

# **Introduction to Analog Systems and Circuits for Transfer Students Lecture**

ECE 2021

**Credit Hours:** 

2.50 - 2.50

#### **Course Levels:**

Undergraduate (1000-5000 level)

**Course Components:** Lecture

#### **Course Description:**

Lecture-only component of ECE 2020, for transfer students. 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 or 1161.01 or 1161.02 or 1172 or 1181H, and Physics 1250, 1250H or 1260, and CSE 1222 or 2221 or Engr 1281.01H or 1281.02H or 1222; and Engr 1182.01 or 1182.02 or 1182.03 or 1282.01H or 1282.02H or 1282.03H, or Engr 1186 and 1187 and concur: 1188 concurrent, or 1187 and 1188 and concur: 1186; and CPHR 2.00 or above.

#### **Course Goals / Objectives:**

- Master circuit concepts such as voltage, current, charge, resistors, inductors, capacitors, etc.
- Master how to analyze and design circuits using Ohm's Law, Kirchhoff's laws and superposition
- Be competent in Phasor Domain sinusoidal techniques
- Be competent in analyzing and designing steady state and transient behavior of RC, RL, RLC circuits
- Be competent in Laplace Transform techniques
- Be competent in analyzing and designing simple active filters based on ideal Op amps

### **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

## **Designation:**

Elective Required