Catalogue Description:
A course on circuits solution and analysis in the s and frequency domains. It includes operational amplifiers, step and steady-state response of \( RL, RC \), and \( RLC \) circuits, Laplace transform and its use in circuit analysis; frequency-selective circuits; active filter circuits; Fourier transform; two-port circuits; and circuit simulation using SPICE.

Credit hours: 3 credits hours

Required or elective: Required for CCE and ECE students

Prerequisites
By course: EECE 210-electric Circuits
By topic: understanding of electric circuit analysis including KCL, KVL, mesh-current, node-voltage, superposition, source transformation, Thevenein’s and norton’s equivalent circuits, simple differential equations and complex numbers

Textbook(s) and/or required materials

References: None

Computer usage: Matlab and PSpice

Course Objectives
1. Ideal operational amplifier
2. Natural and steady-state responses of \( RL, RC \), and \( RLC \) circuits
3. Laplace transform and its applications in circuit analysis
4. Passive and active filters, their transfer functions, graphical representations, and implementations
5. Fourier transform and its application in circuit analysis
6. Theory of two-port-circuits
Course Topics
1. Operational amplifier
2. Response of first order RL, and RC Circuits
3. Natural and Step responses of RLC circuits
4. Introduction to the Laplace transform
5. The Laplace transform in circuit analysis
6. Introduction to frequency selective circuits
7. Active filter circuits
8. The Fourier transform
9. Two-port circuit: parameters

Course Learning Outcomes
1. Understand the ideal operational amplifier and how it can be used to build an inverting amplifier, a noninverting amplifier, a summing amplifier, and difference amplifier circuit
2. Understand natural and step responses of RL, RC, and RLC circuits
3. Understand the Laplace transform and its use in circuit analysis
4. Understand the concept of transfer function and system stability
5. Understand the relation between impulse response, transfer function, and convolution integral
6. Understand frequency selective circuits
7. Understand the concept of design and analysis of active filters
8. Understand the Fourier Transform and its application in circuit analysis
9. Understand the concept, analysis, and interconnection of two-port circuits

Class/laboratory schedule
Three 50-minute lectures per week

Resources of the course
Textbook, PSpice, and Moodle

Evaluation Methods
1. Quizzes (3): 48%
2. PSpice quiz: 12%
3. Final exam: 40%

Professional Components
Engineering topics: 60%
General education: 10%
Mathematics and basic sciences: 30%

Person(s) who prepared this description and date of preparation
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