

DESE Model Curriculum

GRADE LEVEL/UNIT TITLE: 9-12 / Electrical — Basic Theory and Practice

Course Code: CONSTRUCTION

COURSE INTRODUCTION: Electrical

This course is designed to introduce students to the workings of electricity and the electrical trade. Topics covered include electrical theory and regulations, residential services and testing, electrical system elements, and electrical system design. Safety is stressed throughout the course.

Units in this course include:

1. Basic Theory and Practice
2. System Elements
3. System Design

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<p>UNIT DESCRIPTION: Basic Theory and Practice These lessons are designed to give the electrical student a good background in electrical theory and regulations, as well as exposure to standard practices for residential services and testing.</p>	<p>SUGGESTED UNIT TIMELINE: 3 lessons Lesson 1: Theory Lesson 2: Regulations Lesson 3: Services Lesson 4: Testing CLASS PERIOD (min.): 90 minutes</p>					
<p>ESSENTIAL QUESTIONS:</p> <ol style="list-style-type: none"> 1. What principles govern the operation of electricity? 2. How can electricity be controlled and used safely? 3. Why is the National Electrical Code® (NEC®) important? 4. How is the NEC® used? 5. How are electrical systems planned for residences? 6. How is electrical safety provided for in residential electrical systems? 7. Why are electrical test devices used? 8. How are electrical test devices selected and operated? 						
<p>ESSENTIAL MEASURABLE LEARNING OBJECTIVES CCSS LEARNING GOALS (Anchor Standards/Clusters) CROSSWALK TO STANDARDS</p>						
<p>1. Students will describe the principles of electricity and how it is used in residences.</p>				RST 11-12.9 SL 9-10.4 SL 9-10.5 SL 9-10.6 SL 11-12.4 SL 11-12.5 SL 11-12.6 L 9-10.1 L 9-10.6 L 11-12.1 L 11-12.6	26103-08 26104-08	Level 1
<p>2. Students will use Ohm’s Law to calculate unknown parameters in a variety of circuits.</p>				N-RN 3 N-Q 1	26103-08 26104-08	Level 1

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				A-SSE 1 A-SSE 3 A-CED 4 L 9-10.1 L 9-10.2 L 11-12.1 L 11-12.2		
3. Students will explain the history and importance of the National Electrical Code® (NEC®).				L 9-10.1 L 9-10.6 L 11-12.1 L 11-12.6 SL 9-10.1 SL 9-10.6 SL 11-12.1 SL 11-12.6	26105-08	Level 1
4. Students will demonstrate the ability to navigate and use the NEC®.				RI 11-12.1 RI 11-12.3 RI 11-12.7 RST 9-10.1 RST 11-12.1 L 9-10.1 L 9-10.2 L 11-12.1 L 11-12.2	26105-08	Level 1
5. Students will determine electric service requirements (including grounding, bonding, and service-entrance requirements).				N-RN 3 N-Q 1 A-SSE 1 RI 11-12.1 RI 11-12.3 RI 11-12.7 RST 9-10.1 RST 11-12.1	26111-08 26209-08	Level 1
6. Students will select wiring methods and devices				L 9-10.1	26111-08	Level 1

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appropriate for a variety of residential electrical situations.				L 9-10.2 L 11-12.1 L 11-12.2		
7. Students will demonstrate their abilities to select and use appropriate electrical test equipment for given situations.				WHST 9-10.2 WHST 9-10.4 WHST 9-10.10 WHST 11-12.2 WHST 9-10.4 WHST 9-10.10 L 9-10.1 L 9-10.2 L 9-10.4 L 9-10.6 L 11-12.1 L 11-12.2 L 11-12.4 L 11-12.6 RST 9-10.7 RST 11-12.7 RST 11-12.9	26112-08	Level 1
<p>ASSESSMENT DESCRIPTIONS*: (Write a brief overview here. Identify Formative/Summative. Actual assessments will be accessed by a link to PDF file or Word doc.)</p> <p>Students will demonstrate their understanding of content and ability to apply learned skills by:</p> <ul style="list-style-type: none"> • Demonstrating (with sample materials or a simulation program) ways to set up series, parallel, and combination circuits (Formative) • Completing a worksheet regarding Ohm’s Law calculations (Formative) • Participating in classroom discussions regarding the NEC® (Formative) • Locating and translating sections of the NEC® in response to a prompt (Summative) • Completing electrical load calculations for a simple residence (Formative) • Creating electrical drawings for a simple residence (Summative) • Writing handbook entries for electrical test equipment (Summative) <p>*Attach Unit Summative Assessment, including Scoring Guides/Scoring Keys/Alignment Codes and DOK Levels for all items. Label each assessment according to the unit descriptions above (i.e., Grade Level/Course Title/Course Code, Unit #).</p>						

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Obj. #	INSTRUCTIONAL STRATEGIES (research-based): (Teacher Methods)
1, 2, 3, 4, 5, 6, 7	Direct/Experiential: Instructor-led demonstrations and simulations
7	Indirect: Instructor provides materials to guide student learning.
7	Interactive: Instructor guides students to work in teams.
Obj. #	INSTRUCTIONAL ACTIVITIES: (What Students Do)
1, 2, 4	Simulations, Drill and Practice
3, 7	Classroom discussion
5, 6, 7	Writing to Inform
7	Reading for Meaning
<p>UNIT RESOURCES: (include Internet addresses for linking)</p> <p>Support documents:</p> <ul style="list-style-type: none"> • [LOCATE TRANSLATE RUBRIC] • [ELECTRICAL DRAWING RUBRIC] • [HANDBOOK RUBRIC] <p>Internet resources:</p> <ul style="list-style-type: none"> • http://phet.colorado.edu/en/simulation/circuit-construction-kit-ac • http://www.mcffa.com/uploads/4/4/8/0/4480777/ohms_law_worksheet.pdf • http://phet.colorado.edu/en/simulation/ohms-law • http://www.nfpa.org/aboutthecodes/AboutTheCodes.asp?DocNum=70&cookie_test=1 • http://code.necplus.org/index.php?sso=0 <p>Resources available from MCCE free loan library (www.mcce.org):</p> <ul style="list-style-type: none"> • Electricity and Electronics Howard H. Gerrish, TINLEY PARK, IL, GOODHEART-WILLCOX COMPANY INC, 1999. BOOK — Teaches principles and theory accompanied by hands-on learning. Provides a thorough grounding in electrical principles, circuitry, and components. Additional topics include electronic communication and data systems and career opportunities in electronics. 	

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- Electrical Tools, Safety & Wiring

CEV Multimedia, LUBBOCK, TX, CEV MULTIMEDIA, 2003. DVD ROM — This program focuses on basic electrical safety procedures, and discusses a wide variety of topics, such as: Over-current protective devices; Care of insulation on electric power cords; Correct use of tools and following safe and approved working procedures; Proper electrical material identification. In order to provide practical application, electrical demonstration boards provide students with visual demonstration on how to wire three circuits commonly found in most residences— duplex receptacle, lighting fixture controlled by a dimmer, and a three-way lighting circuit. 4 sections, 250 minutes.