



Scope and Sequence Curriculum Outline

Career Program: Electricity II

DOE Code: 4832

Career Cluster: Architecture and Construction

Recommended Grade Levels: 12

Prerequisites: Electricity I

High School Credits: 3 per semester (6 total per school year)

Additional Information: Counts as a Directed Elective or Elective for the General, Core 40, Academic Honors and Technical Honors diplomas

Program Description: Electricity II includes classroom and laboratory experiences in residential wiring, including electrical service, metering equipment, lighting, switches, outlets and other common components and methods of installation and maintenance of the residential wiring system in accordance with the current National Electrical Code. Additionally, students will learn methods and techniques for troubleshooting appliances, motors, motor controls, relay wiring, commercial wiring, and industrial wiring systems. Wiring methods, material selection for commercial and industrial wiring systems, mechanical installation of hardware, and electrical design and layout are also covered. Instruction in thinking critically to analyze, synthesize, and evaluate technical problems and information will also be covered as it relates to health, safety, and welfare standards and codes as dictated by local, state or federal agencies. Upon completion of this program, students continue their education in 2 and 4-year degree programs at the postsecondary level or enter employment in one of the many construction fields. Students also enter apprenticeship programs for specific construction/electrical trades.

Alignment: Indiana Department of Education Academic Standards Course Framework; National Center for Construction Education and Research (NCCER) Core Curriculum; NCCER Electrical II Curriculum; Ivy Tech Community College (dual credit agreement); NCCER textbook materials

Companion Documents: WCC Electricity II Program Syllabus; WCC High School Pathway Plan; WCC Program Description Guide

Curriculum Content Summary:

- Residential Wiring
- Electrical Troubleshooting Techniques
- Commercial / Industrial Wiring
- Basic Employability / Orientation to the Trade

Content	Indiana DOE Standards	Knowledge & Skills <i>(Based on NCCER)</i>	Example Activities	Time Frame	Evaluation / Certification
<p>DOMAIN Residential Wiring</p> <p>Core Standard I Students apply and adapt wiring concepts in residential electrical projects to ensure compliance with National Electrical Code</p>	<p>ETII-1.1 Select wire and devices according to code</p> <p>ETII-1.2 Design and install typical service entrance</p> <p>ETII-1.3 Draw a wiring diagram based on a set of blueprints, specifications and code requirements</p> <p>ETII-1.4 Apply critical thinking skills to technical problems and information</p> <p>ETII-1.5 Identify and interpret health, safety, and welfare standards as dictated by local, state or federal agencies</p>	<p>NCCER Electrical II – Module 3</p> <ul style="list-style-type: none"> • Properly select and install lamps into lighting fixtures • Install lighting fixtures and their associated lamps, including surface-mounted, recessed, suspended, and track-mounted <p>NCCER Electrical II – Module 5</p> <ul style="list-style-type: none"> • Identify various NEMA boxes • Properly select, install, and support pull and junction boxes • Identify various conduit bodies and fittings <p>NCCER Electrical II – Module 6</p> <ul style="list-style-type: none"> • Prepare multiple conductors for fulling in a raceway system • Prepare multiple conductors for pulling using a wire-pulling basket <p>NCCER Electrical II – Module 8</p> <ul style="list-style-type: none"> • Terminate conductors using selected crimp-type and mechanical-type terminals and connectors • Terminate conductors on a terminal strip • Insulate selected types of wire splices and/or install a motor connection kit <p>NCCER Electrical II – Module 9</p> <ul style="list-style-type: none"> • Size the minimum required grounding electrode conductor for a 200A service fed by 3/0 copper • Using the proper fittings, connect one end of a No. 4 AWG bare copper grounding wire to a length of ¾" (MD 21) galvanized water pipe and the other end to the correct terminal in a main panelboard • Install two lengths of Type NM cable in a switch box using Type NM cable clamps • Size the minimum required equipment grounding conductor in each conduit for a 400A feeder gap using two parallel runs of 3/0 copper • 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 <p>NCCER Electrical II – Module 10</p> <ul style="list-style-type: none"> • Identify number of poles, load rating, voltage rating, and amperage interrupting rating on one or more circuit breaker(s) and fuse(s) 	<ul style="list-style-type: none"> • Perform various work related jobs on and around our campus • Perform various work related jobs on and around our campus • Perform various work related jobs on and around our campus • Perform various work related jobs on and around our campus • Wiring in the lab • Perform various work related jobs on and around our campus • Wiring in the lab • Perform various work related jobs on and around our campus • Wiring in the lab 	<p>9 weeks</p> <p>Reinforced throughout the year</p>	<ul style="list-style-type: none"> • Performance/project assessments • Weekly participation/lab work • Dual credit

Content	Indiana DOE Standards	Knowledge & Skills <i>(Based on NCCER)</i>	Example Activities	Time Frame	Evaluation / Certification
<p>DOMAIN Electrical Troubleshooting Techniques</p> <p>Core Standard 2 Students employ wiring concepts to solve electrical problems in generators and alternators</p>	<p>ETII-2.1 Explain operating principles of DC generators</p> <p>ETII-2.2 Examine single phase AC generation principles</p> <p>ETII-2.3 Examine physical and electrical characteristics of three phase alternators</p> <p>ETII-2.4 Perform wiring procedures for alternators</p>	<p>NCCER Electrical II – Module 1</p> <ul style="list-style-type: none"> • Identify AC waveforms • Determine unknown values in AC circuits • Make power calculations in AC circuits, including true power, apparent power, reactive power, power factor, and unknown values • Identify transformers and explain how they operate <p>NCCER Electrical II – Module 2</p> <ul style="list-style-type: none"> • Identify various types of motors and their application(s) • Collect data from a motor nameplate • Connect the terminals for a dual-voltage motor 	<ul style="list-style-type: none"> • Perform various work related jobs on and around our campus <ul style="list-style-type: none"> • Perform various work related jobs on and around our campus • Lab work in Precision Machining 	<p>9 weeks</p> <p>Reinforced throughout the year</p>	<ul style="list-style-type: none"> • Performance/project assessments • Weekly participation/lab work • Dual credit

Content	Indiana DOE Standards	Knowledge & Skills <i>(Based on NCCER)</i>	Example Activities	Time Frame	Evaluation / Certification
<p>DOMAIN Electrical Troubleshooting Techniques</p> <p>Core Standard 3 Students apply wiring concepts to solve electrical problems in transformers</p>	<p>ETII-3.1 Examine basic principles of transformers</p> <p>ETII-3.2 Examine single phase transformers connected in Delta</p> <p>ETII-3.3 Explain Wye and Delta connections of single phase transformers</p> <p>ETII-3.4 Install instrument transformers</p> <p>ETII-3.5 Examine the role of three phase transformers</p> <p>ETII-3.6 Understand National electrical code requirements for transformers installations</p>	<p>NCCER Electrical II – Module 1</p> <ul style="list-style-type: none"> • Identify AC waveforms • Determine unknown values in AC circuits • Make power calculations in AC circuits, including true power, apparent power, reactive power, power factor, and unknown values • Identify transformers and explain how they operate <p>NCCER Electrical II – Module 2</p> <ul style="list-style-type: none"> • Identify various types of motors and their application(s) • Collect data from a motor nameplate • Connect the terminals for a dual-voltage motor 	<ul style="list-style-type: none"> • Perform various work related jobs on and around our campus • Perform various work related jobs on and around our campus • Lab work in Precision Machining 	<p>9 weeks</p> <p>Reinforced throughout the year</p>	<ul style="list-style-type: none"> • Performance/project assessments • Weekly participation/lab work • Dual credit

Content	Indiana DOE Standards	Knowledge & Skills <i>(Based on NCCER)</i>	Example Activities	Time Frame	Evaluation / Certification
<p>DOMAIN Commercial / Industrial Wiring</p> <p>Core Standard 4 Students apply and adapt wiring processes to all commercial / industrial electrical projects to ensure compliance with the National Electrical Code</p>	<p>ETII-4.1 Read blueprints, interpret drawings, understand specifications, and the NEC when installing an industrial wiring system</p> <p>ETII-4.2 Install, service, and repair electrical circuits and controllers in the industrial setting</p> <p>ETII-4.3 Size conductors for each application</p> <p>ETII-4.4 Identify proper machine hook-up from plans</p> <p>ETII-4.5 Install commercial light fixtures</p> <p>ETII-4.6 Provide protection for wiring in industrial work areas</p> <p>ETII-4.7 Identify safety problems in the industrial areas</p> <p>ETII-4.8 List hardware needed</p> <p>ETII-4.9 Select tools needed for each job</p>	<p>NCCER Electrical II – Module 1</p> <ul style="list-style-type: none"> Identify AC waveforms Determine unknown values in AC circuits Make power calculations in AC circuits, including true power, apparent power, reactive power, power factor, and unknown values Identify transformers and explain how they operate <p>NCCER Electrical II – Module 2</p> <ul style="list-style-type: none"> Identify various types of motors and their application(s) Collect data from a motor nameplate Connect the terminals for a dual-voltage motor <p>NCCER Electrical II – Module 3</p> <ul style="list-style-type: none"> Properly select and install lamps into lighting fixtures Install lighting fixtures and their associated lamps, including surface-mounted, recessed, suspended, and track-mounted <p>NCCER Electrical II – Module 4</p> <ul style="list-style-type: none"> Use an electrical or hydraulic bender to bend a stub-up to a precise distance above the deck Make an offset in a length of conduit to clear an obstruction with 1" clearance between the pipe and the obstruction Make a saddle in a length of conduit to cross a pipe with 1" clearance between the pipe and the conduit <p>NCCER Electrical II – Module 5</p> <ul style="list-style-type: none"> Identify various NEMA boxes Properly select, install, and support pull and junction boxes Identify various conduit bodies and fittings <p>NCCER Electrical II – Module 6</p> <ul style="list-style-type: none"> Prepare multiple conductors for fulling in a raceway system Prepare multiple conductors for pulling using a wire-pulling basket <p>NCCER Electrical II – Module 7</p> <ul style="list-style-type: none"> Generate a list of materials for a cable tray layout, including the fasteners to complete the system Join two straight, ladder-type cable tray sections together 	<ul style="list-style-type: none"> Perform various work related jobs on and around our campus Perform various work related jobs on and around our campus. Lab work in Precision Machining Perform various work related jobs on and around our campus Perform various work related jobs on and around our campus Conduit Banding Lab in the shop Perform various work related jobs on and around our campus Wiring in the lab Perform various work related jobs on and around our campus Perform various work related jobs on and around our campus 	<p>9 weeks</p> <p>Reinforced throughout the year</p>	<ul style="list-style-type: none"> Performance/project assessments Weekly participation/lab work Dual credit

Content	Indiana DOE Standards	Knowledge & Skills <i>(Based on NCCER)</i>	Example Activities	Time Frame	Evaluation / Certification
<p>DOMAIN Commercial / Industrial Wiring</p> <p>Core Standard 4 Students apply and adapt wiring processes to all commercial / industrial electrical projects to ensure compliance with the National Electrical Code</p> <p style="text-align: center;">- Continued -</p>		<p>NCCER Electrical II – Module 8</p> <ul style="list-style-type: none"> • Terminate conductors using selected crimp-type and mechanical-type terminals and connectors • Terminate conductors on a terminal strip • Insulate selected types of wire splices and/or install a motor connection kit <p>NCCER Electrical II – Module 9</p> <ul style="list-style-type: none"> • Size the minimum required grounding electrode conductor for a 200A service fed by 3/0 copper • Using the proper fittings, connect one end of a No. 4 AWG bare copper grounding wire to a length of ¾" (MD 21) galvanized water pipe and the other end to the correct terminal in a main panelboard • Install two lengths of Type NM cable in a switch box using Type NM cable clamps • Size the minimum required equipment grounding conductor in each conduit for a 400A feeder gap using two parallel runs of 3/0 copper • 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 <p>NCCER Electrical II – Module 10</p> <ul style="list-style-type: none"> • Identify number of poles, load rating, voltage rating, and amperage interrupting rating on one or more circuit breaker(s) and fuse(s) <p>NCCER Electrical II – Module 11</p> <ul style="list-style-type: none"> • Mount and connect a 120V lighting contactor with a three-wire pushbutton control 	<ul style="list-style-type: none"> • Perform various work related jobs on and around our campus • Perform various work related jobs on and around our campus • Wiring in the lab • Perform various work related jobs on and around our campus • Perform various work related jobs on and around our campus • Wiring in the lab 		

Additional content from Electricity I reinforced in Electricity II

Content	Indiana DOE Standards	Knowledge & Skills <i>(Based on NCCER)</i>	Example Activities	Time Frame	Evaluation / Certification
<p>DOMAIN Basic Employability / Orientation to the Trade</p> <p>Students apply employability skills and understand the construction / electrical trades in order to gain employment</p>	<p>No corresponding standards</p>	<p>NCCER Core – Module 8</p> <ul style="list-style-type: none"> Describe the opportunities in the construction business and how to enter the construction workforce Explain the importance of critical thinking and how to solve problems Explain the importance of social skills and identify ways good social skills are applied in the construction trade <p>NCCER Core – Module 7</p> <ul style="list-style-type: none"> Describe the communication, listening, and speaking processes and their relationship to job performance Describe good reading and writing skills and their relationship to job performance Perform a given task after listening to oral instructions Fill out a work-related form Read and interpret a set of instructions for properly performing a task, and orally instruct another person to perform the task <p>NCCER Electrical 1 – Module 1</p> <ul style="list-style-type: none"> Describe the apprenticeship/training process for electricians Describe various career paths/opportunities one might follow in the electrical trade Define the various sectors of the electrical industry State the tasks typically performed by an electrician Explain the responsibilities and aptitudes of an electrician 	<ul style="list-style-type: none"> Construction Career Field Day Mock interviews Resume writing Job searches in the computer lab Apprenticeship training worksheets and essay Student ambassadors SkillsUSA membership Skills competitions NTHS Guest speakers 	<p>Reinforced throughout the year</p>	<ul style="list-style-type: none"> Essential Skills Evaluation Technical Skills Evaluation Work Ethic Certification Weekly participation Classroom work