

Course Title: COEN 2311: Circuits I
Also listed as GEEN 2314: Circuits I

Semester Credit Hours: 3 (3,1)

I. Course Overview

This course covers important theory in DC and AC circuits analysis. Topics include a review of the solution of simultaneous equations; Kirchoff's Current and Voltage Laws; nodal and mesh circuit analysis; superposition; source transformations; Thevenin and Norton Equivalent circuits; ideal op-amps; and RC, RL, and RLC circuits.

II. PMU Competencies and Learning Outcomes

Skills in understanding of DC and AC circuit theory are major components of professional competence for electrical and computer engineers. Throughout the semester, students are encouraged to apply critical thinking and problem solving skills in the class discussions and assignments. Professional communication skills (written and oral) are encouraged through discussions and assignments. Effective use of the most modern technology is integral to the development of the knowledge and skills acquired in this class.

III. Detailed Course Description

This course covers important theory in DC and AC circuits analysis. Topics include a review of the solution of simultaneous equations; Kirchoff's Current and Voltage Laws; nodal and mesh circuit analysis; superposition; source transformations; Thevenin and Norton Equivalent circuits; ideal op-amps; and RC, RL, and RLC circuits.

IV. Requirements Fulfilled

This is a required course for majors in computer engineering

V. Required Prerequisites

Successful completion of:

- MATH 1324: Calculus III
- PHYS 1422: Physics for Engineers II

Concurrent registration for:

- COEN 2111: Circuits Lab

Completion of or concurrent registration for:

- MATH 2332: Differential Equations

VI. Learning Outcomes

At the end of this course, students will:

- Be able to accurately define current, voltage, energy, and power in DC and AC circuits
- Be able to solve for current, voltage, stored energy, and power in DC and AC circuits using the following techniques: Kirchoff's current and voltage laws; node voltage analysis; mesh current analysis; superposition; and source transformations.
- Be able to define time constants for RC and RL circuits
- Be able to calculate the total response of RC, RL, and RLC circuits

In addition to these outcomes, students develop an intuitive understanding of DC and AC circuits such that they can use this intuition in the analysis and design of circuits

VII. Assessment Strategy

The assessment strategy measures students' understanding of circuit theory and apply the knowledge acquired in the analysis and design. This is achieved in the following ways:

- Class participation is used to help indicate to the instructor and the student his or her level of involvement and understanding.
- Homework assignments are used to provide feedback to students and to indicate individual progress in meeting course goals
- Mid-term examinations are used to indicate students' developing level of mastery of the topics of the course
- An end-of-semester final examination is used to measure the student's mastery in understanding and application of the knowledge integral to the course.

Assessment in this course is designed to assist students to further their understanding of the university's learning objectives. In cooperation with the instructor, each student select two design assignments to become a part of the student's portfolio.

VIII. Course Format

The course consists of lectures, class discussions, homework assignments to be completed outside of class, and examinations. Students prepare for class by reading the text and additional materials and by completion of assignments so that they may be discussed in class are expected as indicators of students' commitment to professional growth. In addition, a recitation session is used to give students practice and supervised instruction in the analysis of DC and AC circuits.

Classroom Hours:

Class lecture: 3 hours per week

Recitation Session: 1 hour per week

IX. Topics to be Covered

- A. Definition of physical quantities: current, voltage, energy, and power
- B. Basic circuit components
- C. Voltage and current laws
- D. Nodal and mesh analysis
- E. Superposition and source transformation
- F. Thevenin and Norton equivalent circuits
- G. Operational amplifiers
- H. Capacitors and inductors
- I. RL and RC circuits
- J. RLC circuits

X. Laboratory Exercises

There are no laboratory exercises associated with this course. Students receive this experience in COEN 2111: Circuits I Lab.

XI. Technology Component

Students in this class are expected to have a computer account with the appropriate server to enable class communications. Media assisted instruction is a tool in this class. Use of appropriate technology for analysis of data and completion of problems is required, for example, use of a scientific calculator, and use of student owned laptop. Students utilize the application software packages (MATLAB and PSPICE) in homework problems.

XII. Special Projects/Activities

A student project is not required for this class.

XIII. Textbooks and Teaching Aids

A. Required Textbook

William Hayat, Jack Kemmerly, and Steven Durbin, *Engineering Circuit Analysis*, Sixth Edition, McGraw-Hill, 2002

B. Alternative Textbooks

None

C. Supplemental Textbooks

John O'Malley, *Schaum's Outline of Basic Circuit Analysis*, Second Edition, McGraw-Hill, 1992.

D. Supplemental Materials

1. Scientific calculator
2. Laptop Computer
3. MATLAB[®] and PSPICE[®] access either on laptop or in a general purpose computer lab
4. Engineering paper
5. CRC Standard Mathematical Tables and Formulae, Daniel Zwillinger