Course Outline for: ENGR 2017 Linear and Steady-State Circuit Analysis

A. Course Description:

1. Number of credits: 5
2. Lecture hours per week: 4
   Lab hours per week: 2
3. Prerequisites: PHYS 1122 (C or higher) and MATH 1520 (C or higher)
4. Corequisites: None
5. MnTC Goals: None

An introduction to linear circuit analysis and steady-state circuit analysis. Students will learn how to build and analyze circuits in order to make predictions about their behavior. Laboratory includes experiments with circuits and familiarization with measurement tools and equipment.

B. Date last reviewed/updated: October 2024

C. Outline of Major Content Areas:

1. Circuit element models.
2. Circuit theorems.
3. Nodal and mesh analysis.
4. Operational amplifiers.
5. Inductors and capacitors.
6. First- and second-order circuits.
7. Phasor analysis.
8. Complex power.
9. Fourier series applications.
10. RLC circuits.
11. Active filters with audio applications.

D. Course Learning Outcomes:

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

1. Analyze circuits to obtain voltages and currents using appropriate methods (e.g., Kirchhoff's laws, node-voltage, mesh-current, and superposition methods).
2. Analyze circuits using basic, equivalent circuit combinations (e.g., series, parallel, source transformations, Y- and ▪- equivalents).
3. Apply an understanding of independent and dependent sources when solving circuits.
4. Find the Thévenin and Norton equivalent circuits for resistive circuits with independent and/or dependent sources.
5. Determine parameters for maximum power transfer to loads.
6. Solve circuits involving ideal operational amplifiers.

7. Solve simple RC, RL, and RLC circuits in the time domain, emphasizing their steady-state responses.
8. Analyze circuits for steady-state voltages and currents using both time-domain and frequency/phasor-domain methods.
9. Relate phasor- and time-domain representations of steady-state circuit quantities to each other.
10. Describe circuits in terms of their frequency response.
11. Calculate complex power.
12. Use electrical and electronic measurement tools and equipment, including oscilloscopes and function generators.
13. Construct simple, active, audio filters.
14. Use appropriate engineering practices to report on results.

E. Methods for Assessing Student Learning:

Methods for assessment may include, but are not limited to, the following:

1. Written journal
2. Oral presentations
3. Projects
4. Exams
5. Labs
6. Homework

F. Special Information:

None