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Northeast Wisconsin Technical College

10-660-108 053723 AC 2: Reactance

Course Outcome Summary

Course Information

Description	10-660-108 AC 2: REACTANCE ...study of the way inductive, capacitive and resistive components behave in a circuit excited by a sine waveform. Effective and average values of the sinewave are derived. (Corequisite: 10-660-107, AC 1: Properties)
Total Credits	1
Total Hours	36

Course History

Last Revision Date	12/14/2017

Employability Skills

1. Communicate Effectively
2. Demonstrate Personal Accountability
3. Solve Problems Effectively
4. Think Critically and Creatively
5. Value Individual Differences and Abilities
6. Work Cooperatively and Professionally

Course Competencies

1. Demonstrate the use of complex numbers in AC reactive circuits

Assessment Strategies

Homework assignments evaluated by instructor
Lab activities demonstrated and evaluated by instructor
AC2: Reactance written examination

Learning Objectives

1.a. Interpret AC phasor quantities as complex numbers
1.b. Apply complex numbers to reactive devices
1.c. Perform simple math of complex numbers
1.d. Express complex numbers in various forms

Criteria

Your performance will be successful when:

1.1. Explain the □j□ operator
1.2. Describe the makeup of a complex number
1.3. Demonstrate the technique for converting between polar and rectangular forms of the complex number
1.4. Demonstrate the techniques for multiplication and division of complex numbers
1.5. Relate the complex number to sine wave quantities
1.6. Calculate operations with complex numbers
1.7. Practice oscilloscope measurements using MultiSim
1.8. Identify the electrical effect of resistance in AC circuits
1.9. Define the reactance produced by a pure inductance
1.10. Graph the change of inductive reactance with frequency
1.11. Calculate currents in circuits with AC sources at various angles

2. Investigate capacitive reactance in series and parallel circuits

Assessment Strategies

Homework assignments evaluated by instructor
Lab activities demonstrated and evaluated by instructor
AC2: Reactance written examination

Learning Objectives

2.a. Describe capacitive reactance in AC circuits
2.b. Explain the concept of impedance in AC circuits
2.c. Determine currents and voltage drops in capacitive circuits.

Criteria

Your performance will be successful when:

2.1. Define the reactance produced by a pure capacitance.
2.2. Graph the change of capacitive reactance with frequency
2.3. Define the use of reactance as a complex mathematical quantity called impedance
2.4. Calculate capacitive reactance of a capacitor.
2.5. Analyze capacitance across a variable frequency voltage source for reactance values.
2.6. Explain why a capacitor causes a phase shift between voltage and current.
2.7. Describe series RC circuits as phase shift networks.
2.8. Measure capacitive reactance and verify theoretically
2.9. Measure phase in a capacitive circuit
2.10. Simulate circuit reactance of capacitors in series and parallel

3. Investigate inductive reactance in series and parallel circuits

Assessment Strategies

Homework assignments evaluated by instructor
Lab activities demonstrated and evaluated by instructor
AC2: Reactance written examination

Learning Objectives

3.a. Describe inductive reactance in AC circuits
3.b. Explain the concept of impedance in AC circuits
3.c. Determine power in AC single phase loads with leading and lagging phase

Criteria

Your performance will be successful when:

3.1. Calculate inductive reactance of an inductor.
3.2. Analyze inductance across a variable frequency voltage source for reactance values.
3.3. Explain why an inductor causes a phase shift between voltage and current.
3.4. Describe series RL circuits as phase shift networks.
3.5. Measure and verify power factor relationships
3.6. Determine the effect of adding power factor correction
3.7. Simulate parallel RLC circuits and correct power factor

4. Examine the circuit characteristics of reactive components in parallel with resistive components

Assessment Strategies

Homework assignments evaluated by instructor
Lab activities demonstrated and evaluated by instructor
AC2: Reactance written examination

Learning Objectives

4.a. Describe the impedance characteristics of reactive circuits
4.b. Explain circuit characteristics of parallel RC circuits
4.c. Explain circuit characteristics of parallel RL circuits
4.d. Determine equivalent circuit values of parallel reactive/resistive circuits
4.e. Compare calculated to measured values in a reactive/resistive circuit near and at the resonance condition

Criteria

Your performance will be successful when:

4.1. Write impedance equations for the parallel circuit
4.2. Calculate the total current of parallel reactive/resistive circuits
4.3. Calculate the equivalent impedance of parallel reactive/resistive circuits
4.4. Determine the phase angle relationships in parallel reactive/resistive circuits
4.5. Explain the current to voltage relationship in any parallel element
4.6. Derive voltage divider equations using complex impedances
4.7. Measure current and voltages in an AC series circuit near resonance
4.8. Simulate a resonant series circuit

5. Investigate the AC circuit characteristics of series RLC circuits

Assessment Strategies

Homework assignments evaluated by instructor
Lab activities demonstrated and evaluated by instructor
AC2: Reactance written examination

Learning Objectives

5.a. Analyze AC circuits containing resistance, capacitance, and inductance
5.b. Determine the flow of power in RLC circuits
5.c. Observe the effect of changing component values in a RLC circuit

Criteria

Your performance will be successful when:

5.1. Compare the concepts of real, reactive and apparent power
5.2. Graph reactive power flow in pure capacitance and inductance
5.3. Calculate power in AC circuits
5.4. Define the relationship between real, reactive and apparent power
5.5. Compute power factor in a circuit
5.6. Analyze combination RLC circuits for true, reactive and apparent power relative to power factor.
5.7. Calculate the phase and impedance of combination RLC circuits.
5.8. Explain AC circuit component relationships using Ohm□s law
5.9. Define the voltage and current relationship of individual components in a RLC circuit
5.10. Measure circuit parameters that make-up an RLC circuit