ENGR 004: Circuit Analysis (*4.0 Units*)

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Office Hours: M/W/F: 10:00 – 11:00 am
M: 1:00 – 2:00 pm
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Welcome

Welcome to Engineering 4, Circuit Analysis. In this class, we will learn about the foundations for DC and AC circuit analysis. This class has a lab component which will enable us to investigate the material through a hands-on approach. **SYLLABUS IS SUBJECT TO CHANGE, UPDATED WILL BE POSTED ON CANVAS**.

How to Succeed

Engineering is rarely ever an individual endeavor. It is commonly said that the main tenant of Engineering is **CLEAR COMMUNICATION**. For this class, I encourage you to contact me with any concerns, related with school or not. If it is something I cannot immediately help you with, I can point you to resources that will help. This includes but is not limited to food, housing, mental health or accessibility concerns, and others.

Engineering is a very demanding discipline and these courses are no exception. I will be asking a lot out of you, both through assignments and lab reports. The typical amount of time spent **outside** of class is approximately 12 hours (3 hours/unit x 4 units = 12 hours). This is the average – sometimes you will spend a lot more, sometimes you will spend a lot less.

Course Description

ENGR004 – An introduction to the analysis of electrical circuits using analytical techniques based on the application of circuit laws and network theorems. Topics include the 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 in AC analysis; AC power calculations; power transfer; and energy concepts. The laboratory portion of the course provides an introduction to the construction and measurement of electrical circuits including: the basic use of electrical test and measurement instruments such as multimeters, oscilloscopes, power supplies, and function generators; the use of circuit simulation software; interpretation of measured and simulated data based on principles of circuit analysis for DC, transient, and sinusoidal steady-state (AC) conditions; elementary circuit design; practical considerations such as component value tolerance and non-ideal aspects of laboratory instruments; and construction and measurement of basic operational amplifier circuits.

Text:

Required: Circuit Analysis ZyBooks (Instructions provided on Canvas)
Optional: Fundamentals of Electric Circuits, Charles K. Alexander & Matthew N. O. Sadiku (Class set provided).

SLO's:

- DC Circuits: Given a DC Operational Amplifier (Op. Amp) circuit, students will be able to solve for unknown voltages and currents using the Ideal Op. Amp model.
- Thevenin's Theorem: Given a typical two-terminal electrical circuit, students will be able to develop a circuit using an appropriate network circuit theorem that will be equivalent to the original circuit at its terminals.
- AC Circuits: Given a typical steady-state AC Circuit, students will be able to solve for AC voltages and currents at all circuit elements.

Homework:

Homework will be assigned at a bi-weekly interval along will ZyBooks reading. ZyBooks is an online textbook with interactive problems within the text that will help strengthen the connection with the material. These will be checked on every other week as well as a physical problem set due on Canvas.

Exams: There will be five exams in this course, not including the final. This is subject to change as we adjust the pacing of the course over time. The current exam schedule is:

1. Ohms Law, KCL, KVL, Delta – Wye
2. Node Voltage, Mesh Current, Circuit Theorems
3. Operational Amplifiers
4. RC, RL, RLC Circuits
5. AC Circuits

Project During Week 10 I will announce the projects for the course. This can be from any of the project booklets provided by Dr. Owens, Arduino Projects, or projects from the Art of Electronics. The last day of class (05/15) will be a Project Demo Day. You can work on these projects at home, during FNL, and during the provided time in lab.

In Class Worksheets: This course is going to build the material from the ground up. This means that the course will be constantly utilizing knowledge from previous topics. In order to stay on top of things, we will spend 30 minutes each Friday with an in-class worksheet you will complete with your table.

Evaluation:

Homework	10%	**Scale:**	90-100%	A
Labs	20%		80-89%	B
Exams	20%		70-79%	C
Final Exam	30%		60-69%	D
Project	15%		Below 59%	F
Quizzes	5%			

Attendance: As stated before, Engineering is a team sport. Your table will be working together on many things and if you are consistently absent your table may suffer losing out on your insights and work. If attendance is an issue, please contact me to discuss further.

Conduct: Please refer to the Catalogue or Student Handbook for Code of Student Conduct. Cheating is a violation of the Code of Student Conduct and will not be tolerated in class; to do so may result in a grade of "F". It can lead to permanent expulsion from this college. Cheating includes allowing someone to copy from your work.
**You may not use a Calculator that has a Qwerty keypad on the exams.

Tentative Class Schedule

Week	Topic
Week 1	Chapter 1: Circuit Terminology Lab: Introduction to the Lab, Lab Write-up Etiquette, Resistor Color Codes
Week 2	Chapter 2: Ohms Law – Series, Parallel, KVL, KCL Lab: Ohms Law Lab
Week 3	Chapter 2 Continued: KVL, KCL, Wye-Delta Lab: Series and Parallel Labs
Week 4	Finish Chapter 2, Start Chapter 3: Superposition, Node Voltage

	Lab: Exam 1
Week 5	Chapter 3 Continued: Mesh Current, Super Meshes, Inspection, Theorems Lab: Node and Mesh Analysis Labs
Week 6	Finish Chapter 3 Lab: Chapter 3 exam
Week 7	Chapter 4: Operational Amplifiers Lab: Thevenin Equivalence Lab
Week 8	Chapter 4 Continued: Operational Amplifiers Lab: Operational Amplifiers Lab
Week 9	Chapter 5: RC and RL Circuits Lab: Chapter 4 exam
Week 10	Chapter 5 Continued: RC and RL Circuits Lab: RL and RC Circuits Lab
Week 11	Spring Break
Week 12	Chapter 6: RLC Circuits Lab: RLC Circuits Lab
Week 13	Chapter 6 Continued Lab:
Week 14	Chapter 7: AC Analysis Lab: Introduction to Oscilloscopes and AC Circuits
Week 15	Chapter 7 Continued: AC Analysis – Phasors and Op Amps Lab: Introduction to Phasors, Project Work day
Week 16	Chapter 8: AC Power Lab: AC Lab
Week 17	Chapter 8 Continued Lab: Chapter 7/8 Exam
Week 18	Final Review, Project Demo Day
Final	TBD