

ENG EC410 Introduction to Electronics

2008-2009 Catalog Data:

Prereq: ENG EK 307. Principles of diode, BJT, and MOSFET circuits. Graphical and analytical means of analysis. Piecewise linear modeling; amplifiers; digital inverters and logic gates. Biasing and small-signal analysis, microelectronic design techniques. Time-domain and frequency domain analysis and design. Includes lab. 4 cr.

Class/Lab Schedule:

LEC: 4 hrs/wk (1 section, TR10-12), DIS: 1 hr/wk (3 sections), LAB: 2hr/wk (3 sections)

Status in the Curriculum: Required

Textbooks and other required materials:

Text: R. Jaeger & T. Blalock, Microelectronic Circuit Design, 3rd edition, McGraw-Hill, 2008

Lab Manual: M. Horenstein, Lab Manual for EC410, on-line, download from ECE website

References:

Horenstein, Microelectronic Circuits & Devices, Prentice-Hall, 1996.

J. G. Tront, PSPICE for Basic Microelectronics, McGraw-Hill, 2008.

Razavi, Fundamentals of Microelectronics, Wiley, 2008.

R.W. Goody, MicroSim PSpice for Windows Volume 1: DC, AC, and Devices & Circuits, 2nd Edition, Prentice-Hall, 1998.

Coordinator:

Alexander V. Sergienko, Associate Professor, ECE Department

Prerequisites by topic:

ENGEK307: Introductory Circuit Theory

Goals:

To provide students with:

- 1 Thorough understanding of the theoretical underpinnings of active electronics circuits and its elements.
- 2 Extensive experience in the analysis and design of electronics amplifiers and elements of logic gates.
- 3 An experience with practical characterization of nonlinear circuit elements and implementation of amplifiers and logic gates.

Course Outcomes:

As an outcome of completing this course, students should be able to:

- 1) *Understand* how the Thevenin equivalent and graphical load line analysis is used

- to analyze the performance of electrical circuits with nonlinear elements.
- 2) *Understand* the principle of operation of semiconductor diodes including Zener diode.
 - 3) *Understand* the operation of diode circuits such as clipping, limiting circuits, and power supplies.
 - 4) *Understand* the fundamentals of MOSFET and BJT transistors and their operation principles.
 - 5) *Understand* the principles of biasing transistor amplifiers.
 - 6) *Understand* the concepts of frequency-domain response of transistor amplifiers.
 - 7) *Understand* the relations between analog and digital electronic devices.
 - 8) *Understand* the principles of calculating noise parameters of logic gates.
 - 9) *Understand* the dynamics behavior and specifics of implementation of fast switching in CMOS and NMOS logic gates.
 - 10) *Design* a voltage regulator circuit (power supply).
 - 11) *Design* a specific voltage or current amplifier.
 - 12) *Implement and test* parameters of clipping and limiting diode circuits.
 - 13) *Implement and test* parameters of BJT and MOSFET inverting transistor amplifier.
 - 14) *Implement and test* the frequency response of the common emitter amplifier.
 - 15) *Implement and test* NMOS and CMOS logic gates.
 - 16) *Implement and test* propagation delay of a CMOS logic gate.
 - 17) *Discover* the differences between parameters of commercially available diodes and transistors.
 - 18) *Write reports* on laboratory projects.

Course Outcomes mapped to Program Outcomes:

Program Outcomes:	a	b	c	d	e	f	g	h	i	j	k
Course Outcomes:	1-9	10-16	10-16	12-16	1-18	1,18	18	1-9,18	12-18	1-18	10-17
Emphasis:	5	5	4	3	5	3	5	3	4	5	5

1=not at all; 5=a great deal;

Contribution of Course to Meeting the Professional Component:

Engineering topics: 100%

Math & Basic Science: 0%

General Education: 0%

Prepared by: A. V. Sergienko, Professor, ECE Department

Date: May 28, 2009