EEE 334 Circuits II (4) [F, S]

Course (Catalog) description:
Application of electric network theory to semiconductor electronics. Design of analog and digital circuits. Diodes and MOSFETS. Digital and analog circuit building blocks. Fundamentals of mixed signal circuits.
Lecture, Lab. Required.

Pre-requisites:
Engineering BS/BSE student and a grade of D or better in ECE201 or EEE202

Textbook:
A.S. Sedra and K.C. Smith, Microelectronic Circuits, 6th ed., Oxford University Press, 2009
Supplemental Materials:
M.E. Herniter, Schematic Capture with MicrosimTM PSpice, Prentice Hall, 2002

Coordinator:
Profs. Hugh Barnaby and Sule Ozev

Prerequisites by Topic:
Circuits I

Course Objectives:
Application of electric network theory to analysis and design of the fundamental non-linear circuits of transistor electronics.

Course Outcomes:
1. Apply electric network theory to semiconductor circuits containing diodes, transistors, operational amplifiers and digital logic gates.
2. Learn to distinguish DC bias from small-signal analysis
3. Analyze basic diode circuits
4. Understand basic analog MOS circuits
5. Learn topology and operation of CMOS digital gates
6. Understand topology, operation and applications of current mirrors and active load circuits

Course Topics:

Topics	**Suggested Time**	**Book Section**
Operational Amplifiers	1 – 2 weeks	Chap 2
Diodes	2 weeks	Chap 4
MOS Large Signal Operation	2 weeks	Chap 5.1 – 5.3

MOS Small Signal	1 week	Chap 5.4 – 5.5, 5.7
Single Stage MOS Amplifiers	4 weeks	Chap 5.6, 5.8, 7.2
Digital Circuits (Inverter, CMOS gates)	2 weeks	Chap 13
Differential Amplifier (*optional*)	1 – 2 weeks	Chap 8

Computer Usage:
PSPICE and MATLAB

Lab 1 PSPICE and Lab Orientation – Instruments and Measurements
Lab 2 Operational Amplifiers
Lab 3 PN Junction Diodes and Applications
Lab 4 MOS Characterizations
Lab 5 Single Stage MOS Amplifiers (Passive and Active Loads)
Lab 6 Introduction to Digital Circuits
Lab 7 *(Honors Only)* Design and Audio Amplifier using MOS Transistor

Assessment:
Through homeworks, quizzes, tests, final exam, and laboratory.
Distribution of Weights: Homework: 10%, Midterm 1: 20%, Midterm 2: 20%, Lab: 15%, Final: 35%

Course Contribution to Engineering Science and Design:
EEE334 contributes to engineering science through linear and non-linear circuit analysis, problem solving, computer simulations and synthesis of device physics and circuit analysis for the purpose of integrated circuit design.

Course Relationship to Program Outcomes:
a: "Fundamentals of integrated circuit design" is a marketable skill essential for students who will specialize in circuit design as well as for those who will go into technical sales and related areas. This course also provides a solid foundation for further engineering education and additional training in applications of the mathematical techniques of the electrical network theory.
e: During both the instruction and the lab the students study problems in the circuit area that are both open-ended and more complex.
k:Students also use circuit simulator and modern laboratory equipment.

Person preparing this description and date of preparation: Gennady Gildenblat, September 10, 2008. Updated July 2012 S. H. Barnaby