

## EE 323 Microelectronic Circuits I

**Credits:** 3

**Categorization of credits:** engineering topic

**Instructors or course coordinator:** Aaron Ohta

**Textbook and Other Required Materials:**

A.S. Sedra & K.C. Smith, *Microelectronic Circuits*, 7th edition. New York: Oxford University Press, 2015.

**Designation:** Required

**Catalog Description:** EE 323 Microelectronic Circuits I (3) Semiconductor structures, operating principles and characteristics of diodes and amplifying devices. Their application as circuit elements in building basic digital, analog, and integrated circuit subsystems. Pre: 213. DP

**Pre- or Co-requisites:** Pre-req: EE 213 (Basic Circuit Analysis II).

**Class/Lab Schedule:** 3 lecture hours per week.

**Topics Covered:**

- Diodes – physics, operation, characteristics
- Amplifiers and operational amplifiers – operation, configurations, applications
- MOSFETs – physics, operation, characteristics, applications
- MOSFET single-stage amplifiers

**Course Objectives and Their Relationship to Program Objectives:**

Understand the basic elements of microelectronic circuits, including diodes and MOSFETs. Understand device structures, operating principles, and characteristics. Be able to use circuit models for the design of amplifiers using op amps and MOSFETs.

[Program Objectives this course addresses: 1, 2, 7.]

**Course Outcomes and Their Relationship to Program Outcomes:**

The following are the course outcomes and the subset of Program Outcomes (numbered 1-7 in square braces "[ ]") they address:

- Understand the operating principles of diodes and their behavior in circuits. Be able to design and analyze diode circuits including rectifier circuits. [1, 2, 4, 7]
- Understand amplifier models and how to use them to design and analyze amplifier circuits. [1, 2, 4, 7]
- Understand the principles of op amps and op amp circuits, including non-ideal effects. Be able to design and analyze op amp circuits to meet design specifications. [1, 2, 4, 7]

- Understand the operating principles of MOSFETs and their behavior in circuits. Be able to design and analyze circuits that use MOSFETs as switches or as single-stage amplifiers. Able to account for frequency effects and non-ideal effects in amplifier circuits. [1, 2, 4, 7]

### **Contribution of Course to Meeting the Professional Component**

Engineering Topics: 100%

### **Computer Usage:**

Students use mathematics software for design calculations. They can also use SPICE for circuit simulations. The course has a web site, which has downloadable lecture notes and homework documents.

### **Design Credits and Features:**

EE 323 has 1 design credit, as many of the circuit design assignments include design specifications and constraints that must be met.

**Person Preparing Syllabus and Date:** A. Ohta, Jan. 14, 2021.