MCEN 3017 Sec 400: Electrical Engineering: Principles and Applications

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Office Hours: MW 2P - 4P or set appointment

Class: 9:00 A - 9:50 P Tuesday and Thursday AEC 204

Lab: Section 401: 2:00-3:50 Tuesday. Section 402: 2:00P – 3:50P Thursday. AEC 123/227

Prerequisites: Physics 131, Math 132, Math 236

Text Book: Electrical Engineering: Principles and Applications; 6/E; Allan R. Hambley; Pearson, 2014; ISBN-13: 978-0-13-311664-9

Lab Manual: Experiments in Electronics Fundamentals and Electric Circuits Fundamentals; 8e; David M. Buchla; Prentice Hall, 2010; ISBN 13: 978-0-13-506327-9

Course Catalog Description: Introductory course covers analysis of electric circuits by use of Ohm's law, network reduction, node and loop analysis, Thevenin's and Norton's theorems, DC and AC signals, transient response of simple circuits, transfer functions, basic diode and transistor circuits, and operational amplifiers.

Brief List of Topics: Basic Circuit Analysis, Digital Systems, Electronic Devices and Circuits, and Electromechanics.

Homework: Full credit for on time. Half credit for late one class. No credit for late more than one class. Answer credit is 10-20%; work credit is 80-90%. For example: Five point problem; correct answer 1 point, supporting work 4 points.

Lab: Fully credit for on time. Half credit for late one lab. No credit for late more than one lab. Grading includes attendance, team effort acquiring data, leaving lab equipment and benches in order, and complete reports. Lab and classroom material may differ.

Grading:

Final	30%	A = 4.0 (92-100), A- = 3.7 (90-91)
Quiz	20%	B+ = 3.3 (88-89), B = 3.0 (82-87), B- = 2.7 (80-81)
Lab	20%	C+ = 2.3 (78-79), C = 2.0 (72-77), C- = 2.0 (70-71)
Hwrk	20%	D+ = 1.3 (68-69), D = 1.0 (62-67), D- = 0.7 (60-61)
Atten	10%	F = 0.0 (<60)

There may be opportunities for extra in homework, lab, quiz, class and projects.

Student Outcomes: MCEN 3017 - Circuits and Basic Electronics

1. Students acquire an ability to apply knowledge of mathematics, science, and engineering. Use of mathematical methods such as matrices, complex numbers, integral and differential calculus and differential equations address this outcome. Application of science and engineering will be addressed through study of pertinent electrical engineering theorems, semiconductors and MEMS. [ABET (a)]

2. Students acquire an ability to design and conduct experiments, as well as to analyze and interpret data. The laboratory consists of approximately 30 experiments which will engage this outcome. [ABET (b)]

3. Students acquire an ability to identify, formulate, and solve engineering problems. The laboratory sessions will develop this outcome. [ABET (e)]

4. Students acquire an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. Use of LabVIEW, MatLab, and a suite of modern instruments will address this outcome. [ABET (k)]

[Notes:

ABET is a non-profit and non-governmental accrediting agency for academic programs in the disciplines of applied science, computing and engineering.

ABET accreditation provides assurance that a college or university program meets the quality standards established by the profession for which the program prepares its students.

In 1980, ECPD was renamed the Accreditation Board for Engineering and Technology (ABET) to more accurately describe its emphasis on accreditation.]

Course Objectives: MCEN3017 – Circuits and Basic Electronics

1. Provide a survey of electrical engineering so that the Mechanical Engineering graduate can interface and contribute to solutions requiring knowledge of sources of power, functioning of circuits, sensors, data and data acquisition and analysis thereof.

2. Study fundamental quantities of charge, voltage, current, power and energy.

3. Understand basic building blocks such as resistance, capacitance, inductance and their manifestations in components such as resistors, capacitors, inductors, transformers, passive and active circuits.

4. Examine various sources of power such as batteries, power supplies, generators and photovoltaic panels.

5. Analyze networks using Kirchhoff's Current and Voltage Laws with sets of linear equations/matrices.

6. Study differential equations for transient behavior of first (RL and RC) and second order (RLC) circuits.

7. Understand steady state behavior of sinusoidal circuits using phasors and complex numbers.

8. Introduce commonly used semiconductor devices such as diodes, rectifiers, bi-polar and field effect transistors, operational amplifiers and digital logic.

9. Introduce LabVIEW so that students can operate and create virtual instruments. This objective contributes to student outcome; 'an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.'

10. Acquire hands on laboratory experience with electronic instruments by performing numerous experiments. This objective contributes to student outcome; 'an ability to design and conduct experiments as well as to analyze and interpret data.' Also included is understanding and explaining differences between empirical and theoretical findings.

Topics Covered: Mandatory:

1 Circuits, currents, voltages, power, energy, Kirchhoff's current and voltage laws, introduction to circuit elements.

2 Resistive circuits, series and parallel combinations, node and mesh analysis, Thevenin and Norton equivalents, Wheatstone bridge.

3 Inductance and capacitance.

4 Transient analysis of first order (RL and RC) and second order (RLC) circuits.

5 Steady state sinusoidal analysis using complex numbers and polar representation of voltage, current and impedance. Introduction to three phase circuits.

Topics Recommended:

9 Sensors, signal conditioning, A/D conversion

10 Signal diodes, Zener diodes and rectifiers and applications thereof.

11 Overview of amplifiers

13 Bipolar Junction Transistors

14 Operational Amplifiers

15 Magnetic circuits and transformers

Topics Optional:

6 Frequency response, Bode plots and resonance

7 Introduction to logic circuits, number systems and synthesis.

8 Introduction to microcomputers

16 DC Machines

17 AC Machines

12 Field Effect Transistors

2015 Dates:

This list is not inclusive; please visit MavZone.

18 Aug: 1st day of class

01 Sep: Last day to add or drop a full semester class

09 Oct: Fall Break

12 Oct: Last day to withdraw from a full semester class

23/24/25/26/27 Nov: Thanksgiving Break

09 Dec: Final

Important Message: There are new rules from CU as of this semester. If a course has a prerequisite then a score of C- is not acceptable for enrollment in the following course. MCEN3017 is a prerequisite for MCEN4037 (Measurement Lab).