

## **EE 328 Microcircuit Fabrication**

**Credits:** 3

**Categorization of credits:** engineering topic

**Instructors or course coordinator:** Aaron Ohta

**Textbook and Other Required Materials:**

“Silicon VLSI Technology,” by Plummer, Deal and Griffin (Prentice Hall): Required

“The Science and Engineering of Microelectronic Fabrication,” by Stephen A. Campbell (Oxford): Reference

Donald Neaman, Semiconductor Physics and Devices, 4th edition. New York: McGraw-Hill, 2012: Reference

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

**Designation:** Elective

**Catalog Description:**

EE 328 Microcircuit Fabrication (3) (3 Lec.) Technology principles, materials, and methods for the design and fabrication of semiconductor devices, integrated circuits, and microelectromechanical systems. Pre: 327 or consent. Co-requisite: 328L. DP

**Pre-requisites:** EE 327 Theory and Design of IC Devices

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

**Topics Covered:**

- Wafer production and cleanroom principles
- Microfabrication techniques: additive and subtractive processes, lithography
- Design and fabrication of semiconductor devices / MEMS
- Introduction to microfluidics
- Design and fabrication of microfluidic devices
- Principles of CMOS IC processing

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

A student should develop an understanding of the (i) principles and techniques for IC processing, the historical and driving role of CMOS production, (ii) MEMS principles and techniques, (iii) current industrial equipment and manufacturing, (iv) and the extension of these fabrication technologies to new and coming device and circuit fabrication challenges. [Program Objectives this course addresses: 1, 2, 4]

## **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:

- Design fabrication processes to realize semiconductor and electromechanical functions. [1, 2]
- Understand the relationship between material science, chemistry, semiconductor theory, mechanical engineering, circuit theory, circuit layout, and processing techniques. [1]
- Understand principles and processes for fabrication tools and clean-room based manufacturing. [1, 4]
- Characterize substrates and process outcomes. [1]
- Use common processing equipment and techniques to address new fabrication challenges. [1, 2, 7]
- Interact with technologists involved at all stages of the IC fabrication process [1, 5]
- Communicate solutions to fabrication challenges to others. [1, 3]

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

Engineering topics: 100%

## **Computer Usage:**

Computers are used for mask designs and MEMS simulations, literature research, and presentation preparation in about 20% of assignments.

## **Design Credits and Features:**

1 design credit. Device design and relationship to layout, materials and processes available, and design of process flows.

**Person Preparing Syllabus and Date:** V. Lubecke, Oct. 7, 2014. Modified by A. Ohta, Jan. 14, 2021.