Number: ENGR 209 – on line - Summer 2010

Title: Circuit Theory I

Credits: 5 credits

Course Structure: Four hours of lecture per week. Two hours of laboratory per week. Two exams.

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Catalog Description:
This course provides electrical engineering students with the fundamentals concepts and techniques needed to systematically analyze electricity and its applications. Topics include Kirchhoff’s laws, superposition principle, mesh and nodal analysis methods, Norton’s and Thevenin’s theorem and transient and steady state response analysis.

Learning Objectives and Corresponding Mapping to ABET Criteria 3: Upon completion of this course, students will be able to:
1. Describe current, voltage, and resistance. (Criteria a, b, and e)
2. Explain the concepts of Power and Energy. (Criteria a, b, and e)
3. Describe Capacitors and Inductors. (Criteria a, b, and e)
4. Evaluate circuits using Ohm’s law, voltage divider, current divider, KCL, KVL, and network theorems. (Criteria a, b, and e)
5. Solve series and parallel circuits (DC). (Criteria a, b, and e)
6. Evaluate circuits using various analysis techniques such as Mesh analysis and Nodal analysis. (Criteria a, b, and e)
7. Evaluate OP-AMP circuits. (Criteria a, b, and e)
8. Explain magnetic circuits. (Criteria a, b, and e)
9. Solve series and parallel circuits including capacitor, inductor. (Criteria a, b, and e)
10. Analyze first order circuits in transient state and steady state. (Criteria a, b, and e)
11. Cooperation with teammates in lab tasks. (Criteria g)
12. Implement circuits using Rs, Ls, and Cs in labs and analyzing them using theories. (Criteria c, j and k)

Textbooks: J. W. Nilsson and S. A. Riedel, Electric Circuits, 9/e, Prentice Hall. 2010

Prerequisites: PHYS 153 (General Physics III).

Topics:
- Circuit Variables: Current, Voltage, Power and Energy
- Circuit Elements: Voltage Sources, Current Sources, Resistance, Ohm's Law, Kirchhoff's laws
- Simple Resistive Circuits: Series and Parallel Topologies
• Techniques of Circuit Analysis: Mesh and Nodal Analysis, Source Transformations, Thevenin and Norton Theorems, Superposition, Maximum Power Transfer
• The Operational Amplifier
• Inductance, Capacitance and Mutual Inductance
• Response of First-order RL and RC Circuits
• Response of RLC Circuits

Computer Resources: SPICE based simulations

Grading:  
A = 3.5~4.0 (90~100%), B = 3.0~3.4 (80~89%), C = 2.0~2.9(70~79%),  
D = 1.0~1.9 (60~69%), F= 0.0 (0~59%)

Assignments: 20%  
Labs 20%  
Midterm exam: 30%  
Final exam: 30%

Outcome Coverage for ABET Criteria 3:

a. An ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering. Homework and lab reports need to use various mathematic skills. Basic concepts from Physics are essential to finish this class.

b. An ability to conduct, analyze and interpret experiments and apply experimental, results to improve processes. Homework and lab reports require analyzing various circuits. To analyze and interpret experimental data, various approaches based on circuit theory are required.

c. An ability to design a system within realistic constraints. Resources are limited in lab. Students need to design circuits within various realistic constraints in lab.

e. An ability to identify, formulate and solve engineering problems. Homework and labs require identifying engineering problems, formulating them with various skills and solving them. To pass midterm and final exams, those abilities are essential.

Outcomes:

Prepared by: Claudio Talarico

Last Revised: April 26, 2010