Introduction to Circuit Analysis

Course Code: ENGR 37
Instructor: Prof. Vasuda Bhatia bhatiavasuda@fhda.edu
Lectures: MWR 1:30 pm -2:20 pm on Zoom Lectures
Office Hours: T 1:45 pm – 2:45 pm; or by appointment on Zoom Office Hours

I. Prerequisites: MATH 1D (or MATH 1DH); PHYS 4B (may be taken concurrently)

II. Course Objective:

This course introduces the analysis of linear circuits; first- and second-order differential equations describing RLC circuits; the natural and forced response of simple circuits; the development of steady-state sinusoidal circuit analysis for the network differential equations; and the study of Thevenin, Norton, and operational amplifiers.

Student Learning Outcome Statements (SLO)
Analyze circuits containing resistive, capacitive, inductive passive elements, along with opamps interconnected to voltage and current sources.
Use circuit laws and network theorems to solve DC steady state circuits, RC, RL, and RLC DC circuit transients and sinusoidal AC steady state circuits.

III. Course Contents:

Module I: Identify basic concept and circuit elements

1. System units
2. Basic quantities
3. Circuit elements
    a. Resistor
    b. Inductor
    c. Capacitor
    d. Dependent sources
    e. Independent sources
4. Terminal characteristics
    a. Current
    b. Voltage

Module II: Analyze resistive circuits

1. Ohm's law
2. Kirchhoff' law
3. Single-loop circuits
4. Single-node-pair circuits
5. Series and parallel resistor combinations
6. Wye to delta transformations
7. Circuits with Dependent Sources

Module III: Apply nodal and loop Analysis

1. Nodal Analysis
2. Loop Analysis
3. Solve circuits involving operational amplifiers
4. Superposition
5. Thevenin's and Norton's theorems
6. Maximum power transfer

Module IV: Calculate capacitance and inductance

1. Capacitors
2. Inductors
3. Capacitor and inductor combinations
4. RC operational amplifier circuit

Module V: Analyze first and second order transient circuits

1. First-order circuits
2. Second-order circuits transient analysis
3. Steady-state analysis

Module VI. Examine AC steady-state analysis: current and voltage across elements

1. Phasors
2. Sinusoids
3. Sinusoidal and complex forcing functions

IV. Methods of Instruction:

A. Lecture and visual aids
B. Discussion of assigned reading
C. Quiz and examination review performed in class
D. Homework
E. Discussion and problem solving performed in class
F. Demonstration of simulated circuits

V. Methods of Evaluating Objectives:

A. Quizzes and exams are based on the reading and problems; and will evaluate material comprehension and accuracy of calculation-based questions.
B. Comprehensive final examination which shows the students ability to integrate and analyze the concepts developed throughout the course.
C. Grading quizzes that evaluate comprehension and application of class concepts and accuracy of the calculations.
D. Simulated circuit reports will be evaluated on the content and the practically of the working circuits.

VI. Course Evaluation:

A. Quizzes: 50%
B. Homework Assignments and Circuit Analysis Reports: 25%
C. Final exam: 25%

Grading Scale

A+ 97-100%	B+ 87-89%	C+ 77-79%	D+ 66-69%
A 93-96%	B 83-86%	C 73-76%	D 60-65%
A- 90-92%	B- 80-82%	C- 70-72%	F 0-59%

I. Quizzes: There will be six quizzes each of 10 marks and top five quizzes will be counted towards the grade (TBA).
II. Final Exam: Final Comprehensive Exam will be given during final exam period.
III. Homework Assignments: Homework will be assigned during class hours and can be given from textbooks or from class discussions.
IV. Circuit Analysis and Simulations: TBA.

VII. Texts and Supporting References:

A. Examples of Primary Texts and References
   1. Fundamentals of Electric Circuits, Charles Alexander, Matthew Sadiku. MacGrawHill 6th Ed. 2017
B. Examples of Supporting Texts and References
   1. Floyd, Thomas, "Principles of Electric Circuits "10th Ed. Prentice Hall 2019

Student Learning Outcome(s):

*The student will be able to analyze circuits containing resistive, capacitive, inductive passive elements, along with op-amps interconnected to voltage and current sources.
*The student will be able to use circuit laws and network theorems to solve DC steady state circuits, RC, RL, and RLC DC circuit transients and sinusoidal AC steady state circuits.

Office Hours:

T	01:45 PM	02:45 PM	Zoom Online