Western Technical College
THE ESSENTIAL EXPERIENCE

Western Technical College

10660118 AC Circuit Analysis

Course Outcome Summary

Course Information

Description	This course provides an introduction to the fundamental concepts of AC circuits. Topics include sine wave, alternating voltage, period, frequency, RMS, peak and peak-to-leak values of an AC waveform, comprehensive coverage of the use of the scopemeter to analyze transformers, capactive reactiance, inductive reactance, seires and parallel RC and RL circuits. An introduction to three phase power and power factor is also included.
Career Cluster	Manufacturing
Instructional Level	Associate Degree Courses
Total Credits	2
Total Hours	54

Textbooks

Delmar's Standard Textbook of Electricity. 7th Edition. Copyright 2020. Herman, Stephen. Publisher: Cengage Learning. **ISBN-13:** 978-1-337-90034-8. Required.

Course Competencies

1. Examine the function of single phase AC (alternating current).

Assessment Strategies

1.1. Demonstration
1.2. Written Objective Test

Criteria

You will know you are successful when

1.1. You identify and measure a sine waves wavelength.
1.2. You calculate the wavelength's period.
1.3. You measure the Sine waves Voltage peak and Voltage peak to peak.
1.4. You explain the relationship between Voltage peak and Voltage peak to peak.
1.5. You calculate Voltage RMS from measured Volts peak.

Learning Objectives

1.a. Identify and measure a sine waves wavelength.
1.b. Calculate the wavelength's period.
1.c. Measure the Sine waves Voltage peak and Voltage peak to peak.
1.d. Explore the relationship between Voltage peak and Voltage peak to peak.
1.e. Calculate Voltage RMS from measured Volts peak.

2. Examine the function and operation of transformers.

Assessment Strategies

2.1. Demonstration
2.2. Written Objective Test

Criteria

You will know you are successful when

2.1. You calculate primary and secondary voltage of a transformer.
2.2. You calculate primary and secondary current of a transformer.
2.3. You calculate primary and secondary power of a transformer.
2.4. You measure voltage and current at the primary and secondary windings of a transformer.

Learning Objectives

2.a. Calculate primary and secondary voltage of a transformer.
2.b. Calculate primary and secondary current of a transformer.
2.c. Calculate primary and secondary power of a transformer.
2.d. Measure voltage and current at the primary and secondary windings of a transformer.

3. Examine inductors and inductor circuits in AC.

Assessment Strategies

3.1. Demonstration
3.2. Written Objective Test

Criteria

You will know you are successful when

3.1. You calculate inductive reactance.
3.2. You calculate total voltage of a series RL circuit using phasors.
3.3. You determine total impedance of a series RL circuit.
3.4. You determine phase angle using vector math.
3.5. You measure phase angle using test equipment.
3.6. You calculate total current of a parallel RL circuit using phasors.

Learning Objectives

3.a. Calculate inductive reactance.
3.b. Calculate total voltage of a series RL circuit using phasors.
3.c. Determine total impedance of a series RL circuit.
3.d. Determine phase angle using vector math.
3.e. Measure phase angle using test equipment.
3.f. Calculate total current of a parallel RL circuit using phasors.

4. Examine capacitors and capacitor circuits in AC.

Assessment Strategies

4.1. Demonstration
4.2. Written Objective Test

Criteria

You will know you are successful when

4.1. You calculate capacitive reactance.
4.2. You calculate total voltage of a series RC circuit using phasors.
4.3. You determine total impedance of a series RC circuit.
4.4. You determine phase angle using vector math.
4.5. You measure phase angle using test equipment.
4.6. You calculate total current of a parallel RC circuit using phasors.

Learning Objectives

4.a. Calculate capacitive reactance.
4.b. Calculate total voltage of a series RC circuit using phasors.
4.c. Determine total impedance of a series RC circuit.
4.d. Determine phase angle using vector math.

4.e. Measure phase angle using test equipment.
4.f. Calculate total current of a parallel RC circuit using phasors.

5. Examine the function of RLC (resistor inductor and capacitor) circuits.

Assessment Strategies

5.1. Demonstration
5.2. Written Objective Test

Criteria

You will know you are successful when

5.1. You will calculate the resonate frequency of an series RLC circuit.
5.2. You will build a RLC circuit to measure resonant frequency.
5.3. You will be able to calculate reactive power , then build a parallel RLC circuit and measure reactive power.
5.4. You will be able to calculate true power , then build a parallel RLC circuit and measure true power.
5.5. You will be able to calculate apparent power , then build a parallel RLC circuit and measure apparent power.
5.6. You will be able to calculate power factor, then build a parallel RLC circuit and measure power factor.
5.7. You will be able to add power factor correction to a parallel RLC circuit

Learning Objectives

5.a. Calculate the resonate frequency of an series RLC circuit.
5.b. Build a RLC circuit to measure resonant frequency.
5.c. Calculate reactive power and build a parallel RLC circuit and measure reactive power.
5.d. Calculate true power and build a parallel RLC circuit and measure true power.
5.e. Calculate apparent power and build a parallel RLC circuit and measure apparent power.
5.f. Calculate power factor and build a parallel RLC circuit and measure power factor.
5.g. Add power factor correction to a parallel RLC circuit.

6. Examine the function of filter circuits.

Assessment Strategies

6.1. Demonstration
6.2. Written Objective Test

Criteria

You will know you are successful when

6.1. You will be able to calculate the cut off frequency for a high pass and low pass filter.
6.2. You will be able to design and built a high pass, low pass filter and band pass filter.
6.3. You will be able to simulate filter circuits in Multi Sim.

Learning Objectives

6.a. Calculate the cut off frequency for a high pass and low pass filter.
6.b. Design and built a high pass, low pass filter and band pass filter.
6.c. Simulate filter circuits in Multi Sim.

7. Examine the theory of three-phase AC power.

Assessment Strategies

7.1. Demonstration
7.2. Written Objective Test

Criteria

You will know you are successful when

7.1. You recognize the phase relationship in a 3 phase circuit.
7.2. You recognize the relationship between phase voltage and line voltage.
7.3. You recognize the relationship between phase current and line current.
7.4. You will be able to draw a 3 phase delta circuit with proper symbology and labels,
7.5. You will be able to draw a 3 phase wye circuit with proper symbology and labels,
7.6. You will be able to measure voltage and current in a 3 phase circuit.

Learning Objectives

7.a. Explore the phase relationship in a 3 phase circuit.
7.b. Explore the relationship between phase voltage and line voltage.
7.c. Explore the relationship between phase current and line current.
7.d. Draw a 3 phase delta circuit with proper symbology and labels,
7.e. Draw a 3 phase wye circuit with proper symbology and labels,
7.f. Measure voltage and current in a 3 phase circuit.

8. Examine three-phase, wye, and delta circuits.

Assessment Strategies

8.1. Demonstration
8.2. Written Objective Test

Criteria

You will know you are successful when

8.1. You can calculate the voltage and current in a wye connected balanced three-phase circuit.
8.2. You can calculate the voltage and current in a delta connected balanced three-phase circuit.
8.3. You can calculate the power in a delta connected balanced three-phase circuit.
8.4. You can calculate the power in a wye connected balanced three-phase circuit.

Learning Objectives

8.a. Calculate the voltage and current in a wye connected balanced three-phase circuit.
8.b. Calculate the voltage and current in a delta connected balanced three-phase circuit.
8.c. Calculate the power in a delta connected balanced three-phase circuit.
8.d. Calculate the power in a wye connected balanced three-phase circuit.

9. Examine three-phase transformer operation.

Assessment Strategies

9.1. Demonstration
9.2. Written Objective Test

Criteria

You will know you are successful when

9.1. You calculate primary and secondary voltage of a transformer in a wye and delta configuration.
9.2. You calculate primary and secondary current of a transformer in a wye and delta configuration.
9.3. You calculate primary and secondary power of a transformer in a wye and delta configuration.
9.4. You measure voltage and current at the primary and secondary windings of a transformer in a wye and delta configuration.

Learning Objectives

9.a. Calculate primary and secondary voltage of a transformer in a wye and delta configuration.
9.b. Calculate primary and secondary current of a transformer in a wye and delta configuration.
9.c. Calculate primary and secondary power of a transformer in a wye and delta configuration.
9.d. Measure voltage and current at the primary and secondary windings of a transformer in a wye and delta configuration.

10. Examine three-phase circuit characteristics.

Assessment Strategies

10.1. Demonstration
10.2. Written Objective Test

Criteria

You will know you are successful when

10.1. You measure true power in a 3 phase circuits.
10.2. You measure apparent power in a 3 phase circuits.
10.3. You measure reactive power in a 3 phase circuits.
10.4. You measure power factor in a 3 phase circuits.
10.5. You power factor correction in a 3 phase circuit.
10.6. You identify and correct the the effects of an unbalanced load in delta and wye circuits.

Learning Objectives

10.a. Measure true power in a 3 phase circuits.
10.b. Measure apparent power in a 3 phase circuits.
10.c. Measure reactive power in a 3 phase circuits.
10.d. Measure power factor in a 3 phase circuits.
10.e. Complete power factor correction in a 3 phase circuit.
10.f. Explore the effects of an unbalanced load in delta and wye circuits.