Miami Dade College

Course Description

EET2101C | Electronics 2 | 4.00 credits

This course is intended for students majoring in electronics or computer engineering technologies. Students will learn how to apply electronic principles to analog circuits including transistor amplifiers, feedback and frequency response of linear circuits, operational amplifiers, MOSFET and oscillators. Prerequisite: EET 1141C.

Course Competencies

Competency 1: The student will demonstrate an understanding of multistage amplifiers by:

1. Calculating current, voltage, and power gains of multistage amplifiers
2. Creating diagrams for amplifiers load lines and identifying relationships with respect to active load considerations in differential amplifiers
3. Constructing and testing various frequency responses for multi-stage amplifier

Competency 2: The student will demonstrate an understanding of frequency response and feedback by:

1. Differentiating between the concepts of the Frequency domain and time domain
2. Defining and calculating Bandwidth, cutoff frequency and center frequency and identifying frequency response curves
3. Comparing and contrasting frequency response with Bode plot
4. Applying mathematical analyses to evaluate frequency domain analysis and behaviors
5. Evaluating the amplifier transfer function to calculate the output frequency spectrum
6. Formulating a complete low and high frequency analysis of BJTs and FET amplifiers
7. Describing the concepts of negative and positive feedback as they are applicable to operational amplifiers.
8. Discussing the two-port network parameters (Y,Z,H,G, etc.)
9. Describing the basic feedback topologies by drawing various examples
10. Calculating feedback gain of a closed loop amplifier including the loop gain

Competency 3: The student will demonstrate an understanding of output stages and power amplifiers as they relate to operational amplifiers by:

1. Discussing the Darlington class AB amplifier and biasing AB output stage amplifiers
2. Explaining and analyzing the operation of class B and AB BJT and FET transistors
3. Demonstrating the integration of class B amplifier as an output stage for an operational amplifier
4. Constructing various FET and BJT class, B and AB circuits based on IC power amplifiers

Competency 4: The student will demonstrate an understanding of the basic applications of operational amplifier (op- amp) circuits by:

1. Describing the basic op-amp and its characteristics including identifying the schematics symbols and its terminals
2. Describing the basic operations of the op- amp's differential input and its basic internal building block diagram including gain, input impedance and output impedance
3. Calculating the common mode rejection ratio (CMRR) for the op-amp
4. Analyzing gain and frequency response of a general-purpose op-amp
5. Computing the op-amp gain for inverting and non-inverting negative feedback configurations

Competency 5: The student will demonstrate an understanding of various operational amplifier applications circuits and their uses by:

1. Analyzing the operations of integrator and differentiator using the op-amp
2. Designing, building, and testing various op-amp configurations including voltage follower, (buffer), summing amplifiers, and scaling adder

3. Designing analog-to-digital (ADC) and digital-to-analog (DAC) converters
4. Designing, building, and testing comparators, zero-level detection, nonzero-level detection, and the effects of input noise on comparator operation
5. Designing and building instrumentation amplifiers
6. Building devices that utilize constant current-to-voltage sources

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

1. Describing the basic operating principles and applications of oscillators
2. Describing positive feedback in relation to creating and maintaining oscillations
3. Discussing the Barkhausen criterion for oscillation
4. Describing the operation and building blocks of various oscillation circuits such as Wein-Bridge RC, Colpitts, Hartly, Clapp and Armstrong LC Oscillators
5. Describing op-amp oscillators with RC, LC, and phase-locked loop circuits
6. Describing, analyzing, and building square and triangle waveform generators from integrated circuits (IC) components

Competency 7: The student will demonstrate an understanding of thyristors and special devices by:

1. Describing the Shockley diode, its basic operations and uses
2. Describing the basic operations, structure, and applications of special devices such as SCR, SCS, Unijunction Transistor (UJT), Programmable Unijunction Transistor (PUT), IGBT, diacs and triacs, Light- Activated SCR, (LASCR)
3. Discussing various types of optical couplers and their applications
4. Using special devices to provide power to various applications
5. Describing the construction of a phototransistor

Competency 8: The student will demonstrate an understanding of voltage regulators by:

1. Defining and constructing line and load regulation circuits
2. Measuring and evaluating load regulation, efficiency of voltage regulators
3. Describing various types of Linear IC voltage regulators
4. Differentiating between the fundamental operations of linear regulators and switching regulators
5. Describing series shunt, switching, and integrating circuit voltage regulators

Learning Outcomes:

- Communicate effectively using listening, speaking, reading, and writing skills
- Solve problems using critical and creative thinking and scientific reasoning