EE 211 Basic Circuit Analysis I

Credits: 4

Categorization of credits: engineering topic

Instructors or course coordinator: Aaron Ohta

Textbook and Other Required Materials:

Ulaby, Maharbiz, and Furse, *Circuit Analysis and Design*, 2018.

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) or MATH 252A (or concurrent), and PHYS 272 (or concurrent); or consent. DP

Pre- or Co-requisites: Math 243 (Calculus III) or Math 252A (Accelerated Calculus II), and Phys 272 (General Physics II)

Class/Lab Schedule: 3 lecture hours per week, one 3-hour lab per week.

Topics Covered:

- Circuits and Resistive Networks: V & I reference directions, power & energy, Ohm's law, Kirchhoff's laws, series & parallel, V & I dividers
- Circuit analysis: nodal and mesh analysis
- Circuit theorems: superposition, source transformation, Thevenin and Norton equivalent networks
- The Operational Amplifier
- First-Order Circuits: capacitors and inductors, RC and RL circuits
- Second-Order Circuits: LC and RLC circuits
- AC Circuits: impedance, frequency response, power, and resonance
- Laboratory Experiments:
    1. Lab safety and instrumentation
    2. Series and parallel circuits
    3. Thevenin equivalent circuits
    4. Superposition
    5. Operational amplifiers
    6. Oscilloscopes
    7. Capacitors
    8. Inductors
    9. First-order circuits
    10. Second-order circuits

Course Objectives and Their Relationship to Program Objectives:

Students should understand the properties of RLC elements 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. [Program Objectives this course addresses: 1, 2, 3]

Course Outcomes and Their Relationship to Program Outcomes:

The following are the course outcomes and the subset of Program Outcomes (numbered 1-7 in square braces "[ ]") they address:

- Understand the principles and to solve RLC and basic op amp circuits. [1]
- Conduct experiments to test and verify theory. [1, 3, 6]
- Design and test R, RC, and op amp circuits. [1, 2, 5, 6]

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, and optionally MATLAB for computation (but only for verification of answers and for networks with matrices 3x3 or larger). The course makes use of Internet services such as email and the web. The course has a website, which has downloadable lecture notes and homework documents.

Design Credits and Features:

There are 0.25 design credits for EE 211. Design content 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. Designs are corroborated by either simulation or breadboard.

Person Preparing Syllabus and Date: O. Boric-Lubecke, Apr. 9, 2009. Modified by A. Ohta, Oct. 1, 2014; A. Ohta, Jan. 12, 2021.