**EECE 2010 Electric Circuits 1**

**Credits and contact hours:** 3 credit course, meeting for 3 50-minute periods each week.

**Course coordinator:** Dr. Nathan Weise

**Text:** James W. Nilsson and Susan A. Riedel, Electric Circuits, 10th. ed., Prentice-Hall, Englewood Cliffs, NJ, 2011, bundled with Mastering Electric Circuits web access

**Catalog description:** Ohm's law and Kirchhoff's laws. Mesh and loop analysis of resistive circuits with DC sources. Source transformations. Thevenin's and Norton's theorems. Natural and step response of first- and second-order circuits. Circuits with ideal op amps.

**Prerequisites:** MATH 1451 Calculus 2 or MATH 1455 Calculus 2 for Biomedical Engineers, either of which may be taken concurrently.

**Required**

**Professional component:**

Engineering science – 40%

Engineering design – 60%

**Course Goals:**

* Introduce basic circuit quantities such as: current, voltage, and power.
* Introduce basic circuit components such as: voltage sources, resistors, capacitors, and inductors.
* Introduce basic circuit theorems such as: Ohm’s law, Kirchhoff’s voltage law, and Kirchhoff’s current law.
* Introduce basic resistive circuit models and analysis techniques including: resistors in series, resistors in parallel, voltage division, current division.
* Introduce general circuit analysis techniques such as: node-voltage method, mesh-current method, source transformations, Thevenin and Norton equivalents, maximum power transfer theorem, and superposition
* Introduce the operational amplifier and common circuits such as: inverting amplifiers, non-inverting amplifiers, summing amplifiers, difference amplifiers
* Introduce the natural and step responses of first order RL and RC circuits
* Introduce the natural and step responses of second order RLC circuits

**Specific outcomes of instruction***By the end of this course, students should be able to:*

* 1. Describe the electrical characteristics of voltage sources, current sources, resistors, inductors, and capacitors.
  2. Use Ohm’s law to solve simple DC circuits.
  3. Apply Kirchhoff’s circuit laws to DC circuits and be able to explain how KCL and KVL lead to appropriate standard circuit analysis techniques.
  4. Identify and analyze Voltage and current dividers
  5. Use standard circuit analysis techniques for DC circuits including the node-voltage method, the mesh-current method, source transformations, Thevenin and Norton equivalents.
  6. Analyze common operational amplifier circuits including: the inverting amplifier, the non-inverting amplifier, the inverting summing amplifier, the difference amplifier.
  7. Identify and analyze first order RL and RC circuits including series and parallel circuits, the natural response (non-driven), the step response (DC source driven).
  8. Identify and analyze second order RLC circuits including: series and parallel circuits, the natural response (non-driven), the step response (DC source driven), over-, under-, and critically damped systems.

**Student outcomes addressed by the course:**Partial fulfillment of Criterion 3 objectives A, E, and G

**Brief list of topics to be covered**

Chapter 1: Circuit Variables

Chapter 2: Circuit Elements

Chapter 3: Simple Resistive Circuits

Chapter 4: Techniques of Circuit Analysis

Chapter 5: The Operational Amplifier

Chapter 6: Inductance, Capacitance and Mutual Inductance

Chapter 7: Response of First Order RL and RC Circuits

Chapter 8: Natural and Step Response of RLC Circuits

Last modified: December 4, 2017