C-ID Descriptor
Circuit Analysis

Descriptor Details

- **Descriptor Title**: Circuit Analysis
- **C-ID Number**: 260
- **Units**: 3
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General Description

An introduction to the analysis of electrical circuits. Use of analytical techniques based on the application of circuit laws and network theorems. Analysis of DC and AC circuits containing resistors, capacitors, inductors, dependent sources, operational amplifiers, and/or switches. Natural and forced responses of first and second order RLC circuits; the use of phasors; AC power calculations; power transfer; and energy concepts.

Prerequisites

Calculus-Based Physics for Scientists and Engineers: B (C-ID PHYS 210)

Corequisites

Ordinary Differential Equations (C-ID MATH 240)

Advisories

None

Content

1. Ohm’s Law
2. Electrical Power and Energy
3. Kirchhoff’s Laws
4. Equivalent Circuits
5. Voltage and Current Division
6. Dependent Sources
7. Nodal and Mesh Analysis
8. Thevenin and Norton Equivalent Circuits
9. Superposition
10. Operational Amplifiers and Analysis using Ideal Models
11. Voltage gain and current limitations of non-ideal op amp circuits
12. Transient and Complete response of RC, RL, and RLC Circuits
13. Sinusoidal steady-state analysis including phasors, complex impedance, and power factor
14. Frequency response of first and second order AC circuits
15. AC Power including power transfer and power factor correction

Optional Course Content:

1. Three phase power

Lab Activities

None

Objectives

Upon successful completion of the course, students will be able to:

1. Analyze DC circuits to find current, voltage, resistance, power, and/or energy.
2. Draw and label circuit diagrams and show thorough mathematical solutions.
3. Apply different circuit analysis techniques and demonstrate a process for selecting an appropriate technique for a given problem.
4. Solve circuits containing two or more Op Amps

5. Find the transient response and complete response for RC, RL, and RLC circuits involving DC sources.
6. Solve AC circuits by using Phasors.
7. Calculate average and complex power for AC circuits.

Evaluation Methods

Tests, examinations, and/or homework where students demonstrate their mastery of the learning objectives and their ability to set-up, organize, and present complete solutions to problems including labeled circuit diagrams.

Textbooks

Alexander and Sadiku - Fundamentals of Electric Circuits

Nilsson and Riedel - Electric Circuits

Johnson, Hilburn, Johnson, Scott - Electric Circuit Analysis

Hayt and Kemmerly – Engineering Circuit Analysis