

McCann Technical High School
Electricity Program Curriculum
Grades 9- 12

**Aligned with the Massachusetts Department of
Education's Vocational Frameworks for Electricity**

**Supported with Curriculum produced by the National
Center for Construction Education and Research
(NCCER)**

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ELECTRICITY COURSE PHILOSOPHY

In the Electrical Department at McCann Technical School and consistent with our school and district philosophy, we believe our goals are to promote continual learning by teaching our trade competencies, by learning in our shop environment and from completing projects in the school and the community.

The McCann Electrical students are familiarized with all aspects of the electrical trade. Our ultimate goal is to prepare students for a career as an electrician, continued education in the electrical field or other opportunities in the electrical profession.

If this is accomplished, the student will be able to be meaningfully employed and enjoy a quality standard of living.

ELECTRICITY PROGRAM DESCRIPTION

The Electricity Program at C.H. McCann Technical High School takes a student from the simple low voltage circuit through Residential, Commercial and Industrial wiring up to and including Complex Motor Control Circuits. All phases of proper wiring methods are taught in both shop and theory classes. Students learn such apparatus and procedures such as motors, generators, controllers, transformers, fire and security alarm circuits, heating systems, programmable logic controllers (PLC) and the proper uses of test equipment.

Throughout the four year program all aspects of safety are taught. All students learn how to use hand and power tools, and all precaution of such use, to prevent self-injury or injury to others.

The Electricity Program, which is a Chapter 74 approved, is broken down into many learning modules that are taught according to the National and Massachusetts Electrical Code Standards. Electrical circuitry is taught by actual "hands on" experiences in wiring, using the many learning modules.

Qualified students are placed in Co-op jobs outside school, if such jobs are available, during junior and senior year. Electricity students also install and maintain most of the McCann Campus electrical projects and do many outside community projects within our District.

This course of study offers students extensive instruction and "hands on" experience in the electrical field. The Commonwealth of Massachusetts credits students with apprenticeship time if he/she enters the field of electricity upon graduation.

Students must be reliable, safety conscious and capable of working in a disciplined environment. This is most important due to the dangers of working with electricity.

The Electrical students upon completing the program have the opportunity to learn a rewarding trade with the potential to earn an excellent income and quality of life. Many of our graduates have also completed college programs in Electrical Technology and Engineering.

Electricity Exploratory Syllabus

The purpose of the Electricity Exploratory Program is to introduce students to the career opportunities available in the electrical profession. The students are informed of the different types of electricians and other aspects of the electrical trade that are available upon completion of the electricity program. In the exploratory program the students will be introduced to electrical drawings, basic wiring methods, electrical hand tool usage, and the wiring of actual electrical projects. General and electrical safety will be taught and incorporated in all activities.

The student will complete two periods of theory per day of exploratory. In theory the student will be introduced to the different resources used in our curriculum including electrical concepts, electrical print reading, math for electricians, and the *Massachusetts Electrical Code*®.

The Electricity Shop shall be an environment where learning can take place. To achieve this each student must feel comfortable among their peers. Any student intentionally disrupting this environment will be disciplined accordingly.

Prior to starting any project, a wiring diagram shall be completed and checked by an instructor, and the project sheet shall be completed in full including name, date, and start time. The job sheet and wiring diagram shall be hung on the student's clipboard in their assigned area.

The electrical trade is primarily an on your feet profession; therefore, students are expected to stand while working on their projects. Tables and seating will be provided for completing wiring diagrams, code questions, and practical problems. Use of the tables in the shop area is by permission only. Any student at a table without permission will be considered off task and not in assigned work area. This student will be disciplined and graded accordingly.

The dress code in the shop shall adhere to all standards in the student handbook as well as the following:

Safety glasses, work boots, work pants, t-shirt/collared shirt, no hanging/loose jewelry. Safety glasses and work boots must be worn at all times while in the shop area. Students not wearing safety glasses while in the shop area will receive an office detention. Pants must be at waist level and belts should be worn if necessary to maintain proper pants level. All shirts shall be tucked in to pants. A pair of safety glasses will be issued for exploratory. It is the responsibility of the student to have and replace their glasses immediately if lost or broken.

Backpacks, pocketbooks, I-pods, MP3 players, and cell phones are not allowed in the shop.

Any student that breaks or destroys another individual's or the school's property intentionally or by misuse will be held responsible for replacement of such item(s).

Each day, students are evaluated on their work as well as their personal effort, preparedness, behavior, attitude, and participation. Each category is given a point value. Students earn a daily score which will be averaged at the end of the exploratory session as their exploratory grade.

Day One:

Students introduce themselves to their peers in the exploratory group and they name an activity or hobby that they enjoy.

Instructor explains what the Electricity Shop is and does. Students explain jobs and tasks that they think electricians perform.

View video: [Build Your Future](#), National Center For Construction Education and Research (NCCER).

Read chapter one (Orientation to the Electrical Trade) of NCCER of Electrical Level One

Complete review questions and trade terms at the end of the chapter.

Explain shop rules and safety practices.

Draw a wiring diagram of a light fixture controlled by a single pole switch.

Introduce the students to the basic electrical tools and materials needed for projects.

Demonstrate the installation of a light fixture controlled by a single pole switch.

Divide the students into groups of two and have them wire a light fixture controlled by a single pole switch.

Day Two:

View video: [Bill Nye Electrical Current](#)

Read chapter one "Before You Begin" from [Electrical Wiring](#) and answer the review questions.

Draw wiring diagrams for lights controlled by a "switch leg" and a light controlled by two switches.

Divide the students into groups of two and have them wire the switch leg and light controlled by two switches projects.

Three Day:

A review of the questions the students completed in the previous two days.

The students are introduced to Ohm's Law and are given a worksheet to complete.

The instructor explains the types of jobs and continuing education available to the students upon completion of the Electricity Program.

Ninth Grade Syllabus

Upon completion of the exploratory program, ninth grade students that have chosen the electricity program continue an introduction to electricity. The students are trained in basic and electrical safety, electrical drawings, and building electrical projects using type NM cable. The students are given a project workbook with multiple jobs starting with NM cable, progressing to MC cable and then electrical metallic tubing (EMT). The students work on projects in these books at their own pace. The projects introduce and reinforce electrical circuitry, skills and Massachusetts Electrical Code requirements. The students are also given demonstrations and training exercises on tasks and skills needed in the electrical profession. Participation in Skills USA competition is incorporated into shop activities.

Related classes introduce direct current (DC) theory, electrical math, and residential wiring. Students' are taught how to use the Massachusetts Electrical Code (MEC) and it is integrated with residential wiring lessons and shop assignments. Reading, writing, and math assignments related to the electrical professions are integrated with academic frameworks during this class.

The Electricity Shop shall be an environment where learning can take place. To achieve this each student must feel comfortable among their peers. Any student intentionally disrupting this environment will be disciplined accordingly.

Prior to starting any project, a wiring diagram shall be completed and checked by an instructor, and the project sheet shall be completed in full including name, date, and start time. The job sheet and wiring diagram shall be hung on the student's clipboard in their assigned area.

The electrical trade is primarily an on your feet profession; therefore, students are expected to stand while working on their projects. Tables and seating will be provided for completing wiring diagrams, code questions, and practical problems. Use of the tables in the shop area is by permission only. Any student at a table without permission will be considered off task and not in assigned work area. This student will be disciplined and graded accordingly.

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Backpacks, pocketbooks, I-pods, MP3 players, and cell phones are not allowed in the shop.

Any student that breaks or destroys another individuals or the schools property intentionally or by misuse will be held responsible for replacement of such item(s).

A notebook is required to be kept by each student. This notebook shall contain all assignments, quizzes, and tests associated with our theory class. The assignments shall be kept in chronological order (first assignment is the first page etc). This notebook will be reviewed and graded periodically.

Related theory class is held for two periods per day during the shop week. The students will be given assignments to be worked on in class; any assignments not completed in class will be assigned as homework. Students will need their notebooks, a pencil, calculator, and all required books. Any student not prepared for class will be given an extra assignment to be completed at home. Students who fail to complete this extra assignment will receive an office detention. All electrical math problems shall have a diagram, electrical formula, substitution, and answer. Any problems not completed in this format will be marked wrong.

Tests and quizzes will be given frequently to evaluate the comprehension and progress of each individual. These evaluations indicate when we as a class move ahead or continue to review the current material. Any individual who is having difficulty or fails a quiz/ test can see me before or after class for extra help. These individuals will be allowed to retake tests/ quizzes during the remainder of the current shop week or the following class week. Student's grades for retake tests will be 80% of the grade received for this test (example a 100 would be counted as an 80). I am normally available from 7:30 to 8:00 am and 2:45 to 3:00 pm or by previous scheduled appointment.

Each day, students are evaluated on their work as well as their personal effort, preparedness, behavior, attitude, and participation. Each category is given a point value. Maximum point values add up to 100 points. Students earn a daily score which will be averaged at the end of the week. This weekly score counts as 70% of the students' shop grade average, with the remaining 30% for related theory.

We have reviewed the syllabus and requirements for the electricity shop.

Student's Name _____

Student's Signature _____

Parent(s) or Guardian(s) Signature _____

Tenth Grade Syllabus

Students in the sophomore year are introduced to intermediate electrical installation skills including wiring of the mock house systems, armored cable (AC), metal-clad cable (MC), electrical metallic tubing (EMT), electrical nonmetallic tubing (ENT), rigid polyvinyl chloride conduit (PVC), and intermediate metal conduit (IMC) wiring methods. Students are exposed to large and small appliance operations and schematics. Students are introduced to relay logic including; general purpose relays and low voltage lighting relays. Electrical and hand tool safety is an integral part of the course. Participation in Skills USA competition is incorporated into shop activities.

Related classes expand on direct current (DC) theory, electrical math, and residential wiring. Students' use of the Massachusetts Electrical Code (MEC) is continued with increased integration with residential wiring lessons and shop assignments. Reading, writing, and math assignments related to the electrical professions are integrated with academic frameworks during this class.

The Electricity Shop shall be an environment where learning can take place. To achieve this each student must feel comfortable among their peers. Any student intentionally disrupting this environment will be disciplined accordingly.

Prior to starting any project, a wiring diagram shall be completed and checked by an instructor, and the project sheet shall be completed in full including name, date, and start time. The job sheet and wiring diagram shall be hung on the student's clipboard in their assigned area.

The electrical trade is primarily an on your feet profession; therefore, students are expected to stand while working on their projects. Tables and seating will be provided for completing wiring diagrams, code questions, and practical problems. Use of the tables in the shop area is by permission only. Any student at a table without permission will be considered off task and not in assigned work area. This student will be disciplined and graded accordingly.

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Related theory class is held for two periods per day during the shop week. The students will be given assignments to be worked on in class; any assignments not completed in class will be assigned as homework. Students will need their notebooks, a pencil, calculator, and all required books. Any student not prepared for class will be given an extra assignment to be completed at home. Students who fail to complete this extra assignment will receive an office detention. All electrical math problems shall have a diagram, electrical formula, substitution, and answer. Any problems not completed in this format will be marked wrong.

Tests and quizzes will be given frequently to evaluate the comprehension and progress of each individual. These evaluations indicate when we as a class move ahead or continue to review the current material. Any individual who is having difficulty or fails a quiz/ test can see me before or after class for extra help. These individuals will be allowed to retake tests/ quizzes during the remainder of the current shop week or the following class week. Student's grades for retake tests will be 80% of the grade received for this test (example a 100 would be counted as an 80). I am normally available from 7:30 to 8:00 am and 2:45 to 3:00 pm or by previous scheduled appointment.

Each day, students are evaluated on their work as well as their personal effort, preparedness, behavior, attitude, and participation. Each category is given a point value. Maximum point values add up to 100 points. Students earn a daily score which will be averaged at the end of the week. This weekly score counts as 70% of the students' shop grade average, with the remaining 30% for related theory.

We have reviewed the syllabus and requirements for the electricity shop.

Student's Name _____

Student's Signature _____

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Eleventh Grade Syllabus

Students in the junior year are introduced to Industrial Motor Controls by the installation and trouble shooting of multiple trainer activities. They also work on wiring the Fire Alarm, Burglar Alarm, Heating Ventilation and Air Conditioning (HVAC) Trainers. They will work on a multiple dissectible Motor Trainer a dissectible Transformer Trainer a three phase Transformer trainer, Gas and Oil furnace trainers and have an introduction to Programmable logic Controllers (PLC). All of the students must read the trainer instruction books and write what project they will be working on before they start the project. Prior to starting any project, a wiring diagram shall be completed and checked by an instructor, and the project sheet shall be completed in full including name, date, and start time. The job sheet and wiring diagram shall be hung by the students' project while working on the project. Electrical and hand tool safety is an integral part of the course. Participation in Skills USA competition is incorporated into shop activities. Juniors are now eligible for the Co-op Program in the last quarter of the marking period. The students continue in-school and out of school electrical projects

Related Theory introduces students to alternating current (AC), electrical math and commercial wiring. Topics covered in Theory class are Load calculations and Branch and Feeder Circuits, Conductor Selection and Calculations, Practical Application of Lighting, Hazardous Locations, Over current Protection, Distribution Equipment, Transformers, Commercial Electrical Services, Motor Calculations, Voice, Data, and video and Motor Controls. Students' use of the Massachusetts Electrical Code (MEC) is continued with increased integration with Commercial wiring lessons and shop assignments. Reading, writing, and math assignments related to the electrical professions are integrated with academic frameworks during this class.

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The electrical trade is primarily an on your feet profession, therefore students are expected to stand while working on their projects. Tables and seating will be provided for completing wiring diagrams, code questions, and practical problems. Use of the tables in the shop area is by permission only. Any student at a table without permission will be considered off task and not in assigned work area. This student will be disciplined and graded accordingly.

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Any student that breaks or destroys another individuals or the schools property intentionally or by misuse will be held responsible for replacement of such item(s).

A notebook is required to be kept by each student. This notebook shall be a 3" binder with six tabbed divisions.

The tabs shall be arranged in the following order:

Shop jobs and wiring diagrams

Code worksheets

Delmar electricity text (purple book)

NCCER Contren Learning Series Electrical Level Three

Mathematics for electrician's text

Miscellaneous (electrical current events, guide sheets, etc.)

The papers in this notebook shall be placed in the correct section with the students name and date on each paper. The papers shall be from front to back in chronological order. These notebooks will be left for grading with the shop instructor during the student's class week.

Related theory class is held for two periods per day during the shop week. The students will be given assignments to be worked on in class. Any assignments not completed in class will be assigned as homework. Students will need their notebooks, a pencil, calculator, and all required books. Any student not prepared for class will be given an extra assignment to be completed at home. Students who fail to complete this extra assignment will receive an office detention. All electrical math problems shall have a diagram, electrical formula, substitution, and answer. Any problems not completed in this format will be marked wrong.

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We have reviewed the syllabus and requirements for the electricity shop.

Student's Name _____

Student's Signature _____

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Twelfth Grade Syllabus

In the 12th grade of the Electricity Program, the students will learn Industrial wiring methods. They will become knowledgeable with Complex Motor Controls, Programmable Logic Controllers, all types of 3 phase equipment, Alarm circuitry and network and telecommunication wiring methods. Student will be exposed to numerous trainers which include HVAC, Oil and Gas heating systems, Climate Controls, Photo-Voltaic Fiber Optics and Burglar Alarm Systems. All seniors will continue doing outside and in-school electrical projects. Students will finalize their portfolio and will also compete in Skills USA. The Co-op program is available all year and could lead to full time employment upon graduation.

All of the students must read the trainer instruction books and write what project they will be working on before they start the project. Prior to starting any project, a wiring diagram shall be completed and checked by an instructor, and the project sheet shall be completed in full including name, date, and start time. The job sheet and wiring diagram shall be hung by the students' project while working on the project. Electrical and hand tool safety is an integral part of the course. Participation in Skills USA competition is incorporated into shop activities.

A major requirement for the 12th grade is the Senior Project.

Purpose: To provide an opportunity for members of the senior class to showcase a culmination of their educational experiences at McCann Technical High School.

Procedure: There are six components to the senior project that must be completed.

Written Research Paper- The research paper will be conducted and supervised by the English Department. It must be a minimum of five pages with three sources (one non-internet).

Shop Product- The final outcome produced by the student in the medium of his or her technical area.

Math Paper- A five paragraph essay showing how Math concepts are related to their Senior Project (or Vocational Area if necessary).

Science Paper- A five paragraph essay showing how Science concepts are related to their Senior Project (or Vocational Area if necessary).

Presentation- An oral presentation given in shop, which includes a PowerPoint segment, and synthesizes their product, their research paper, and the skills they have learned in their time at McCann.

Student Log of Hours- Students must keep a long in their Vocational course of the hours they have worked on their project. This log must also provide documentation that the instructor conducted

two sit-down meetings per quarter with their students for the purposes of checking in and monitoring progress.

Responsibilities: The ownership for the senior project falls upon the English, Math, Science, and Vocational Departments. English teachers are responsible for the research-paper, helping prepare students for their presentations, and providing editing help for their students on their Math and Science papers. Vocational instructors are responsible for the “Product” portion of the project as well as the PowerPoint presentations. Members of the English and Vocational departments are responsible for submitting check-lists at the end of each quarter to monitor student progress. Math and Science teachers are responsible for the execution of their respective five paragraph essays.

Grading:

The final senior project will be graded in four areas. A grade for this project will appear in the English, Math, Science, and Vocational grade books. The English grade will count as a final exam fifth marking period grade. The Vocational grade will also count as a fifth marking period grade. The Math and Science papers will count as two test grades. Assignments may be given over the course of the entire project at the discretion of the teacher to be evaluated as they see fit (i.e. assigning homework as it pertains to their projects.) The final fifth marking period grade will break down as follows.

ENGLISH-

100% Research Paper

VOCATIONAL-

70% Final Product

30% Presentation

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A notebook is required to be kept by each student. This notebook shall be a 3" binder with six tabbed divisions.

The tabs shall be arranged in the following order:

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Code worksheets

Delmar electricity text (purple book)

NCCER Contren Learning Series Electrical Level Four

Mathematics for electrician's text

Miscellaneous (electrical current events, guide sheets, etc.)

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We have reviewed the syllabus and requirements for the electricity shop.

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ELECTRICITY RESOURCES

Massachusetts Electrical Code 2011

National Center for Construction Education and Research (NCCER) Core Curriculum (including safety, communication and employability skills), Electrical Level One, Electrical Level Two, Electrical Level Three, and Electrical Level Four

Standard Text Book of Electricity (Delmar's)

Electrical Wiring Residential (Delmar's) 2005

Electrical Wiring Commercial (Delmar's) 2005

Electrical Wiring Industrial (Delmar's) 2005

Industrial Motor Control (Delmar's)

Mathematics for Electricians (McGraw –Hill Book Co.)

Programmable Logic Controllers (American Technical Publishers)

Photovoltaic Systems (American Technical Publishers)

Trainers for Alarm Circuitry, Motors, Motor Control, Generators, Transformers, Heating systems, HVAC Systems, Solar Voltaic, Wind Turbines and Programmable Logic Controllers.



Level One

MODULE 26101-08 – ORIENTATION TO THE ELECTRICAL TRADE

Task Number	Item	Date(s)	Recorded By
This is a knowledge-based module; there is no performance testing.			

MODULE 26102-08 – ELECTRICAL SAFETY

Task Number	Item	Date(s)	Recorded By
1.	Perform a visual inspection on various types of ladders.		
2.	Set up a ladder properly to perform a task.		
3.	Properly don a harness.		
4.	Perform a hazard assessment of a job such as replacing the lights in your classroom. <ul style="list-style-type: none">• Discuss the work to be performed and the hazards involved.• Locate the closest phone to the work site and ensure that the local emergency telephone numbers are either posted at the phone or known by you and your partner(s).• Plan an escape route from the location in the event of an accident.		

MODULE 26103-08 – INTRODDUCTION TO ELECTRICAL CIRCUITS

Task Number	Item	Date(s)	Recorded By
This is a knowledge-based module; there is no performance testing.			

MODULE 26104-08 – ELECTRICAL THEORY

Task Number	Item	Date(s)	Recorded By
This is a knowledge-based module; there is no performance testing.			

MODULE 26105-08 – INTRODUCTION TO THE *National Electrical Code*®

Task Number	Item	Date(s)	Recorded By
1.	Use <i>NEC Article 90</i> to determine the scope of the <i>NEC</i> ®. State what is covered by the <i>NEC</i> ® and what is not.		
2.	Find the definition of the term <i>feeder</i> in the <i>NEC</i> ®.		
3.	Look up the <i>NEC</i> ® specifications that you would need to follow if you were installing an outlet near a swimming pool.		
4.	Find the minimum wire bending space for two 1/0 AWG conductors installed in a junction box or cabinet and entering opposite the terminal.		

MODULE 26106-08 – DEVICE BOXES

Task Number	Item	Date(s)	Recorded By
1.	Identify the appropriate box type and size for a given application.		
2.	Select the minimum size pull or junction box for the following applications: <ul style="list-style-type: none">• Conduit entering and exiting for a straight pull• Conduit entering and exiting at an angle		

MODULE 26107-08 – HAND BENDING

Task Number	Item	Date(s)	Recorded By
1.	Make 90-degree bends, back-to-back bends, offsets, kicks, and saddle bends using a hand bender.		
2.	Cut, ream, and thread conduit.		

MODULE 26108-08 – RACEWAYS AND FITTINGS

Task Number	Item	Date(s)	Recorded By
1.	Identify and select various types and sizes of raceways, fittings, and fasteners for a given application.		
2.	Demonstrate how to install a flexible raceway system.		
3.	Terminate a selected raceway system.		
4.	Identify the appropriate conduit body for a given application.		

MODULE 26109-08 – CONDUCTORS AND CABLES

Task Number	Item	Date(s)	Recorded By
1.	Install conductors in a raceway system.		

MODULE 26110-08 – BASIC ELECTRICAL CONSTRUCTION DRAWINGS

Task Number	Item	Date(s)	Recorded By
1.	Using an architect's scale, state the actual dimensions of a given drawing component.		
2.	Make a material takeoff of the lighting fixtures specified in Performance Profile Sheet 2 using the drawing provided on Performance Profile Sheet 3. The takeoff requires that all lighting fixtures be counted, and where applicable, the total number of lamps for each fixture type must be calculated.		

Answer:

Lighting Fixture Type	Manufacturer and Catalog Number	Number and Type of Lamps	Total Number of Fixtures	Total Number of Lamps for Fixture Type
FA	Lithonia LB 440	4-F40CS	59	236
FB	Lithonia LB 240	2-F20U	13	26
FC	Lithonia LP/RFB-3	INCL.	13	N/A
A	Hitek TWP 150	1-450HPS	4	4
EX	Lithonia XSIG-EL	INCL.	5	N/A
EM	Lithonia ELU-2	INCL.	2	N/A

MODULE 26111-08 – RESIDENTIAL ELECTRICAL SERVICES

Task Number	Item	Date(s)	Recorded By
1.	For a residential dwelling of a given size, and equipped with a given list of major appliances, demonstrate or explain how to: <ul style="list-style-type: none">• Compute the lighting, small appliance, and laundry loads.• Compute the loads for large appliances.• Determine the number of branch circuits required.• Size and select the service-entrance equipment (conductors, panelboard, and protective devices).		
2.	Using an unlabeled diagram of a panelboard (Performance Profile Sheet 3), label the lettered components.		
3.	Select the proper type and size outlet box needed for a given set of wiring conditions.		

MODULE 26112-08 – ELECTRICAL TEST EQUIPMENT

Task Number	Item	Date(s)	Recorded By
1.	Under instructor supervision, measure the voltage in your classroom from line to neutral and neutral to ground.		
2.	Under instructor supervision, use an ohmmeter to measure the value of various resistors.		

Level Two

MODULE 26201-08 – ALTERNATING CURRENT

Task Number	Item	Date(s)	Recorded By
This is a knowledge-based module; there is no performance testing.			

MODULE 26202-08 – MOTORS: THEORY AND APPLICATION

Task Number	Item	Date(s)	Recorded By
1	Collect data from a motor nameplate.		
2	Identify various types of motors and their application(s).		
3	Connect the terminals for a dual-voltage motor.		

MODULE 26203-08 – ELECTRIC LIGHTING

Task Number	Item	Date(s)	Recorded By
1	Read and interpret information given in lamp manufacturers' catalogs for one or more selected lamps.		
2	Properly select and install lamps into lighting fixtures.		
3	Install one or more of the following lighting fixtures and their associated lamps: <ul style="list-style-type: none">• Surface-mounted• Recessed• Suspended• Track-mounted		

MODULE 26204-08 – CONDUIT BENDING

Task Number	Item	Date(s)	Recorded By
1	Use an electric or hydraulic bender to bend a conduit stub-up to an exact distance of 15 1/4" above the deck.		
2	Make an offset in a length of conduit to miss a 10" high obstruction with a clearance between the obstruction and the conduit of not less than 1" nor more than 1 1/2".		
3	Make a saddle in a length of conduit to cross an 8" pipe with 1" clearance between the pipe and the conduit.		

MODULE 26205-08 – PULL AND JUNCTION BOXES

Task Number	Item	Date(s)	Recorded By
1	Identify various NEMA boxes.		
2	Properly select, install, and support pull and junction boxes over 100 cubic inches in size.		
3	Identify various conduit bodies and fittings.		

MODULE 26206-08 – CONDUCTOR INSTALLATIONS

Task Number	Item	Date(s)	Recorded By
1	Prepare multiple conductors for pulling in a raceway system.		
2	Prepare multiple conductors for pulling using a wire-pulling basket.		

MODULE 26207-05 – CABLE TRAY

Task Number	Item	Date(s)	Recorded By
1	Prepare a list of materials for a cable tray layout. List all the components required, including the fasteners required to complete the system.		
2	Join two straight, ladder-type cable tray sections together.		

MODULE 26208-08 – CONDUCTOR TERMINATIONS AND SPLICES

Task Number	Item	Date(s)	Recorded By
1	Terminate conductors using selected crimp-type and mechanical-type terminals and connectors.		
2	Terminate conductors on a terminal strip.		
3	Insulate selected types of wire splices and/or install a motor connection kit.		

MODULE 26209-08 – GROUNDING AND BONDING

Task Number	Item	Date(s)	Recorded By
1	Using the proper fittings, connect one end of a No. 4 AWG bare copper grounding wire to a length of ¾" galvanized water pipe and the other end to the correct terminal in a main panelboard.		
2	Install two lengths of Type NM cable in a switch box using Type NM cable clamps: <ul style="list-style-type: none">• Strip the ends of the cable to conform with NEC® requirements.• Secure the cable in the switch box and tighten the cable clamps.• Connect and secure the equipment grounding conductors according to NEC® requirements, and secure to the switch box with either a ground clip or a grounding screw.		
3	Size the minimum required grounding electrode conductor for a 200A service fed by 3/0 copper.		
4	Size the minimum required equipment grounding conductor in each conduit for a 400A feeder tap using two parallel runs of 3/0 copper.		
5	Size the minimum required bonding jumper for a copper water pipe near a separately derived system (transformer) where the secondary conductors are 500 kcmil copper.		

MODULE 26210-08 – CIRCUIT BREAKERS AND FUSES

Task Number	Item	Date(s)	Recorded By
1	Identify the following on one or more circuit breaker(s) and fuse(s): <ul style="list-style-type: none">• Number of poles• Load rating• Voltage rating• Amperage interrupting rating		

MODULE 26211-08 – CONTROL SYSTEMS AND FUNDAMENTAL CONCEPTS

Task Number	Item	Date(s)	Recorded By
1	Mount and connect a 120V lighting contactor with a three-wire pushbutton control.		

Level Three

MODULE 26301-08 – LOAD CALCULATIONS — BRANCH AND FEEDER CIRCUITS

Task Number	Item	Date(s)	Recorded By
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This is a knowledge-based module; there is no performance testing.

MODULE 26302-08 – CONDUCTOR SELECTION AND CALCULATIONS

Task Number	Item	Date(s)	Recorded By
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This is a knowledge-based module; there is no performance testing.

MODULE 26303-08 – PRACTICAL APPLICATIONS OF LIGHTING

Task Number	Item	Date(s)	Recorded By
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1. Using manufacturers' catalogs, select the appropriate lighting fixtures for specific lighting situations.
2. While touring selected structures to observe their lighting systems:
 - Identify the various types of lighting fixtures used.
 - Explain the specific purpose(s) served by the different fixtures.
 - Identify the lighting system class of service.

MODULE 26304-08 – HAZARDOUS LOCATIONS

Task Number	Item	Date(s)	Recorded By
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1. Using two rigid metal conduit nipples, a sealing fitting, three pieces of No. 12 THHN conductors, and a packing fiber/sealing kit, perform the following operations:
 - Secure one conduit nipple in each end of the seal.
 - Make sure the required number of threads are engaged.
 - Pull the three THHN conductors through the nipples and seal so that about 6" is protruding from each nipple.
 - Pack the fiber following the instructions furnished with the sealing kit.
 - Mix the sealing compound.
 - Position the unit in the required location and pour in the sealing compound.

MODULE 26305-08 – OVERCURRENT PROTECTION

Task Number	Item	Date(s)	Recorded By
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This is a knowledge-based module; there is no performance testing.

MODULE 26306-08 – DISTRIBUTION EQUIPMENT

Task Number	Item	Date(s)	Recorded By
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This is a knowledge-based module; there is no performance testing.

MODULE 26307-08 – TRANSFORMERS

Task Number	Item	Date(s)	Recorded By
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This is a knowledge-based module; there is no performance testing.

MODULE 26308-08 – COMMERCIAL ELECTRICAL SERVICES

Task Number	Item	Date(s)	Recorded By
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This is a knowledge-based module; there is no performance testing.

MODULE 26309-08 – MOTOR CALCULATIONS

Task Number	Item	Date(s)	Recorded By
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This is a knowledge-based module; there is no performance testing.

MODULE 26310-08 – VOICE, DATA, AND VIDEO

Task Number	Item	Date(s)	Recorded By
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This is a knowledge-based module; there is no performance testing.

MODULE 26311-08 – MOTOR CONTROLS

Task Number	Item	Date(s)	Recorded By
1.	Make all connections for a magnetic motor controller, controlled by two pushbutton stations, including the connections for holding the circuit interlock.		

Level Four

MODULE 26401-08 – LOAD CALCULATIONS–FEEDERS AND SERVICES

Task Number	Item	Date(s)	Recorded By
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This is a knowledge-based module; there is no performance testing.

MODULE 26402-08 – Health Care Facilities

Task Number	Item	Date(s)	Recorded By
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This is a knowledge-based module; there is no performance testing.

MODULE 26403-08 – STANDBY AND EMERGENCY SYSTEMS

Task Number	Item	Date(s)	Recorded By
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This is a knowledge-based module; there is no performance testing.

MODULE 26404-08 – BASIC ELECTRONIC THEORY

Task Number	Item	Date(s)	Recorded By
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1	Test a transistor to determine whether it is an NPN or PNP.		
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2	Identify the cathode on three different styles of SCRs, using the shape or markings for identification.		
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MODULE 26405-08 – FIRE ALARM SYSTEMS

Task Number	Item	Date(s)	Recorded By
1	Connect selected fire alarm system(s).		

MODULE 26406-08 – SPECIALTY TRANSFORMERS

Task Number	Item	Date(s)	Recorded By
1	Identify various specialty transformers.		
2	Using a clamp-on ammeter, demonstrate the principles of a current transformer. Identify the primary winding, then calculate and measure the effects of increasing the number of turns (loops) in the primary winding.		
3	Connect a buck-and-boost transformer to a single-phase circuit so that it will first be in the boost mode, and then in the buck mode. Record the voltage increase and decrease for each configuration.		

MODULE 26407-08 – ADVANCED CONTROLS

Task Number	Item	Date(s)	Recorded By
1	Identify and connect various control devices.		

MODULE 26408-08 – HVAC CONTROLS

Task Number	Item	Date(s)	Recorded By
1	Identify various types of thermostats and explain their operation and uses.		
2	Install a conventional 24V bimetal thermostat and hook it up using the standard coding system for thermostat wiring.		
3	Check and adjust a thermostat, including the heat anticipator setting and indicator adjustment.		

MODULE 26409-08 – HEAT TRACING AND FREEZE PROTECTION

Task Number	Item	Date(s)	Recorded By
1	Prepare and connect heat tracing cable in a power connection box or splice box.		

MODULE 26410-08 – MOTOR OPERATION AND MAINTENANCE

Task Number	Item	Date(s)	Recorded By
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This is a knowledge-based module; there is no performance testing.

MODULE 26411-08 – MEDIUM-VOLTAGE TERMINATION/SPLICES

Task Number	Item	Date(s)	Recorded By
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1	Prepare a cable and complete a splice or stress cone.		
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MODULE 26412-08 – SPECIAL LOCATIONS

Task Number	Item	Date(s)	Recorded By
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This is a knowledge-based module; there is no performance testing.

MODULE 26413-08 – INTRODUCTORY SKILLS FOR THE CREWLEADER

Task Number	Item	Date(s)	Recorded By
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This is a knowledge-based module; there is no performance testing.
