486mcd2018

Master Course Description for EE-486 (ABET sheet)

Title: Fundamentals of Integrated Circuit Technology

Credits: 3

UW Course Catalog Description:

Coordinator: Scott T. Dunham, Professor, Electrical and Computer Engineering

Goals: To develop a working knowledge of the methods of integrated circuit fabrication.

Learning Objectives: At the end of this course, students will be able to:

1. *Design and analyze* a process sequence for manufacture of microelectronic chips.
2. *Understand* the physical and chemical bases for the common IC processes.
3. *Explain* how the limitations of the materials and fabrication methods lead to limitations in device characteristics.

Textbook: Plummer, Griffin and Deal, *Silicon VLSI Technology*, 2nd Ed., Prentice Hall, 2008.

Reference: None

Prerequisites by Topic: An introduction to semiconductor devices and materials.

Topics:

1. Course Introduction and Review of Semiconductors and Devices (Chap. 1)
2. IC Fabrication Process Overview (Chap. 2)
3. Semiconductor Substrates and Defects (Chap. 3)
4. Impurity Diffusion (Chap. 7)
5. Ion Implantation (Chap. 8)
6. Thermal Oxidation of Silicon (Chap. 6)
7. Thin Film Deposition (Chap. 9)
8. Etching (Chap. 10)
9. Back End (Chap. 11)
10. Lithography (Chap. 5)
11. Latest Technologies

Course Structure: The class meets twice weekly for periods that average 75 minutes. There is a weekly homework assignment, a midterm exam, and a final.

Computer Resources: Students will use the ECE Linux Cluster for running advanced technology computer aided design (TCAD) software (e.g., Synopsys Sentaurus Process).

Grading: Course grading will be based upon homework (20%), the midterm exam (35%) and the final (45%).

ABET Student Outcome Coverage: This course addresses the following outcomes:

H = high relevance, M = medium relevance, L = low relevance to course.

(1) *An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics* **(H)** In almost every lecture, math, science and engineering knowledge will be developed in the student. This includes detailed discussion of the physics, chemistry and technology of silicon planar processing and its mathematical simulation. The homework and exams will test various aspects of the math, science and engineering knowledge developed by the students. The homework problems challenge the students to identify engineering problems that evolve from a high-level design objective, and to formulate a methodology for achieving success, and ultimately to solve the problem.

(2) *An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors* **(M)** Homework assignments include process design problems in which the students design process sequences for the fabrication of simple device structures with specified characteristics within manufacturability and safety guidelines. A state-of-the-art technology computer aided design (TCAD) software package is used in the course, and students use that tool for design of more complicated processes. Design will be included on most homeworks, as well as on exams, contributing about 20% of the final grade.

Prepared By: Scott T. Dunham

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