Western Technical College

10660115 DC/AC 1

Course Outcome Summary

Course Information

Description	DC/AC 1 provides the fundamental concepts of Powers of 10 notation, an introduction to voltage, current and resistance, and their relationship expressed with Ohm's Law. This course also introduces series and parallel circuits as well as combination circuits. The course concludes with an introduction to magnetism, electromagnetism and alternating voltage and current. Circuits will be constructed in the lab using both actual components and simulation software.
Career Cluster	Manufacturing
Instructional Level	Associate Degree Courses
Total Credits	3
Total Hours	72

Pre/Corequisites

Pre/Corequisite 10804113 College Technical Math 1A (OR) 20804229 Math Analysis

Textbooks

Grob's Basic Electronics – with Connect. 13th Edition. Copyright 2021. Schultz, Mitchel E. Publisher: McGraw-Hill Publishing Company. **ISBN-13:** 978-1-264-09418-9. Required.

Success Abilities

1. Cultivate Passion: Enhance Personal Connections
2. Cultivate Passion: Expand a Growth-Mindset
3. Live Responsibly: Develop Resilience
4. Live Responsibly: Foster Accountability

Program Outcomes

1. Apply electronic theory to practice
2. Operate test equipment
3. Build electronic circuits and systems
4. Evaluate the operation of electronic circuits or systems
5. Communicate technical information

Course Competencies

1. Demonstrate proper use of electronic symbols, standards, and terminology.

Assessment Strategies

1.1. Written Product

Criteria

You will know you are successful when

1.1. you match the name for electrical and magnetic quantities and units, to the correct SI symbol.
1.2. you select the proper wire using the AWG standard.
1.3. you equate engineering notation powers of ten, to the standard metric prefix and symbol for each.
1.4. you convert among metric prefixed units.
1.5. you convert a quantity written in scientific notation to a standard metric prefix.
1.6. you select the correct electrical component for circuit assembly from a schematic diagram.
1.7. you draw current paths on a circuit diagram using either conventional or electron flow.
1.8. you label polarities across components.
1.9. you use a scientific calculator to perform electronic calculations.

Learning Objectives

1.a. List general safety standards for electrical/electronic equipment.
1.b. Use metric prefixes appropriately.
1.c. List examples of commonly used SI units.
1.d. Use scientific calculators effectively.
1.e. Contrast electron flow and conventional flow used in circuit analysis.
1.f. Identify common electrical/electronic schematic symbols.

2. Apply atomic theory to the components, quantities and properties of basic DC and AC electrical circuits.

Assessment Strategies

2.1. Written Product

Criteria

You will know you are successful when

2.1. you list the three types particles that make up the structure of most atoms.
2.2. you list the polarity of charge associated with the three particles of the atom.
2.3. you describe the significance of the electron orbits of a material considered to be a conductor.
2.4. you describe the significance of the electron orbits of a material considered to be an insulator.
2.5. you describe the significance of the electron orbits of a material considered to be a semiconductor.
2.6. you define the term coulomb.
2.7. you define the term voltage.
2.8. you define term current.
2.9. you define the term resistance.
2.10. you list examples of different types of voltage sources.
2.11. you describe the physical effects of electrostatic charges on each other.
2.12. you list the three components that make up an electrical circuit.

Learning Objectives

2.a. Describe the model of an atom.

2.b. Explain the theory of electrical charges.
2.c. Explain the electrical characteristics of an insulator.
2.d. Explain the electrical characteristics of a conductor.
2.e. Explain the electrical characteristics of a semiconductor.
2.f. Explain the significance of the electron as it relates to voltage and current.

3. Measure basic DC electrical quantities.

Assessment Strategies

3.1. Demonstration
3.2. Written Product

Criteria

You will know you are successful when

3.1. you measure voltage with a DMM and an analog meter.
3.2. you measure current with a DMM and an analog meter.
3.3. you measure resistance with a DMM and an analog meter.
3.4. you assemble basic DC circuits according to supplied criteria.
3.5. you follow safety guidelines when working in the lab.
3.6. you record circuit data and analyze the results.

Learning Objectives

3.a. Measure the resistance of a circuit or component using the ohmmeter.
3.b. Use both analog and digital type meters.
3.c. Measure DC voltages using the voltmeter.
3.d. Measure DC currents using an ammeter.

4. Troubleshoot DC and AC circuits.

Assessment Strategies

4.1. Demonstration

Criteria

You will know you are successful when

4.1. you analyse DC and AC circuits for failures.
4.2. you determine the cause of failure in a DC and AC circuit.
4.3. you determine a resolution for the failure in a DC and AC circuit.
4.4. you calculate the expected value for proper operation.

Learning Objectives

4.a. Determine if an open circuit condition exists.
4.b. Determine if a short circuit condition exists.
4.c. Determine what the correct circuit value should be.
4.d. Use appropriate test equipment to determine circuit failure.

5. Determine the values of and relationships between DC voltage, current, resistance, and power characteristics.

Criteria

You will know you are successful when

5.1. you calculate the value of voltage in a circuit using Ohm's law.
5.2. you calculate the value of current in a circuit using Ohm's law.
5.3. you calculate the value of resistance in a circuit using Ohm's law.
5.4. you calculate the power in a circuit when at least two of the following are known: voltage, current, or resistance.
5.5. you apply Ohm's law to determine a resistance needed to meet specifications.
5.6. you calculate power consumption per hour.
5.7. you calculate operating cost based on power usage and energy cost.

Learning Objectives

5.a. Calculate the value of voltage in a circuit using Ohm's law.
5.b. Calculate the value of current in a circuit using Ohm's law.

5.c. Calculate the value of resistance in a circuit using Ohms' law.
5.d. Calculate the power in a circuit when at least two of the following are known: voltage, current, or resistance.
5.e. Use Ohm's law to determine a resistance needed to meet specifications.
5.f. Calculate power consumption per hour.
5.g. Calculate operating cost based on power usage and energy cost.

6. Analyze series DC and AC resistive circuits.

Criteria

You will know you are successful when

6.1. you list which components are in series.
6.2. you calculate voltage.
6.3. you calculate current.
6.4. you calculate resistance
6.5. you calculate power.

Learning Objectives

6.a. Identify a series resistive circuit containing multiple number of resistors.
6.b. Use Ohm's law to calculate circuit values.
6.c. Use Watt's law to calculate circuit values.

7. Analyze parallel DC and AC resistive circuits.

Criteria

You will know you are successful when

7.1. you list which components are in parallel.
7.2. you calculate voltage.
7.3. you calculate current.
7.4. you calculate resistance.
7.5. you calculate power.

Learning Objectives

7.a. Identify a parallel resistive circuit containing multiple number of resistors.
7.b. Use Ohm's law to calculate circuit values.
7.c. Use Watt's law to calculate circuit values.

8. Analyze series-parallel DC resistive circuits.

Criteria

You will know you are successful when

8.1. you list which components are in series.
8.2. you list which components are in parallel.
8.3. you draw the current paths in the circuit with the appropriate polarity.
8.4. you calculate voltage.
8.5. you calculate current.
8.6. you calculate resistance.
8.7. you calculate power.

Learning Objectives

8.a. Identify a series-parallel resistive circuit containing multiple number of resistors.
8.b. Use Ohm's law to calculate circuit values.
8.c. Use Watt's law to calculate circuit values.

9. Specify the parameters of AC sinusoidal steady-state signals.

Criteria

You will know you are successful when

9.1. you calculate the peak value of a signal.
9.2. you calculate the peak-to-peak value of a signal.
9.3. you calculate the RMS value of a signal.

9.4. you can calculate the frequency of a signal.
9.5. you calculate the period of a signal.
9.6. you calculate the instantaneous value of a signal.
9.7. you calculate the phase between to signals.
9.8. you calculate signal values using radians.
9.9. you calculate signal values using degrees.

Learning Objectives

9.a. Define the term peak amplitude.
9.b. Define the term peak-to-peak amplitude.
9.c. Define the term RMS amplitude.
9.d. Define the term frequency.
9.e. Define the term period.
9.f. Explain the terms of the sinusoidal equation.

10. Measure the parameters of AC electrical signals in resistive circuits.

Criteria

You will know you are successful when

10.1. you measure circuit values with an oscilloscope.
10.2. you measure circuit values with a DMM.

Learning Objectives

10.a. Measure the peak amplitude of an AC signal.
10.b. Measure the peak-to-peak amplitude of an AC signal.
10.c. Measure the RMS amplitude of an AC signal.
10.d. Measure the frequency of an AC signal.
10.e. Measure the period of an AC signal.
10.f. Measure the phase between two AC signals.

11. Analyze steady-state series-parallel AC resistive circuits.

Criteria

You will know you are successful when

11.1. you calculate the peak amplitude of an AC signal.
11.2. you calculate the peak-to-peak amplitude of an AC signal.
11.3. you calculate the RMS amplitude of an AC signal.
11.4. you calculate the frequency of an AC signal.
11.5. you calculate the period of an AC signal.
11.6. you calculate the phase between two AC signals.

Learning Objectives

11.a. Calculate the peak amplitude of an AC signal.
11.b. Calculate the peak-to-peak amplitude of an AC signal.
11.c. Calculate the RMS amplitude of an AC signal.
11.d. Calculate the frequency of an AC signal.
11.e. Calculate the period of an AC signal.
11.f. Calculate the phase between two AC signals.

12. Calculate power in AC resistive circuits.

Criteria

You will know you are successful when

12.1. you calculate the power in a component.
12.2. you calculate the power delivered by the source.
12.3. you calculate the power in the load.
12.4. you relate the effective value of an AC waveform to an equivalent DC value.

Learning Objectives

12.a. Calculate the power in a component.
12.b. Calculate the power delivered by the source.
12.c. Calculate the power in the load.

13. Explore the principles of magnetism and electromagnetism.

Assessment Strategies

13.1. Written Product

Criteria

You will know you are successful when

13.1. you describe the magnetic field surrounding a magnet.
13.2. you describe the magnetic field surrounding an electromagnet.
13.3. you define the units of magnetic flux.
13.4. you define the units of flux density.
13.5. you list the three classifications of magnetic materials.
13.6. you describe the operation of a motor.
13.7. you describe the operation of a relay.
13.8. you describe the operation of a solenoid.

Learning Objectives

13.a. Examine the principles for a magnetic field surrounding a permanent magnet.
13.b. Examine the principles for a magnetic field surrounding a current carrying conductor.
13.c. Examine the operation of the three most common electromagnetic devices.
13.d. Examine the effects of magnetic field interaction.