EE 211 Basic Circuit Analysis I

Designation: Required

Catalog Description: EE 211 Basic Circuit Analysis I (4) (3 Lec, 1 3-hr Lab) Linear passive circuits, time domain analysis, transient and steady-state responses, phasors, impedance and admittance; power and energy, frequency responses, resonance. Pre: MATH 243 (or concurrent) and PHYS 272 (or concurrent), or consent. DP.

Credits: 4

Pre-requisites: Math 243 (Calculus III) and Phys 272 (General Physics II)

Class/Lab Schedule: 3 lecture hours per week, 1 3-hr. lab. per week.

Topics Covered:
- The Circuits Abstraction and Resistive Networks: V & I reference directions, power & energy, Ohm’s law, Kirchhoff’s laws, series & parallel, V & I dividers (5 hours)
- Network Theorems: node method, superposition, Thevenin and Norton equivalent networks (7 hours)
- The Digital Abstraction and MOSFET switch: MOSFET switch model and Boolean logic implementation (3 hours)
- The MOSFET amplifier: MOSFET current source model and signal amplification (3 hours)
- First-Order Circuits: capacitors and inductors, RC and RC circuits (5 hours)
- Second-Order Circuits: LC and RLC circuits (6 hours)
- AC Circuits: impedance, frequency response, and resonance (10 hours)
- The Operational Amplifier (6 hours)
- Laboratory Experiments:
  1. Lab Safety and Instrumentation
  2. P-Spice
  3. Network Theorems
  4. The MOSFET switch
  5. The MOSFET amplifier
  6. First-Order Circuits
  7. MATLAB
  8. Second-Order Circuits
  9. AC Circuits
  10. Frequency Response

Text Book and Other Required Materials:
- “Foundations of Analog and Digital Electronic Circuits” by Agarwal and Lang Electric

Course Objectives and Their Relationship to Program Objectives:
Students should understand the properties of RLC elements, MOSFETs and operational
amplifiers and learn the techniques for solving circuit problems, including zero, first, and second-order circuits. Students should be able to use and understand the principles of basic laboratory instruments. Laboratory experiments accompany the lectures to verify theory and to demonstrate the practical limitations of theory and measurement. Some design problems are included as proof of the student’s ability to apply theory. Computer-aided design (CAD) tools include PSpice and Electronics Workbench (Multisim), and MatLab for network analysis (after learning the methods of circuit analysis). [Program Objectives this course addresses: 1,2,3,4, and 5.]

**Course Outcomes and Their Relationship to Program Outcomes:**

The following are the course outcomes and the subset of Program Outcomes (numbered 1-11 in square braces "[ ]") they address:

- Understand the principles and to solve RLC and basic op amp circuits. [1,5,11]
- Conduct experiments to test and verify theory. [1,5,7,11]
- Design and test R, RC, and op amp circuits. [1,2,3,5]

**Contribution of Course to Meeting the Professional Component**

Engineering Topics: 100%

**Computer Usage:**

Students use Microsoft Excel for processing of data and presentation of charts and graphs, Electronics Workbench (or MultiSim) and PSpice for simulation, and MatLab for computation (but only for verification of answers and for networks with matrices 3x3 or larger.

**Design Credits and Features:**

There are 0.25 design credits for EE 211. The Equivalent of ½ cr for design content of includes homework problems and laboratory exercises with emphasis on implementation of functional concepts and practical applications such as an attenuator, a high-impedance probe, a timer, and filters. Corroboration of design by either simulation or breadboard.

**Person(s) Preparing Syllabus and Date:** O. Boric-Lubecke, April 9, 2009