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COURSE INFORMATION

Alternate Title: Introduction to AC/DC

Description:

10-660-116 INTRODUCTION TO AC/DC ...introduces the concepts of AC and DC power and basic circuits. Using a multimeter, students learn about voltage, current, and resistance in both AC and DC circuits.

Instructional Level: 10

Total Credits: 2

Total Hours: 72

COURSE HISTORY

Status: Active

Active Date: 5/23/2022

Last Revision Date: 6/19/2023

Revised By: Kiel Harell (15007358)

Last Approval Date: 6/21/2023

Approved By: Kiel Harell (15007358)

SUPPLIES

- ACDC Wiring Kit

EMPLOYABILITY SKILLS

1. Communicate Effectively

Type: NWTC Status: Active

2. Demonstrate Community and Global Accountability

Type: NWTC Status: Active

3. Demonstrate Personal Accountability

Type: NWTC Status: Active

4. Solve Problems Effectively

Type: NWTC Status: Active

5. Think Critically and Creatively

Type: NWTC Status: Active

6. Value Individual Differences and Abilities

Type: NWTC Status: Active

7. Work Cooperatively and Professionally

Type: NWTC Status: Active

COURSE COMPETENCIES

1. Investigate Electrical Properties

Status: Active

Criteria

- 1.1. List the unit of measure and symbol for all four electrical properties
- 1.2. Apply unit prefixes appropriately to electrical properties (i.e. mA, k Ω , and μ F)
- 1.3. Calculate resistance using Ohm's Law.
- 1.4. Calculate amperage using Ohm's Law.

Learning Objectives

- 1.a. Identify basic electrical properties
- 1.b. Use Ohm's Law to describe electrical properties.

2. Demonstrate use of Digital Multimeter (DMM) & Oscilloscope

Status: Active

Criteria

- 2.1. Connect and configure DMM for measuring AC and DC electrical properties.
- 2.2. Connect and configure O-Scope for measuring AC electrical properties.
- 2.3. Measure AC and DC electrical properties of circuits
- 2.4. Capture transient values (i.e. Inrush current, min – max values)
- 2.5. Verify working fuses in DMM.
- 2.6. Test transducers for correct operation.
- 2.7. Test continuity of transformer windings.
- 2.8. Measure RMS, Peak, and Peak to Peak voltage values using DMM and O-Scope.
- 2.9. Compare measured values from both devices.

Learning Objectives

- 2.a. Demonstrate setup of DMM and O-Scope.
- 2.b. Measure electrical values of a circuit.
- 2.c. Test electrical devices to verify operation.
- 2.d. Compare DMM and O-Scope measurements.

3. Construct Electrical Circuits Using Schematic Drawings

Status: Active

Criteria

- 3.1. Construct series circuits using resistors, inductors, capacitors.
- 3.2. Connect transformer windings in series.
- 3.3. Construct parallel circuits using resistors, inductors, capacitors.
- 3.4. Connect transformer winding in parallel.
- 3.5. Construct circuits using a variable resistor as a potentiometer.
- 3.6. Construct circuits using a variable resistor as a rheostat.

3.7. Construct a bridge circuit using a thermistor and a rheostat.

Learning Objectives

3.a. Construct Series Circuits

3.b. Construct Parallel Circuits

3.c. Construct Variable Resistor Circuits

4. Identify Electrical and Physical Characteristics of Transformers

Status: Active

Criteria

4.1. Define operation of transformers.

4.2. Define basic components of transformers.

4.3. Explain why inrush current must be accounted for in transformer systems.

4.4. Use schematics to connect transformer to meet operational requirements.

4.5. Use DMM to verify transformer is meeting operational voltage requirements.

4.6. Use DMM to record winding inrush current.

Learning Objectives

4.a. Define transformer characteristics.

4.b. Connect transformer meet operational requirements.

5. Analyze Electrical Properties of Transducers

Status: Active

Criteria

5.1. Measure resistance value at different temperatures.

5.2. Analyze values and determine type of thermistor.

5.3. Measure voltage value at different temperatures.

5.4. Calculate temperature coefficient and verify correct operation of device.

5.5. Measure bridge voltages at different temperatures.

5.6. Define the two properties of temperature change shown by a bridge circuit.

5.7. Analyze measurement to verify bridge circuit shows changes to two properties.

Learning Objectives

5.a. Analyze Electrical Properties of Thermistors.

5.b. Analyze Electrical Properties of Thermocouples.

5.c. Analyze Electrical Properties of Thermistor Bridge Circuit.

6. Analyze Electrical Properties of Parallel and Series Circuits

Status: Active

Criteria

6.1. Measure circuit continuity to verify construction of circuit.

6.2. Measure circuit resistance, voltage, and ampacity.

6.3. Verify measurements validate series circuit electrical properties.

6.4. Measure circuit continuity to verify construction of circuit.

6.5. Measure circuit resistance, voltage, and ampacity.

6.6. Verify measurements validate parallel circuit electrical properties.

Learning Objectives

6.a. Analyze Electrical Properties of Series Circuits.

6.b. Analyze Electrical Properties of Parallel Circuits.

7. Analyze Electrical Properties of Reactance

Status: Active

Criteria

7.1. Describe what reactance is in AC circuits.

7.2. Differentiate between capacitive and inductive reactance.

7.3. Describe how changes in reactance effects circuit impedance.

7.4. Measure ampacity changes in a capacitive circuit as frequency changes.

7.5. Analyze measurements and define how changes in capacitive reactance effect ampacity.

7.6. Measure ampacity changes in an inductive circuit as frequency changes.

7.7. Analyze measurements and define how changes in inductive reactance effect ampacity.

7.8. Measure effective capacitance and inductance in series and parallel circuits.

7.9. Calculate effective capacitance and inductance in series and parallel circuits.

7.10. Verify measured values are equivalent to calculated values.

Learning Objectives

7.a. Define Reactance

7.b. Verifying reactance in AC circuits

7.c. Verifying effective capacitance and inductance.