COLLEGE OF ENGINEERING

Introduction to Analog Systems and Circuits

ECE 2020

Credit Hours:

3.00

Course Levels:

Undergraduate (1000-5000 level)

Course Components:

Lecture Recitation Lab

Course Description:

Circuit theory and applications of passive components and Op amps. Introduction to analog systems using differential equations and Laplace transforms.

Prerequisites and Co-requisites:

Prereq: Math 1152, 1161.01, 1161.02, 1172, or 1181H; and Physics 1250, 1250H, or 1260, or CHEM 1210 or 1250.

Course Goals / Objectives:

- Master circuit concepts such as voltage, current, charge, resistors, inductors, capacitors, etc.
- Master how to analyze, design and implement circuits using Ohm's Law, Kirchhoff's laws and superposition
- Be competent in Phasor Domain sinusoidal techniques
- Be competent in analyzing, designing and implementing steady state and transient behavior of RC, RL, RLC circuits
- Be competent in Laplace Transform techniques
- Be competent in analyzing, designing and implementing simple active filters based on ideal Op Amps
- Be familiar with how to use modern computer tools for analog simulation
- Be competent in how to use laboratory instruments and laboratory methodology
- Be competent with methodology for critical troubleshooting skills

Course Topics:

- Fundamentals of electric circuits: Charge, Voltage, Kirchhoff's Laws, power and sign conventions, Ohm's law, practical circuit elements
- Circuit Analysis Techniques: Node Voltage / Mesh analysis, superposition, Thevenin and Norton equivalents
- Ideal op amp, feedback, active filters, cascaded active filters
- RC and RL first-order circuits, natural and total response, RC Op amp circuits
- Initial and Final Conditions, Series and Parallel RLC, General solution of second-order circuits
- Laplace transforms, properties, pole zero diagrams and inverse Laplace transform
- System transfer function scaling, impulse response, step response, sinusoidal response, s-Domain circuit analysis
- Sinusoidal signals, Phasor domain analysis, impedance transformations
- RC, RL, RLC frequency response vs transient response
- Bode Plots, Passive and Active Filters
- Periodic Waveforms, Average and Complex Power, Maximum power Transfer
- Simulated circuit analysis
- Introduction to Lab Equipment, troubleshooting skills

Designation:

Required Elective