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| **TEXAS CTE LESSON PLAN**  [www.txcte.org](http://www.txcte.org) | |
| **Lesson Identification and TEKS Addressed** | |
| **Career Cluster** | Science, Technology, Engineering & Mathematics |
| **Course Name** | Principles of Applied Engineering |
| **Lesson/Unit Title** | DC Circuits |
| **TEKS Student Expectations** | **130.402. (c) Knowledge and Skills**  (2) The student investigates the components of engineering and technology systems. The student will be expected to:  (B) identify the inputs, processes, and outputs associated with technological systems;  (C) describe the difference between open and closed systems;  (D) describe how technological systems interact to achieve common goals;  (6) The student thinks critically and applies fundamental principles of system modeling and design to multiple design projects. The student will be expected to:  (B) identify the chemical, mechanical, and physical properties of engineering materials  (C) use problem-solving techniques to develop technological solutions. |
| **Basic Direct Teach Lesson**  (Includes Special Education Modifications/Accommodations and  one English Language Proficiency Standards (ELPS) Strategy) | |
| **Instructional Objectives** | The student will be able to:   * Recognize and label the different parts of an electrical circuit. * Identify and use the symbols in an electrical schematic. * Demonstrate mathematical and problem-solving skills involving circuit analysis. * Apply mathematical formulas in a variety of different ways using algebra and logic. |
| **Rationale** | A steady, constant voltage is much easier to deal with mathematically making this the easiest way to learn about how circuits work. |
| **Duration of Lesson** | Teacher’s Discretion |
| **Word Wall/Key Vocabulary**  *(ELPS c1a,c,f; c2b; c3a,b,d; c4c; c5b) PDAS II(5)* | * Battery * electrical circuits * AC voltage and DC voltage * Ohm’s Law * Polarity |
| **Materials/Specialized Equipment Needed** | **Materials Needed:**   * A battery * DC Circuits quiz for each student   **Equipment Needed:**   * Computer * Projector |
| **Anticipatory Set**  (May include pre-assessment for prior knowledge) | **SAY:** Today we are going to learn about electrical circuits.  **ASK:** Does anyone know the difference between AC voltage and DC voltage? (AC varies, DC is constant)  **SHOW:** A battery.  **SAY:** This voltage produces a constant, steady voltage.  **ASK:** Does anyone know how this battery works? (converts chemical energy into electricalenergy)  **SAY:** Even though AC voltage is the commonly used power source in our homes, we are goingto use DC voltage to show how an electrical circuit works.  **ASK:** Does anyone know why we want to use DC voltage to describe circuit operation?  **SAY:** Because a steady, constant voltage is much easier to deal with mathematically. So, eventhough some of this material may seem difficult to you, this is the easiest way to learn about how circuits work. |
| **Direct Instruction \*** | Instructors can use handouts, and note pages in conjunction with the following outline.  I. Common circuit elements  A. Battery cells connect in series to make a battery. Note: POLARITY  B. One common circuit element missing from this picture is a switch (EE pg. 59)  C. The LED is an electronic device and is not covered here, but it is ON  D. Note how the voltmeter and the ammeter are connected  II. Circuit devices and symbols  A. Definitions make good board work  B. Students need to write, draw, make their own circuits  III. A simple electric circuit  A. Introduce the switch as a control element  B. A complete circuit needs a path from one side of the battery to the other  C. Interrupt the circuit anywhere, current stops flowing  D. This switch is a single pole, single throw (SPST)  IV. Ohm’s Law  A. There are 3 forms of Ohm’s Law  B. The Ohm’s Law circle is also shown as a triangle, either form works the same  (EE pg. 72)  C. Use the circle to help solve the first 3 Problems  V. Series Circuits (EE Ch 6)  A. These additional formulas create a “tool chest” to solve different types of problems  B. Ohm’s Law is the basis for most of these additional formula’s, but they will look new  C. The formulas are derived from simple electrical properties  VI. Parallel Circuits (EE Ch 7)  A. Each branch is a separate and independent circuit  B. What happens in one branch does not affect any other branch  C. Total resistance in a parallel circuit is lower than the smallest resistor value  D. Using the calculator’s 1/x button can make parallel circuit calculations easy  *Individualized Education Plan (IEP) for all special education students must be followed. Examples of accommodations may include, but are not limited to:*  None |
| **Guided Practice \*** | Show students how to work the problems. Change some of the electrical values and guide the students through the steps to the solution.  *Individualized Education Plan (IEP) for all special education students must be followed. Examples of accommodations may include, but are not limited to:*  None |
| **Independent Practice/Laboratory Experience/Differentiated Activities \*** | Students work problems from chapters 1-7 of Electricity and Electronics (EE) textbook.  *Individualized Education Plan (IEP) for all special education students must be followed. Examples of accommodations may include, but are not limited to:*  None |
| **Lesson Closure** | **Question:** What are some of the key concepts used in a series circuit?  **Answer:** Resistance adds, current is the same everywhere, voltage drops are split up betweencomponents in a ratio depending on their resistance.  **Question:** What are some of the key concepts used in a parallel circuit?  **Answer:** Voltage is the same across each branch, current is different in each branch anddepends on branch resistance, total current adds and is the sum of the individual branch currents, total resistance divides using the inverse formula, and total resistance is always lower than the smallest branch resistance. |
| **Summative/End of Lesson Assessment \*** | **Informal Assessment** :  Teacher observation of board work and problems from the Electricity and Electronics textbook. (Series Circuits: page 104, problems 1-7; Parallel Circuits: page 111, problems 1-5)  **Formal Assessment**  The DC Circuits quiz.  *Individualized Education Plan (IEP) for all special education students must be followed. Examples of accommodations may include, but are not limited to:*  None |
| **References/Resources/**  **Teacher Preparation** |  |
| **Additional Required Components** | |
| **English Language Proficiency Standards (ELPS) Strategies** |  |
| **College and Career Readiness Connection[[1]](#footnote-1)** |  |
| **Recommended Strategies** | |
| **Reading Strategies** |  |
| **Quotes** |  |
| **Multimedia/Visual Strategy**  **Presentation Slides + One Additional Technology Connection** |  |
| **Graphic Organizers/Handout** |  |
| **Writing Strategies**  **Journal Entries + 1 Additional Writing Strategy** |  |
| **Communication**  **90 Second Speech Topics** |  |
| **Other Essential Lesson Components** | |
| **Enrichment Activity**  (e.g., homework assignment) | Have students build different circuits in lab, and then take measurements to verify that calculated values can predict actual values. |
| **Family/Community Connection** |  |
| **CTSO connection(s)** | SkillsUSA  Technology Student Association (TSA) |
| **Service Learning Projects** |  |
| **Lesson Notes** |  |

1. Visit the Texas College and Career Readiness Standards at <http://www.thecb.state.tx.us/collegereadiness/CRS.pdf>, Texas Higher Education Coordinating Board (THECB), 2009. [↑](#footnote-ref-1)