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Objective	Applied skills strongly demonstrated	Some applied skills demonstrated	Little applied skills demonstrated	Minimal applied skills
1. Identify and describe electrical components and quantities.*	Solve unit conversion problems.	Solve problems using engineering notation and metric prefixes.	Express measured data with the proper number of significant digits.	Discuss the SI standard. Identify the symbol for an electrical component. Define/Explain: Schematic symbols, variable symbols, units, prefixes. Identify discrete components and value. Convert from one unit with a metric prefix to another. Use engineering notation and metric prefixes to represent large and small quantities. Explain the concept of significant digits.
2. Definitions of voltage, current, electrical resistance and power.*	Calculate power theoretically and based on circuit measurements.	Perform circuit measurements using lab equipment of voltage, current and resistance.	Interpret a standard resistor code. Discuss the characteristics of power supplies and batteries.	Define voltage, resistance, current, and power.

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3. Ohm's law, electrical energy and power.*	Design, build and test a circuit to achieve a specific current, resistance or voltage. Calculate energy consumption. Select resistors based on power considerations.	Describe the relationship between voltage current and resistance. Measure voltage current and resistance in a simple circuit. Calculate electrical power for a basic circuit.	Calculate current, voltage and resistance in a simple circuit. Calculate electrical power and energy for a simple circuit.	Define Ohm's law. Define electrical energy. Define electrical power.
4. Series circuit analysis (Apply Ohm's and Kirchhoff's Laws to series circuits.)*	Apply the voltage divider rule. Design, build and test an unloaded voltage divider circuit. Construct a circuit and measure voltage with respect to ground. Troubleshoot series circuits, opens and shorts. Construct and analyze series-aiding and series-opposing multiple source circuits.	Compute DC series circuits (voltages, current, power). Take measurements of DC series circuits. Compute power in and power out. Apply Kirchhoff's Voltage Law. Verify current is the same through all components. Compute voltages in series-aiding and series-opposing multiple source circuits.	Recognize series combinations of components from schematic diagrams. Apply Ohm's Law in a series circuit to each component and combination of components. Recognize series-aiding and series-opposing multiple source circuits.	Define series circuit State Kirchhoff's Voltage law.

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5. Parallel circuit analysis*	Apply the current divider rule Design, build, and test a current divider circuit. Construct a circuit and measure voltage with respect to ground. Troubleshoot parallel circuits, opens and shorts. Construct and analyze parallel multiple source circuits. Analyze the internal resistance of single and multiple source circuits.	Compute DC parallel circuits (voltages, current, power). Take measurements of DC parallel circuits. Compute power in and power out. Apply Kirchhoff's Current Law to solve a simple circuit. Verify voltage is the same across all parallel components. Compute current in a parallel multiple source circuit.	Recognize parallel combinations of components from schematic diagrams. Determine total parallel resistance with three or more resistors. Apply Ohm's Law in a parallel circuit to each component and combination of components. Recognize parallel multiple source circuits.	Define parallel circuit State Kirchhoff's Current law Determine total parallel resistance with two resistors in parallel.
6. Series-parallel circuit analysis*	Analyze by calculation using the collapse and expand method for a 3 plus loop circuit. Analyze using simulation. Design, build, and test a	Analyze by calculation using the collapse and expand method for a 2 loop circuit. Analyze ladder networks. Analyze a balanced Wheatstone bridge.	Determine total equivalent resistance for a series-parallel circuit.	Recognize series-parallel circuits. Recognize a ladder network. Recognize a balanced

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	loaded voltage divider. Analyze the loading effect of a meter on a circuit.			Wheatstone bridge.
7. Circuit theorems (Superposition, Thevenin's and Norton's theorems)*	Lab exercise or computer simulation to prove Thevenin and/or Norton theorem. Lab exercise or computer simulation to prove Superposition theorem. Lab exercise or computer simulation to prove Maximum Power Transfer theorem.	Calculate the equivalent Thevenin and/or Norton circuit. Convert a Norton circuit to a Thevenin circuit and Thevenin circuit to Norton circuit. Calculate circuit voltages & currents using Superposition. Calculate resistances for Maximum Power Transfer.	Perform source conversions (current to voltage; voltage to current). Calculate the voltages and current in a multi-source series-parallel circuit.	Define the concept of equivalent circuits and internal resistance. Define superposition, Thevenin's, and Norton's theorems. Define Maximum Power Transfer theorem.
8. Mesh and/or nodal analysis techniques*	Apply Mesh or Nodal Analysis Techniques to find currents through and voltage drops across all resistors in a complex circuit (three or more loops). Lab exercise or computer simulation to validate Mesh	Apply Mesh or Nodal Analysis Techniques to find currents through and voltage drops across all resistors in a simple circuit (two loops). Verify results by applying Kirchhoff's Laws.	Write Mesh equations for a simple circuit with two loops or write nodal equations for a simple circuit with two nodes. Recognize when source conversion is necessary and perform source conversion.	Describe the procedure used in the Mesh or Nodal Analysis Techniques. Recognize which of Kirchhoff's Laws are being applied in each analysis technique.

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	or Nodal analysis Verify results by applying Kirchhoff's Laws.			
9. Properties of capacitors and their behavior under DC conditions*	Apply and verify the universal time constant curve in an R-C circuit. Observe R-C transient circuits with instrumentation. Solve for voltage, current, and time in an RC circuit using exponential equations.	Analyze series and parallel connections of capacitors Calculate capacitance from physical characteristics of a capacitor. Perform calculations using the universal time constant curve. Calculate energy stored in a capacitor Calculate the Voltage and Current in an R-C circuit at τ, 2τ, 3τ, 4τ and 5τ	Describe dielectric characteristics Describe voltage and current in steady state condition of an R-C circuit. Describe/plot current and voltage in a transient circuit. Calculate charge on a capacitor. Describe energy stored in a capacitor Calculate time constant of an R-C circuit	Define capacitance Describe basic construction and characteristics of a capacitor Identify and discuss various types of capacitors Define charge, charge storage, and discuss voltage as force. Identify and discuss the universal time constant curve
10. Properties of inductors and their behavior under DC conditions*	Apply and verify the universal time constant curve in an R-L circuit. Observe R-L transient circuits with instrumentation.	Analyze series and parallel connections of inductors. Calculate inductance from physical characteristics of an inductor. Perform calculations using	Describe voltage and current in steady state condition of an R-L circuit. Describe/plot current and voltage in a transient circuit. Calculate induced voltage	Define inductance. Define the basic construction of an inductor. Identify and discuss various

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	Solve for voltage, current, and time in an R-L circuit using exponential equations. Calculate mutual inductance.	the universal time constant curve. Calculate energy stored in an inductor. Calculate the Voltage and Current in an R-L circuit at τ, 2τ, 3τ, 4τ and 5τ.	during a collapsing magnetic field. Describe energy stored in an inductor. Calculate the time constant of an R-L circuit.	types of inductors. List the factors that affect the strength of the magnetic field. Identify and discuss the universal time constant curve.