THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

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

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Designation:

Elective
Required