

EE 2001 - Introduction to Circuits and Electronics

Required or Elective:

Required

Catalog Description:

(3.0 cr; Prereq- & Phys 1302, & is required in Math 2243, 2373, 2573; fall, spring, summer, every year)

Physical principles underlying circuit element models. Kirchhoff's laws. Independent and dependent sources. Opamps. Linearity in circuits. Diodes and rectification. FET characteristics, biasing, small signal models, and simple amplifiers. Transients in first- and second-order circuits. CMOS-based logic gates. Introduction to circuit simulators.

Contact Hours:

3 hours of lecture, 1 hour of discussion per week

Text:

Electric Circuits, James W. Nilsson and Susan A. Riedel, 9th Ed., Prentice-Hall

Microelectronic Circuits, Adel S. Sedra and Kenneth C. Smith, 6th Ed., Oxford Univ. Press

Prerequisites by Topic:

Differential equations, electricity, and magnetism.

Course Objectives:

Students completing this course should have:

- 1) An understanding of nodal and mesh analysis of simple resistive circuits and the concept of linearity.
- 2) An understanding of the biasing of diodes and their use in rectification.
- 3) An understanding of the characteristics and biasing of field effect transistors.
- 4) An understanding of the small signal models of FETs and their use in elementary amplifiers.
- 5) An understanding of first and second-order transients in RL, RC, and RLC circuits.
- 6) An understanding of logic inverter specifications.
- 7) An understanding of CMOS-based logic inverters and basic CMOS logic gates.
- 8) An understanding of how to use Spice-based circuit simulators.

Instructor:

Varies from semester to semester. Several ECE faculty rotate teaching this course

Assessment: (percentages are approximate and vary somewhat with instructor)

Weekly problem assignments - 10%

Hour (mid-term) Exams (one or two) 40%

Quizzes (some unannounced) - 10%

Final exam - 40%

Course Outline:

Week #	Lecture Topic	# of Hours	Chapter
1	Basic circuit concepts	3	NR-1,2,3.1-3.5
2	Basic circuit concepts	2	NR-1,2,3.1-3.5
	Circuit theorems	1	NR-4
3	Circuit theorems	3	NR-4
4	Circuit theorems	1	NR -4
	Diodes	2	SS-4
5	Diodes and rectification	3	SS-4
6	Hour Exam#1	1	
	MOSFET characteristics, load lines, and biasing	2	SS-5
7	MOSFET characteristics, load lines, and biasing	2	SS-5
	MOSFET single transistor amplifiers	2	SS-5
8	MOSFET single transistor amplifiers	2	SS-5
	Op Amps	1	SS-2, NR-5
9	Op Amps	3	NR-5, SS-2
10	RC, RL, and RLC transients	3	NR-6,7,8
11	Hour Exam#2	1	
	RC, RL, and RLC transients	2	NR- 6,7,8
12	RC, RL, and RLC transients	1	NR-6,7,8
	Digital Logic Inverter electrical specifications	2	SS-13.1
13	CMOS Inverter	3	SS-13.1-3
14	CMOS Inverter	1	SS, 13.1-3
	CMOS Logic Gates	2	SS-13.4
15	CMOS Logic Gates	1	SS-13.4
	Review	1-2	

NR = Nilsson and Riedel SS = Sedra and Smith

Relationship to Professional Component:

This course is part of the engineering science an engineering design requirement of the professional component.

Relationship to Program Outcomes:

In accordance with ABET accreditation criteria, all engineering programs must demonstrate that their students achieve certain outcomes. Of the outcomes listed in the ABET criteria (enumerated as (a) through (k)), this course teaches skills which help the student achieve the following outcomes:

- (a) an ability to apply knowledge of mathematics, science, and engineering
- (e) an ability to identify, formulate, and solve engineering problems
- (i) a recognition of the need for, and an ability to engage in life-long learning
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Prepared by: William P. Robbins, Spring 2011