Miami Dade College

Course Description

EET1025C | Alternating Current Circuits | 4.00 credits

This course is intended for students majoring in electronics engineering technology and related disciplines. Students will learn inductance, capacitance, vector notation, AC circuits, impedance, phase shift, networks, transformers, and resonance. Students will apply and verify theories and principles through hands-on, laboratory experiments utilizing modern testing equipment. Prerequisite: EET 1015C; Pre/Corequisite: MAC 1114 or 1147.

Course Competencies

Competency 1: The student will demonstrate an understanding of magnetism, applications of electromagnetism, and induced voltages by:

1. Sketching lines of force around a magnet (or a current/carrying wire), and relating them to flux density
2. Describing how a piece of iron can be magnetized
3. Describing the construction of a solenoid
4. Describing the operation of a relay, a meter movement, a read/write (R/W) disk head, and a simple electric motor

Competency 2: The student will demonstrate an understanding of various types of alternating current (AC) wave forms by:

1. Defining the mathematical relationship between frequency and period.
2. Analyzing the various types of alternating voltages and currents of sine waves
3. Plotting the sinusoidal waveform in the time domain
4. Solving problems involving relationships between root mean square (rms), peak, and peak-to-peak values of alternating current waveforms

Competency 3: The student will demonstrate the ability to perform operations using phasors, complex numbers, and logarithms by:

1. Using a phasor to represent a sine wave
2. Using complex numbers to express phasor quantities
3. Converting phasors from rectangular to polar form and vice-versa
4. Performing mathematical operations with complex numbers: addition, subtraction, multiplication, and division
5. Expressing a power, voltage or current ratio as decibels (dB)

Competency 4: The student will demonstrate an understanding of the operation of transformers and their applications by:

1. Explaining mutual inductance
2. Describing how a transformer is constructed and how it operates
3. Explaining how a step-up transformer works
4. Explaining how a step-down transformer works
5. Discussing the effect of a resistive load across the secondary winding
6. Explaining the concept of a reflected load in a transformer
7. Describing impedance matching with transformers
8. Explaining how the transformer acts as an isolation device
9. Describing a practical transformer
10. Comparing and contrasting several types of transformers

Competency 5: The student will demonstrate the ability to solve RC (resistor-capacitor) circuit problems by:

1. Describing the concept of the capacitor and how it charges and discharges in an AC circuit
2. Describing different types of capacitors, and relating their advantages and disadvantages

3. Computing the relationship between current and voltage in an RC circuit
4. Determining impedance and phase angle in a series RC circuit
5. Analyzing a series RC circuit
6. Determining impedance and phase angle in a parallel RC circuit
7. Analyzing a parallel RC circuit
8. Analyzing series-parallel RC circuits
9. Determining power in RC circuits
10. Discussing basic RC applications
11. Analyzing faults in RC circuits by tracing an AC signal through a circuit and correcting a fault

Competency 6: The student will demonstrate the ability to solve RL (resistor-inductor) circuit problems by:

1. Describing the concept of the inductor showing why an inductor has high impedance in a high-frequency circuit
2. Describing the different types of inductors
3. Computing the impedance of an inductor at a specific frequency
4. Computing the relationship between current and voltage in an RL circuit
5. Determining the magnitude and phase angle of the impedance in a series RL circuit
6. Analyzing a series RL circuit using phasor math to compute all currents and voltages in phasor form
7. Determining the magnitude and phase angle of the impedance in parallel RL, and series parallel RL circuits
8. Analyzing parallel RL, and series-parallel RL circuits using phasor math to compute all currents and voltages in phasor form
9. Analyzing faults in RL circuits

Competency 7: The student will demonstrate the ability to solve RLC (resistor inductor capacitor) circuit problems by:

1. Computing the resonant frequency of series and parallel RLC circuits
2. Computing the quality factor, Q, of series and parallel RLC circuits
3. Computing the bandwidth of series and parallel RLC circuits
4. Computing all voltages and currents at a specified frequency in series and parallel RLC circuits
5. Building a circuit to perform low pass, high pass, and band pass filtering of a signal

Competency 8: The student will demonstrate the ability to solve circuit problems by:

1. Finding the Thevenin equivalent of an RC or RLC circuit
2. Computing the values for and drawing the equivalent of the load that will allow maximum power transfer

Competency 9: The student will demonstrate the ability to solve problems involving resonance by:

1. Explaining the concept of frequency domain plots
2. Describing and simulating the spectrum of a signal
3. Plotting and interpreting Bode Plots
4. Expressing ratios as dBs (decibels)

Competency 10: The student will demonstrate the ability to simulate circuits by:

1. Assembling and testing circuits, simple RC circuits, and complicated RLC circuits in the time domain
2. Assembling and testing circuits, simple RC circuits, and complicated RLC circuits in the frequency domain
3. Simulating Bode plots

Competency 11: The student will demonstrate the ability to build and test circuits by:

1. Assembling and testing RC circuits including series, parallel and series- parallel combined
2. Setting up an oscilloscope and calibrating the probes
3. Using an oscilloscope to measure frequency, amplitude, and phaseshift
4. Setting a signal generator to a precise frequency and amplitude with the aid of an oscilloscope
5. Using a digital multimeter to measure root mean square voltage

Learning Outcomes:

- Use quantitative analytical skills to evaluate and process numerical data
- Use computer and emerging technologies effectively