr>
<td></td>
<td>• Special Occupancies&lt;br&gt;• Articles 517, 518, 550 &amp; 590</td>
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Notes:

- Take this time to review the portion of Articles 517, 18, 550 & 590 Covered in this class period.
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</table>
| 1    | The National Electrical Code  
• Electric Signs & Outline Lighting and Manufactured Wiring Systems  
• Articles- 600 & 604 | • Text- Understanding the NEC Volume 2 & The NEC 2014 Pages 125-137  
• PowerPoint- UNEC Vol 2, 600-680 Slides 1-41  
• Video- Special Equipment Section- Articles- 600 & 604 | • Determine branch-circuit ratings  
• Determine necessary equipment and install such equipment  
• Adequately construct such systems in compliance with the requirements of relevant Code article subsections | • Cover listings, markings, branch-circuit requirements, disconnects, and grounding and bonding for signs  
• Explain construction and securing and supporting for manufactured wiring systems |
| 2    | The National Electrical Code  
• Elevators, Escalators, & Moving Walks  
• Articles- 620 | • Text- Understanding the NEC Volume 2 & The NEC 2014 Pages 139-142  
• PowerPoint- UNEC Vol 2, 600-680 Slides 46-61  
• Video- Special Equipment Section- Articles-620 | • Adequately reference Articles 620  
• Be familiar with provisions and installations of these types of equipment | • Explain the installation and NEC requirements of equipment  
• Cover disconnecting means and control  
• Cover machine rooms, control rooms, machinery spaces, and control spaces |
| 3    | The National Electrical Code  
• Electric Signs & Outline Lighting, Manufactured Wiring Systems, Office Furnishings, and Elevators, Escalators, & Moving Walks  
• Articles 600, 604 & 620 | • Text- Understanding the NEC Vol. 2 & The NEC 2014  
• Review-Articles 600, 604 & 620 Pages 125-142 | • Take this time to review the portion of Articles 600, 604 & 620 Covered in this class period. | • Take this time to review the portion of Articles 600, 604 & 620 Covered in this class period. |
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| 1    | The National Electrical Code  
• Electric Vehicle Charging Systems  
• Article 625 | • Text- Understanding the NEC Volume 2 & The NEC 2014 Pages 145-149  
• PowerPoint- UNEC Vol 2, 600-680 Slides 62-82  
• Video- Special Equipment Section- Articles 625 | • Adequately reference Article 625  
• Be familiar with provisions and installations of this type of equipment | • Cover the scope and definitions of the article  
• Discuss wiring methods  
• Explain and discuss equipment construction  
• Cover control and overcurrent protection  
• Cover provisions for location of equipment |
| 2    | The National Electrical Code  
• Audio Signal Processing, Amplification, & Reproduction Equipment  
• Article 640 | • Text- Understanding the NEC Volume 2 & The NEC 2014 Pages 151-155  
• PowerPoint- UNEC Vol 2, 600-680 Slides 83-103  
• Video- Special Equipment Section- Articles 640 | • Adequately reference Article 640  
• Be familiar with provisions and installations of this type of equipment | • Cover the protection of electrical equipment  
• Explain the mechanical execution of work  
• Cover wiring methods and grounding and bonding  
• Cover permanent audio system installations |
| 3    | The National Electrical Code  
• Information Technology Equipment  
• Article 645 | • Text- Understanding the NEC Volume 2 & The NEC 2014 Pages 157-162  
• PowerPoint- UNEC Vol 2, 600-680 Slides 104- 122  
• Video- Special Equipment Section- Articles 645 | • Adequately reference Article 645  
• Be familiar with provisions and installations of this type of equipment | • Cover the scope and definitions of the article  
• Cover supply circuits and interconnecting cables  
• Explain cables not in IT room  
• Cover disconnecting means provisions  
• Cover EGCs |

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</table>
| 1    | The National Electrical Code  
  • Swimming Pools, Spas, & Hot Tubs  
  • Article- 680 | • Text- Understanding the NEC Volume 2 & The NEC 2014 Pages 164-178  
  • PowerPoint- UNEC Vol 2, 600-680 Slides 123-184  
  • Video- Special Equipment Section- Articles- 680.1 – 680.25 | • Adequately reference Article 680, Parts I and II  
  • Be familiar with provisions and installations of this type of equipment | • Cover cord-and-plug-connected equipment  
  • Cover locations for underground wiring  
  • Cover lighting, receptacles, equipment, and underwater luminaires  
  • Cover feeders |
| 2    | The National Electrical Code  
  • Swimming Pools, Spas, & Hot Tubs  
  • Article- 680 | • Text- Understanding the NEC Volume 2 & The NEC 2014 Pages 164-178  
  • PowerPoint- UNEC Vol 2, 600-680 Slides 123-184  
  • Video- Special Equipment Section- Articles- 680.1 – 680.25 | • Adequately reference Article 680, Parts I and II  
  • Be familiar with provisions and installations of this type of equipment | • Cover cord-and-plug-connected equipment  
  • Cover locations for underground wiring  
  • Cover lighting, receptacles, equipment, and underwater luminaires  
  • Cover feeders |
| 3    | The National Electrical Code  
  • Swimming Pools, Spas, & Hot Tubs  
  • Article- 680 | • Text- Understanding the NEC Vol. 2 & The NEC 2014  
  • Review-Article 680 Pages 164-178 | • Adequately reference Article 680, Parts I and II  
  • Be familiar with provisions of 680.1-680.25 | • Cover equipotential bonding  
  • Cover pumps  
  • Cover GFCI-protected receptacles and receptacle locations |
# Year 3 Lesson Plan

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</table>
|        | The National Electrical Code  
• Swimming Pools, Spas, & Hot Tubs  
• Article- 680 | • Text- Understanding the NEC Volume 2 & The NEC 2014  
Pages 178-181  
• PowerPoint- UNEC Vol 2, 600-680  
Slides 185-211  
• Video- Special Equipment  
Section- Articles- 680.26-680.34 | • Adequately reference Article 680, Parts II, and III  
• Be familiar with provisions and installations of this type of equipment | • Cover equipotential bonding  
• Cover pumps  
• Cover GFCI-protected receptacles and receptacle locations                                                                                      |
| Hour 2 | The National Electrical Code  
• Swimming Pools, Spas, & Hot Tubs  
• Article- 680 | • Text- Understanding the NEC Volume 2 & The NEC 2014  
Pages 178-181  
• PowerPoint- UNEC Vol 2, 600-680  
Slides 185-211  
• Video- Special Equipment  
Section- Articles- 680.26-680.34 | • Adequately reference Article 680, Parts II, and III  
• Be familiar with provisions and installations of this type of equipment | • Cover equipotential bonding  
• Cover pumps  
• Cover GFCI-protected receptacles and receptacle locations                                                                                      |
| Hour 3 | The National Electrical Code  
• Swimming Pools, Spas, & Hot Tubs  
• Article- 680 | • Text- Understanding the NEC Vol. 2 & The NEC 2014  
• Review-Article 680  
Pages 164-188 | • Adequately reference Article 680, Parts I, II, and III  
• Be familiar with provisions and installations of this type of equipment | • Cover equipotential bonding  
• Cover pumps  
• Cover GFCI-protected receptacles and receptacle locations                                                                                      |
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</table>
| 1    | The National Electrical Code  
• Emergency Systems  
• Article-700 | • Text- Understanding the NEC Volume 2 & The NEC 2014  
Pages 205-212  
• PowerPoint- UNEC Vol 2, 700-760 Slides 260-305  
• Video- Special Conditions Section- Articles- 700 | • Adequately reference Article 700  
• Be familiar with provisions and installations of this type of equipment | • Cover the general requirements  
• Cover circuit wiring  
• Cover requirements for sources of power  
• Cover circuits for lighting and power  
• Cover overcurrent protection |
| 2    | The National Electrical Code  
Legally Required Standby Systems & Optional Standby Systems  
Articles- 701 & 702 | • Text- Understanding the NEC Volume 2 & The NEC 2014  
Pages 213-220  
• PowerPoint- UNEC Vol 2, 700-760 Slides 306-352  
• Video- Special Conditions Section- Articles- 701 & 702 | • Adequately reference Articles 701 and 702  
• Be familiar with provisions and installations of these types of equipment | • Cover the general requirements  
• Cover circuit wiring  
• Cover requirements for sources of power  
• Cover overcurrent protection |
| 3    | The National Electrical Code  
• Emergency, and Legally Required & Optional Standby Systems  
• Articles 700, 701, & 702 | • Text- Understanding the NEC Vol. 2 & The NEC 2014  
• Review-Articles 700, 701 &702 Pages  205-220 | • Adequately reference Articles 700, 701 and 702  
• Be familiar with provisions and installations of these types of equipment | • Cover the general requirements  
• Cover circuit wiring  
• Cover requirements for sources of power  
• Cover overcurrent protection |

**Notes**
| Hour 1 | The National Electrical Code  
• Remote-Control, Signaling, & Power-Limited Circuits  
• Articles- 725.1 – 725.51 | • Text- Understanding the NEC Volume 2 & The NEC 2014 Pages 221-229  
• PowerPoint- UNEC Vol 2, 700-760 Slides 1-41  
• Video- Special Conditions Section- Articles- 725.1 – 725.51 | • Adequately reference Article 725, Parts I and II  
• Be familiar with provisions and installations of this type of equipment | • Cover the general requirements  
• Cover class I circuit requirements |
| Hour 2 | The National Electrical Code  
• Remote-Control, Signaling, & Power-Limited Circuits  
• Articles- 725.121 – 725.179 | • Text- Understanding the NEC Volume 2 & The NEC 2014 Pages 229-235  
• PowerPoint- UNEC Vol 2, 700-760 Slides 42-76  
• Video- Special Conditions Section- Articles- 725.121 – 725.179 | • Adequately reference Articles 725, Parts III and IV  
• Be familiar with provisions and installations of this type of equipment | • Cover class II and III circuit requirements  
• Cover listing requirements |
| Hour 3 | The National Electrical Code  
• Remote-Control, Signaling, & Power-Limited Circuits  
• Article 725 | • Text- Understanding the NEC Vol. 2 & The NEC 2014  
• Review-Article 725 Pages 221-235 | • Adequately reference Articles 725, Parts I, II, III and IV  
• Be familiar with provisions and installations of this type of equipment | • Cover the general requirements  
• Cover class I circuit requirements  
• Cover class II and III circuit requirements  
• Cover listing requirements |

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**Class 9**

## Topic

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<th>Hour 1</th>
<th>The National Electrical Code</th>
<th>Text/Resources</th>
<th>Learning Objectives</th>
<th>Important Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Fire Alarm Systems &amp; Communications Circuits</td>
<td>• Text- Understanding the NEC Volume 2 &amp; The NEC 2014 Pages 237-246, 265-280 • PowerPoint- UNEC Vol 2, 700-760 &amp; 800-820 Slides 77-235 • Video- Special Conditions &amp; Communications Systems Section- Articles- 760, 770 &amp; 800</td>
<td>• Adequately reference Article 760, Parts I and II • Adequately reference Article 800 • Be familiar with provisions and installations of these types of equipment</td>
<td>• Cover fire alarm circuits • Cover power limited fire alarm circuits • Cover outside cables and those entering buildings • Cover grounding methods • Cover installation methods within buildings and listing requirements</td>
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</table>

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<tr>
<th>Hour 2</th>
<th>The National Electrical Code</th>
<th>Text/Resources</th>
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<th>Important Focus</th>
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<tbody>
<tr>
<td></td>
<td>• Radio and Television Equipment &amp; Community Antenna, Television (CATV), and Radio Distribution Systems</td>
<td>• Text- Understanding the NEC Volume 2 &amp; The NEC 2014 Pages 281-303 • PowerPoint- UNEC Vol 2, 800-820 Slides 236-333 • Video- Communications Systems Section- Articles- 810 &amp; 820</td>
<td>• Adequately reference Articles 810 and 820 • Be familiar with provisions and installations of this type of equipment</td>
<td>• Cover general requirements • Cover receiving equipment and antenna systems • Cover amateur transmitting and receiving stations • Cover outside coaxial cables and those entering buildings • Cover protection and grounding • Cover installation methods within buildings and listing</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Hour 3</th>
<th>The National Electrical Code</th>
<th>Text/Resources</th>
<th>Learning Objectives</th>
<th>Important Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Fire Alarm Systems &amp; Communications</td>
<td>• Text- Understanding the NEC Vol. 2 &amp; The NEC 2014 • Review-Article 760, 770, 800, 810 &amp; 820</td>
<td>• Adequately reference Articles 760, 800, 810 and 820 • Be familiar with provisions and installations of this type of equipment</td>
<td>• Take this time to review the portion of Articles 760, 800, 810 and 820 Covered in this class period.</td>
</tr>
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## Notes
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<tbody>
<tr>
<td>Hour 1</td>
<td>Solar Training • Part 1 • Articles- 690.1 – 690.4</td>
<td>• Explain how to work safely with solar panels</td>
<td>• Discuss Code rules associated with photovoltaic systems</td>
</tr>
<tr>
<td></td>
<td>• Text- Understanding NEC Requirements for Solar Photovoltaic Systems, &amp; The NEC 2014 Pages 331-338 • Video- Solar Photovoltaic Systems</td>
<td>• Demonstrate proficiency with Code rules pertaining to photovoltaic systems</td>
<td>• Introduce the students to some of the dangers of working with solar panels</td>
</tr>
<tr>
<td>Hour 2</td>
<td>Solar Training • Part 1 • Articles- 690.5 – 690.8</td>
<td>• Explain how to work safely with solar panels</td>
<td>• Discuss Code rules associated with photovoltaic systems</td>
</tr>
<tr>
<td></td>
<td>• Text- Understanding NEC Requirements for Solar Photovoltaic Systems, &amp; The NEC 2014 Pages 339-344 • Video- Solar Photovoltaic Systems</td>
<td>• Demonstrate proficiency with Code rules pertaining to photovoltaic systems</td>
<td>• Introduce the students to some of the dangers of working with solar panels</td>
</tr>
<tr>
<td>Hour 3</td>
<td>Solar Training • Part 1 • Articles- 690.9 – 690.18</td>
<td>• Explain how to work safely with solar panels</td>
<td>• Discuss Code rules associated with photovoltaic systems</td>
</tr>
<tr>
<td></td>
<td>• Text- Understanding NEC Requirements for Solar Photovoltaic Systems, &amp; The NEC 2014 Pages 350-362 • Video- Solar Photovoltaic Systems</td>
<td>• Demonstrate proficiency with Code rules pertaining to photovoltaic systems</td>
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<td>1</td>
<td>Solar Training</td>
<td>• Part 2&lt;br&gt;• Articles- 690.31-690.35&lt;br&gt;• Text- Understanding NEC Requirements for Solar Photovoltaic Systems, &amp; The NEC 2014 Pages 361-368&lt;br&gt;• Video- Solar Photovoltaic Systems</td>
<td>• Explain how to work safely with solar panels&lt;br&gt;• Demonstrate proficiency with Code rules pertaining to photovoltaic systems</td>
<td>• Discuss Code rules associated with photovoltaic systems&lt;br&gt;• Introduce the students to some of the dangers of working with solar panels</td>
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<td>2</td>
<td>Solar Training</td>
<td>• Part 2&lt;br&gt;• Articles- 690.41-690.49&lt;br&gt;• Text- Understanding NEC Requirements for Solar Photovoltaic Systems, &amp; The NEC 2014 Pages 369-377&lt;br&gt;• Video- Solar Photovoltaic Systems</td>
<td>• Explain how to work safely with solar panels&lt;br&gt;• Demonstrate proficiency with Code rules pertaining to photovoltaic systems</td>
<td>• Discuss Code rules associated with photovoltaic systems&lt;br&gt;• Introduce the students to some of the dangers of working with solar panels</td>
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<td>3</td>
<td>Solar Training</td>
<td>• Part 2&lt;br&gt;• Articles- 690.53-690.74&lt;br&gt;• Text- Understanding NEC Requirements for Solar Photovoltaic Systems, &amp; The NEC 2014 Pages 377-382&lt;br&gt;• Video- Solar Photovoltaic Systems</td>
<td>• Explain how to work safely with solar panels&lt;br&gt;• Demonstrate proficiency with Code rules pertaining to photovoltaic systems</td>
<td>• Discuss Code rules associated with photovoltaic systems&lt;br&gt;• Introduce the students to some of the dangers of working with solar panels</td>
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<td>Hour 1</td>
<td>3rd Quarter</td>
<td>• All quarter material used</td>
<td>• N/A</td>
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<tr>
<td></td>
<td>• Review</td>
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<td>• Review all material from the 3rd quarter utilizing unit summaries to prepare students for the quarter final examination • Make sure all of the information that will be on the exam is covered</td>
</tr>
<tr>
<td>Hour 2</td>
<td>3rd Quarter</td>
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<tr>
<td>1</td>
<td>Ch. 1- Units 1 &amp; 2 •Basic Principles of Motor Controls &amp; Definitions, Abbreviations, and Symbols</td>
<td>• Text- Und. Basic Motor Controls Pages 1-19 • PowerPoint- Motor Controls Slides 1-16 • Video- Und. Basic Motor Controls 1 Sections 1.1 – 2.3</td>
<td>• Understand common language, symbols, and abbreviations associated with motors and motor control</td>
<td>• Introduce motor control terminology and cover the basics of motor controls • Identify common abbreviations and terms for devices and discuss common symbols</td>
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<td>2</td>
<td>Ch. 1- Unit 3 •Common Control Equipment, Devices, and Symbols</td>
<td>• Text- Und. Basic Motor Controls Pages 23-37 • PowerPoint- Motor Controls Slides 17-53 • Video- Und. Basic Motor Controls 1 Sections 3.1-3.18</td>
<td>• Identify components and explain their function and operation</td>
<td>• List, define, and explain the operation of common control equipment and devices</td>
</tr>
<tr>
<td>3</td>
<td>Ch. 1- Introduction to Motor Controls •Units 1 – 3 •Review &amp; Quiz</td>
<td>• Text- Und. Basic Motor Controls • Review - Pages 1-37 • Review and Quiz</td>
<td>• Successfully pass the unit quizzes within the program completion requirements</td>
<td>• Take this time to review the chapter using the unit conclusions • Direct students to take the unit quizzes</td>
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**Notes**
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<tr>
<td><strong>Hour 1</strong></td>
<td>Ch. 2- Units 4 &amp; 5  • Components of Control Circuit Schematics &amp; Magnetic Control</td>
<td>• Text- Und. Basic Motor Controls  Pages 45-66  • PowerPoint- Motor Controls Slides- 54-95  • Video- Und. Basic Motor Controls 1  • Sections 4.1-5.6</td>
<td>• List common components of schematics  • Explain the purpose of various components associated with magnetic control</td>
</tr>
<tr>
<td><strong>Hour 2</strong></td>
<td>Ch. 2- Units 6 &amp; 7  • Magnetic Motor Starters &amp; Basic Control Circuits</td>
<td>• Text- Und. Basic Motor Controls  Pages 69-94  • PowerPoint- Motor Controls Slides 96-142  • Video- Und. Basic Motor Controls 1  Sections 6.1-7.5</td>
<td>• Properly wire 2- and 3-wire circuits from schematics</td>
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<tr>
<td><strong>Hour 3</strong></td>
<td>Ch. 2- Unit 8  • Overcurrent Protection for Control Circuits</td>
<td>• Text- Und. Basic Motor Controls  Pages 99-105  • PowerPoint- Motor Controls Slides 143- 152  • Video- Und. Basic Motor Controls 1  Sections 8.1-8.5</td>
<td>• Demonstrate proper protection for control circuits and transformers</td>
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| 1    | Ch. 2- Unit 9  
•Indicator (Pilot) Lights and Illuminated Pushbuttons | • Text- Und. Basic Motor Controls  
Pages 107-114  
• PowerPoint- Motor Controls  
Slides 153-170  
• Video- Und. Basic Motor Controls  
Section 9.1-9.3 | • Identify circuit locations that would likely employ the use of indicator lights | • Introduce indicator lights  
• List common applications where these devices are used  
• Go over illuminated pushbuttons |
| 2    | Ch. 2- Unit 10  
•Selector Switches and Truth Tables | • Text- Und. Basic Motor Controls  
Pages 117-124  
• PowerPoint-Motor Controls  
Slides 171-187  
• Video- Und. Basic Motor Controls  
Sections 10.1-10.4 | • Properly connect a 2- and 3-position selector switch | • Discuss multi-position selector switches and their functions  
• Cover truth tables |
| 3    | Ch. 2- Motor Controls & Schematics  
•Units 4 – 10  
•Review & Quiz | • Text- Und. Basic Motor Controls  
•Review - Pages 107-124  
•Review and Quizzes | • Successfully pass the unit quizzes within the program completion requirements | • Take this time to review the chapter using the unit conclusions  
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<tr>
<td>1</td>
<td>Ch. 3- Unit 11 •Reversing Controls for Three-Phase Motors</td>
<td>• Text- Und. Basic Motor Controls Pages 117-124 • PowerPoint- Motor Controls Slides 188-213 • Video- Und. Basic Motor Controls 2 Sections 11.1-11.3</td>
<td>• Explain the principles on which motors can be reversed in direction</td>
<td>• Introduce the reversing of motors and the components utilized to accomplish it • Discuss interlocking devices</td>
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<td>2</td>
<td>Ch. 3- Unit 11 •Reversing Controls for Three-Phase Motors</td>
<td>• Text- Und. Basic Motor Controls Pages 117-124 • PowerPoint- Motor Controls Slides 188-210 • Video- Und. Basic Motor Controls 2 Sections 11.4-11.7</td>
<td>• Properly wire a reversing starter or explain how it would be accomplished with given components</td>
<td>• Demonstrate several wiring techniques related to reversing</td>
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<tr>
<td>3</td>
<td>Ch. 3- Unit 12 •Reversing Controls with Indicator (Pilot) Lights for Three-Phase Motors</td>
<td>• Text- Und. Basic Motor Controls Pages 117-124 • PowerPoint- Motor Controls Slides 211-214 • Video- Und. Basic Motor Controls 2 Sections 12.1-12.2</td>
<td>• Explain, using a diagram, the connection of pilot lights in the applications covered.</td>
<td>• Cover adding forward and reverse pilot lights • Explain alternate pilot light connection points</td>
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| 1    | Ch. 3- Unit 13  
• Reversing Controls with Limit Switches for Three-Phase Motors | • Text- Und. Basic Motor Controls  
Pages 147-154  
• PowerPoint- Motor Controls  
Slides 215-233  
• Video- Und. Basic Motor Controls  
Sections 13.1-13.4 | • Connect indicator lights to reversing controls | • Cover section pertaining to the use of indicator lights with reversing controls |
| 2    | Ch. 3- Unit 14  
• Reversing Single-Phase Motors | • Text- Und. Basic Motor Controls  
Pages 157-162  
• PowerPoint- Motor Controls  
Slides 234-244  
• Video- Und. Basic Motor Controls  
Sections 14.1-14.3 | • Demonstrate an understanding of reversing single-phase motors | • Explain how to reverse single-phase motors  
• List some common single-phase motor types |
| 3    | Ch. 3- Reversing Controls  
• Review and Quiz | • Text- Und. Basic Motor Controls  
• Review - Pages 147-162  
• Review and Quizzes | • Successfully pass the unit quizzes within the program completion requirements | • Take this time to review the chapter using the unit conclusions  
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| 1    | Ch. 4- Unit 15  
• Sequencing Control | • Text- Und. Basic Motor Controls  
Pages 167-174  
• PowerPoint- Motor Controls  
Slides 245-264  
• Video- Und. Basic Motor Controls 2  
Sections 15.1-15.2 | • Exhibit an understanding of motor sequencing and the related controls | • Cover section on sequencing multiple motors |
| 2    | Ch. 4- Unit 16  
• Master Stop Function | • Text- Und. Basic Motor Controls  
Pages 177-179  
• PowerPoint- Motor Controls  
Slides 265-267  
• Video- Und. Basic Motor Controls 2  
Sections 16.1-16.3 | • Properly configure a circuit utilizing a master stop function | • Cover section on the master stop function |
| 3    | Ch. 4- Controls for Multiple Motors  
• Units 15 & 16  
• Review & Quizzes | • Text- Und. Basic Motor Controls  
• Review - Pages 167-179  
• Review and Quizzes | • Successfully pass the unit quizzes within the program completion requirements | • Take this time to review the chapter using the unit conclusions  
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| 1    | Annex A- Units 17 & 18  
• Motor and Controller Disconnection Means in Schematics & Miscellaneous Motor Control Circuits | • Text- Und. Basic Motor Controls  
Pages 183-193  
• PowerPoint- Motor Control Slides 268- 288  
• Video- Und. Basic Motor Controls  
Sections 17.1-18.3 | • Size, connect, and protect various control circuits using a variety of components | • Cover sections on disconnecting means and also miscellaneous motor control circuits |
| 2    | Annex A- Unit 19 & 20  
• Motor Winding Connections & Miscellaneous Control and Signaling Circuits | • Text- Und. Basic Motor Controls  
Pages 199-211  
• PowerPoint-Motor Controls Slides 289- 309  
• Video- Und. Basic Motor Controls  
Sections 19.1-20.2 | • Demonstrate the ability to properly wire a motor with multiple leads for high- and low-voltage on dual voltage types | • Wrap up the motor controls section with the last units on winding connections and other circuits |
| 3    | Annex A-Miscellaneous Requirements  
• Units 17 – 20 Review & Quizzes | • Text- Und. Basic Motor Controls  
• Review - Pages 183-211  
• Review and Quizzes | • Successfully pass the unit quizzes within the program completion requirements | • Take this time to review Annex A using the unit conclusions  
• Direct students to take the unit quizzes |

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<td>• Familiarize Students with the basics of VSD applications</td>
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| Hour 1 | 4th Quarter • Review | All semester material used | N/A | • Review all material from the 4th quarter utilizing unit summaries to prepare students for the semester final examination  
• Make sure all of the information that will be on the exam is covered |
|---|---|---|---|---|
| Hour 2 | 4th Quarter • Review | All semester material used | N/A | • Review all material from the 4th quarter utilizing unit summaries to prepare students for the semester final examination  
• Make sure all of the information that will be on the exam is covered |
| Hour 3 | 4th Quarter • Review | All semester material used | N/A | • Review all material from the 4th quarter utilizing unit summaries to prepare students for the semester final examination  
• Make sure all of the information that will be on the exam is covered |

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<td>• N/A</td>
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