

EECS 170A ELECTRONICS I
(Required for CpE, EE and MSE)

- Catalog Data:** **EECS 170A Electronics I (Credit Units: 4)** The properties of semiconductors, electronic conduction in solids, the physics and operation principles of semiconductor devices such as diodes and transistors, transistor equivalent circuits, and transistor amplifiers. Corequisite: Physics 7E. Prerequisites: EECS70A, Physics 7D. Formerly ECE113A. (Design units: 1)
- Textbook:** Anderson & Anderson, *Fundamentals of Semiconductor Devices*, 1st edition, McGraw Hill, 2005.
Or
Pierret, Robert F. *Semiconductor Device Fundamentals*, Addison-Wesley, 1996.
- References:**
- Coordinator:** Peter Burke
- Course Objectives:** To understand the properties of semiconductors.
To understand electronic conduction in solids.
To understand the physics and operation principles of diodes and transistors.
To learn transistor equivalent circuits.
Ability to analyze and design single-stage amplifiers.
- Course Outcomes:** Students will:
Describe the properties of semiconductors.
Describe carrier transport in semiconductors.
Analyze p-n junction diodes and bipolar junction transistors.
Describe transistor equivalent circuits and single stage amplifiers.
Design doping processes, basic p-n junction diodes, basic bipolar junction transistors, and single-stage transistor amplifiers.
- Prerequisites By Topic:** Calculus, fundamental electromagnetic theory, fundamental atomic physics, basic quantum mechanics, and fundamental circuit analysis.
- Lecture Topics:** Semiconductor materials and applications
Energy band and crystal structure of semiconductors
Charge carriers in semiconductors
Carrier transport in semiconductors
Prototype PN Homo junction
Metal-semiconductor junctions
Bipolar junction transistors (BJT)
BJT models equivalent circuits
Single stage amplifiers
MOSFET fundamentals and CMOS technology
- Class Schedule:** Meets for 3 hours of lecture and 1 hour of discussion each week for 10 weeks.

Computer Usage:

Laboratory Projects:

Professional Component: Contributes toward the Computer Engineering Topics Courses and Electrical Engineering Topics Courses and Major Design experience.

Relationship to Program Outcomes: This course relates to Program Outcomes a, and g as stated at: <http://undergraduate.eng.uci.edu/degreeprograms/electrical/mission>

Design Content Description

Approach: Three weeks of this course are devoted to elementary design of doping processes, p-n junction diodes, bipolar junction transistors, and transistor amplifiers. In particular, time is devoted to the design of doping processes; the design of basic p-n junction diodes; the design of bipolar junction transistors; and the design of single stage transistor amplifiers.

Homework: 50%

Lectures: 100%

Laboratory Portion:

Grading Criteria:

Homework: 5%

Midterm: 45%

Final exam: 50%

100%

Estimated ABET Category Content:

Mathematics and Basic Science: 0 credit units or 0%

Engineering Science: 3 credit units or 75%

Engineering Design: 1 credit units or 25%

Prepared by: Peter J. Burke **Date:** July 2007

CEP Approved: Fall 2004