Miami Dade College

Course Description

EET1037C | Electronic Computer Simulations | 3.00 credits

An investigation of network theorems with practical illustrations. The venin's, Norton's, Kirchhoff' sand the superposition methods of analysis are applied to the solution of resistive and reactive networks. Resonant circuits and transient voltages and currents are analyzed. Prerequisite: EET 1141C; Corequisite: MTB 1322

Course Competencies

Competency 1: The student will demonstrate the ability to use microcomputer circuit simulation programs by:

1. Performing basic computer tasks including saving, copying, and naming, files; creating directories; make a temporary directory on the desktop, renaming a file or directory; making a template page, etc.
2. Identifying the screen elements and functions of the simulation software
3. Navigating the simulation software screen
4. Placing text on the screen, labeling a component, changing a component value, changing the color of objects (the background, a wire, a component), showing the grid, page bounds, border; zooming in and out; printing reports, instruments, and bills of materials; and writing a circuit description
5. Selecting components to build circuits
6. Generating parts lists
7. Generating reports
8. Connecting to the internet and downloading documentation

Competency 2: The student will demonstrate an understanding of basic electronic circuit theory by:

1. Describing the characteristics of a variety of circuit types including: series, parallel, series- parallel, diode, zener diode, and voltage divider biased common emitter circuits
2. Describing how various filters functions, including low-pass, high pass, bandpass
3. Explaining how rectifiers work

Competency 3: The student will demonstrate the ability to use the simulation software by:

1. Designing, constructing, and analyzing diode circuits
2. Designing, constructing, and analyzing regulator circuits using zenerdiodes
3. Design, construct, and analyze series and parallel circuits
4. Design, construct, and analyze a series RC circuit using a signal generator, DVM (digital volt meter), and an oscilloscope
5. Drawing and obtaining measurements of DC (direct current) series-parallel circuits
6. Drawing a zener diode voltage regulator and determining the proper circuit voltages and currents
7. Designing an original circuit incorporating a variety of circuit components e.g., LED's, switches, light bulbs, buzzers, son alerts, etc. and verifying the circuit operation
8. Drawing and analyzing a high pass attenuator

Competency 4: The student will demonstrate the ability to use the simulation software to analyze circuits by:

1. Using the Bode plotter to interpret the waveform of low-pass filters
2. Using polar to rectangular conversion to analyze RC alternating current circuits
3. Interpreting the effect of changing values on the circuit
4. Obtaining both the forward and reverse bias voltages
5. Analyzing a zener diode
6. Analyzing a zener diode voltage regulator circuit
7. Explaining the Bode plotter and its use in electronic circuits analysis
8. Using frequency response and mathematical analysis

9. Applying Millman's Theorem to analyze complex circuits and verify their operations
10. Analyzing step up, step down, and center tap transformers to determine their primary voltage, secondary voltage, and turns ratio
11. Analyzing the properties of a full wave rectifier
12. Describing the functionality of Lissajous patterns, and how they are used to calibrate the frequency of waveform
13. Designing a Lissajous circuit that will produce a specific pattern

Competency 5: The student will demonstrate the ability to use the simulation software to identify circuit problems by:

1. Troubleshooting circuit malfunctions
2. Troubleshooting simple diode circuits, a voltage regulated power supply, and a zener diode
3. Observing the input and output waveforms of a full wave rectifier, and be able to troubleshoot the circuit on the computer
4. Observing the proper values of voltages and currents in the voltage divider bias circuit and troubleshoot the circuit to determine the defective part
5. Determining the defective component in a full wave rectifier
6. Determining the defective component in a bridge rectifier
7. Observing the properties of a half wave rectifier, interpreting the signals, and troubleshooting the circuit

Competency 6: The student will demonstrate an understanding of filters by:

1. Defining a filter, describing how it operates, and explaining its uses
2. Stating the differences between a low-pass and a high-pass filter
3. Describing how the bode plot is used to analyze filters
4. Drawing and analyzing a low pass filter and printing out the bode plotter waveform
5. Drawing and analyzing a high pass filter using bode plot, frequency response and mathematical analysis
6. Drawing and analyzing a band stop filter and interpreting the bode plot data
7. Describing the performance characteristics of a high pass attenuator
8. Obtaining the proper decibel values using complex algebra

Competency 7: The student will demonstrate the ability to work with clipper circuits by:

1. Defining and describing the properties of clipper circuits
2. Describing the operation of and differences between series and shunt clippers, positive and negative peak series diode clippers, and positive and negative shunt diode clippers
3. Drawing the waveform for various types of clipper circuits
4. Troubleshooting defective components in a clipper circuit

Competency 8: The student will demonstrate an understanding of wave forms by:

1. Explaining the functions of positive and negative peak clampers
2. Using a square wave input to describe the reference level of clamper waveforms
3. Drawing clamper waveforms observed on the computer

Competency 9: The student will use the simulation software to demonstrate an understanding of basic linear integrated circuit (IC) functionality by:

1. Describing IC characteristics including Beta, characteristic curves, junction voltages, ac input resistance, etc.
2. Observing typical IC properties using computer software
3. Drawing a base bias amplifier on the computer screen
4. Measuring all DC voltages and currents and observing the input and output AC waveforms on the computer
5. Performing an AC analysis of the amplifier and printing out the circuit, waveforms and analysis results
6. Observing the proper values of voltages and currents in the voltage divider bias circuit and

troubleshooting the circuit to determine the defective part

7. Configuring a voltage divider biased common emitter circuit
8. Performing a load line analysis to determine the optimum operating point location

Competency 10: The student will demonstrate an understanding of logic circuits by:

1. Defining a logic circuit and its uses
2. Describing how logic circuits differ from other types of circuits
3. Constructing and analyzing logic circuits including both and or gates
4. Identifying the Karnaugh map and the diode components which are equivalent to each gate

Learning Outcomes:

- Use quantitative analytical skills to evaluate and process numerical data
- Solve problems using critical and creative thinking and scientific reasoning
- Use computer and emerging technologies effectively