

ECE 200 – Spring 2003

Electric Circuits

Course (catalog) description	Resistive circuits. Loop and nodal analysis. Network theorems. Capacitor and inductor circuits. Transient analysis. Forced response. Sinusoidal steady-state response. Frequency response. Introduction to computer-aided analysis.
Prerequisite(s)	CSE 101 or CSE 131 or CSE 230; MTH 234; Co-requisite: MTH 235 concurrently
Textbook(s) and/or other required material	Thomas & Rosa, <i>The analysis and Design of Linear Circuits</i> , Prentice-Hall, 3 rd Ed., 2001 G.M. Wierzba, <i>ECE200 Lecture Notes & Solved Problems CD.</i> , Anthony Copy center, Rm. 1277 Anthony Hall
Course objectives	<p>This course introduces the student to electric and electronic circuit analysis. This is done first with DC circuits. Here analysis theorems are presented and used to predict circuit response. Software is also used to analyze more complicated circuits. Next circuit response versus time is introduced by exploring the transient response of inductor and capacitor circuits. Lastly, AC steady-state circuits are explained using a transformation into the frequency domain. This topic is further explored with power transfer and frequency response.</p> <p>At the completion of this course, each student should be able to do the following:</p> <ol style="list-style-type: none">1. Understand the properties of basic circuit elements including controlled sources and op-amps2. Analyze DC circuits3. Analyze first order RL and RC circuits4. Analyze AC circuits5. Apply network theorems for circuit analysis6. Understand the importance of resonance7. Understand complex power8. Understand electrical safety
Topics covered	.Circuit variables: Charge, current, voltage, energy, power; Circuit elements: Voltage and current independent sources, dependent sources; resistance Kirchhoff's current and voltage laws; Cramer' rule; Power check; Electrical safety; Simplification theorems: Resistances in series and parallel; Voltage and current; divider; Delta-to-wye and Wye-to-Delta transformations; Measuring voltage and current; Wheatstone bridge; Techniques of circuit analysis: Nodal analysis; mesh analysis; Circuit analysis using Pspice; Determinant; evaluation using MATLAB; Source transformations; Superposition and linearity; Thevenin and Norton Theorems; Maximum power transfer; Operational amplifiers; Inductance and capacitance; Natural response of RL and RC circuits; Significance of time constants; Step response of RL and RC circuits; Sequential switching; Switch modeling in Pspice; Op-amp integrator; Sinusoidal steady-state analysis; Root-mean-square; Euler's identity; Phasors; Impedance and admittance; Circuit theorems in the frequency domain; Frequency domain analysis

using Pspice; Complex determinants using MATLAB; Phasor diagrams; Series and parallel resonance; Complex power; Power factor and power factor correction; Residential wiring; Grounding and ground fault circuit interrupter; Maximum average power transfer; Ideal transformer; Balanced three-phase circuits; Wye-to-wye three-phase circuit analysis; Wye-to-delta three-phase circuit analysis; Power calculations in three-phase circuits; Measuring average power in three-phase circuits: two-Wattmeter method; Bode plots using basic forms; Real and complex roots; Low-pass, high-pass, and band-pass filters.

Contribution of course to meeting the professional component

- a. College-level mathematics and basic sciences—0 credits with experimental experience—yes or no
- b. Engineering topics—4 credits
- c. General education—0 credits

Relationship of course to program objectives

The following measurement standard is used to evaluate the relationship between the course objectives and selected educational-program objectives:

1 = Strong Emphasis, 2 = Emphasis, 3 = Minor Emphasis, 4= No Emphasis
Indicate the actual relationship and the desired goal as: actual/goal

- a. an ability to apply knowledge of mathematics, science, and engineering—1/1
- b. an ability to design and conduct experiments, as well as to analyze and interpret data—4/4
- c. an ability to design a system, component, or process to meet desired needs—4/4
- d. an ability to function on multi-disciplinary teams—4/4
- e. an ability to identify, formulate, and solve engineering problems—4/4
- f. an understanding of professional and ethical responsibility—4/4
- g. an ability to communicate effectively—3/3
- h. the broad education necessary to understand the impact of engineering solutions in a global/societal context—4/4
- i. a recognition of the need for and the ability to engage in life-long learning—3/3
- j. a knowledge of contemporary issues—4/4
- k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice—1/1
- l. a knowledge of probability and statistics, including applications appropriate to the program name—4/4
- m. a knowledge of advanced mathematics, typically including differential equations, linear algebra and complex variables (EE only)—1/1
- n. A knowledge of discrete mathematics—4/4
- o. Engaged in a major engineering design experience—4/4
- p. an ability to design complex devices and systems containing both hardware and software components—4/4

Class/laboratory schedule

4(4-0) Four 50 minute lectures per week