ECE 207
Elements of Electrical Engineering
Fall Semester 2010
Call No: 19018

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Office Hours: T 9:00am-11:00am, W 9:00am-11:00am
Lectures: TR, Integrated Learning Center 150 (ILC 150), 3:30-4:45pm
Course Web-Site: d2l.arizona.edu

Course Description: Current and voltage dividers. Resistors, capacitors, inductors. Node voltage and mesh current analysis of circuits. Thevenin and Norton equivalents. AC circuits, phasors, impedance. Electromagnetic fields, electric power, transformers, magnetic materials, generators, and motors. Operational amplifiers, Elements of digital circuits. Sensors and measurements of physical quantities. Prerequisites: PHYS 241 and Concurrent registration, MATH 254.

Justification: Electrical and computer engineering applications impact most aspects of our lives. For example, you probably use a computer (computational engine and entertainment), cell phone (communication device), calculator (computing aid), personal digital audio player (entertainment), automobile (transportation), microwave oven (household appliance), and digital camera (entertainment) to name just a few of the electrical and computer engineering type systems. The material in this course should provide a better understanding behind the technology in many of these systems and provide you with a more confident attitude when buying, designing, or troubleshooting these or subsequent devices.

Teaching Philosophy: I want each and every one of you to succeed in your career. One way to better prepare for success is to learn how to learn new material on your own. You can start that process by developing strategies that are effective for your learning. Everyone learns differently. (A learning style quiz is available at www.personal.psu.edu/bxb11/LSI/LSI.htm .) But, the more problems you attempt and solve, the more likely you will be able to learn the material and succeed in this class. I will try to learn more about your knowledge-base at this stage of your career and help you bridge the gap between your previous knowledge-base and the new material in this class. I want you to gain confidence in your ability to work and solve different electrical and computer engineering type problems in this course. This confidence should then spill over into other areas of study and follow you through your career.

Tips for Success: I will expect you to work hard in this class. In terms of time commitment, you should be prepared to spend at least 2-3 hours outside of class for every hour inside of class. You should read the appropriate sections of the textbook before coming to class. You should also review the previous lecture notes, before the next class period. The homework problems should be read and studied (for understanding) and attempted the night they are assigned. The problems are not designed to be done the night before they are due. You should attempt and turn in all of the homework assignments. To prepare for the exams, you should examine and study the homework, days before the scheduled exam. If you have questions during the semester, you are encouraged to ask them in class or during my office hours.

Text: Electrical Engineering: Principles and Applications, Fourth Edition by Allan R. Hambley, Pearson: Prentice-Hall, 2008.

Examinations: There will be three one-hour examinations and one comprehensive final examination. No make-up exams will be given. A grade of zero will be given for a missed exam. Regrading of an exam must occur within one week after the exam is given. If there are any problems or questions, see the instructor.

Homework: Ten assignments will be made during the semester. Homework will be due after class on its due date.

Accommodations: The Electrical and Computer Engineering Department is committed to meeting the needs of students with disabilities. Students requiring accommodation must discuss their needs with the instructor.

Determination of Final Grade: Your final grade in this course is based upon your rank in the class, that is, a system of *curving* is used. After each exam, the test distribution will be made available from which you can assess your performance.

(Unless an announcement is made otherwise, the examinations will be held on the following dates.)

Exam #1	(September 21)	15%
Exam #2	(October 21)	15%
Exam #3	(November 18)	15%
Homework		10%
Classroom Participation		10%
Final Exam	(December 16) (2pm - 4pm)	35%

Class Cancellations:

R	November 11	Veteran's Day
R	November 25	Thanksgiving Recess

Elements of Electrical Engineering:

By the end of this course, the student will be able to

1. solve a resistive network that is excited by an AC or a DC source.
2. solve first-order circuits involving resistors and a capacitor or an inductor.
3. derive the differential equations associated with a circuit containing one or more energy storage elements.
4. derive the complex impedance associated with a resistive, inductive, and capacitive load.
5. use the ideal op-amp properties to derive the transfer function of an op-amp circuit.
6. select a current limiting resistor in an LED circuit.
7. create a transistor-based circuit to supply the necessary current to power a DC motor.
8. analyze a circuit containing one or more diodes.
9. design a freewheeling diode circuit in an system containing an inductive load.
10. design a collection of transistors to create logic gates.
11. determine the output of a collection of logic gates for a given input pattern.
12. analyze an AC circuit containing resistors, inductors, and capacitors.
13. state the current/voltage relationships of resistors, inductors, and capacitors.
14. analyze a circuit containing a transformer.
15. design a low-pass filter with a particular bandwidth.
16. convert between decimal numbers and binary numbers.
17. explain the concept of circuit loading.

Course Outline:

Course Description and Introduction (Chapter 1)
- Circuits, Currents, and Voltages
- Power and Energy
- Kirchhoff's Current Law and Voltage Law

Resistive Circuits (Chapter 2)
- Voltage-Divider and Current-Divider
- Node-Voltage Analysis
- Mesh-Current Analysis
- Thevenin and Norton Equivalents

Inductance and Capacitance (Chapter 3)

First-Order Transients (Chapters 4)
- RC Circuits
- DC Steady-state
- RL Circuits

Sinusoidal Steady-State Analysis (Chapter 5)
- Sinusoidal Currents and Voltages
- Phasors
- Complex Impedances
- Power in AC Circuits

Operational Amplifiers (Chapter 14)
- Ideal Operational Amplifiers
- Amplifier Circuits
- Filters

Computer-based Instrumentation (Chapter 9)
- Sampling Frequency
- Signal Conditioning
- Filtering

Diodes (Chapter 10)
- Basic Diode Concepts
- Rectifier Circuits

Magnetic Circuits and Transformers (Chapter 15)
- Inductance and Mutual Inductance
- Transformers

DC Machines (Chapter 16)
- Principles of DC Machines

Transistors (Chapters 12 & 13)
- Transistors as switches
- Creating Logic Gates with Transistors
- Driving High Current Loads with Transistors