

EE 397E – Introduction to Nanoelectronics

Designation: This course may substitute for ESCI 314, the course in electronics devices and materials Required of EE majors.

Description: This introductory course will provide the background needed to understand the physics and technology of nanoelectronic devices. The lecture material will focus on the technologically most significant nanoelectronic device, the silicon metal oxide semiconductor field effect transistor (Si-MOSFET).

Prerequisites: PHYS 211, E E 210. Prerequisite or Concurrent: E E 310, EE 330.

Prerequisites by Topics:

1. Understanding and the ability to use differential equations, linear algebra, and complex variables in the solution of linear circuits.
2. Understanding of basic linear circuit analysis.
3. Understanding of basic electromagnetics.

Textbook/Required Materials: *Principles of Semiconductor Devices*, by Sima Dimitrijevic. Oxford University Press, 2006.

Learning Outcomes:

Students should be able to:

- understand crystal structure of silicon
- understand introductory quantum mechanical concepts and bandstructure formulation
- understand conduction in classical semiconductors
- understand the simple theory of Si-MOSFET operation
- understand the basics of Si-MOSFET process technology

Topics:

- crystal structure of silicon
- quantum mechanical concepts
- bandstructure formulation
- classical semiconductors
- Si-MOSFET

Class/laboratory schedule: Three 50-minute lectures per week.

Contribution to Meeting the Requirements of Criterion 5. Curriculum:

This course provides a design emphasis in the area of solid-state devices. It is a prerequisite to senior level electives on solid-state fabrication technology (EE 418) and advanced solid state device physics (EE 419).

Relationship to Program Outcomes:

- O.1.1. Graduates will possess mathematics skills necessary for electrical engineering.
- O.1.2. Graduates will have a theoretical and practical background in both physics and chemistry.
- O.2.2. Graduates will understand electronic devices.
- O.4.2. Graduates will develop an appreciation of continuing educational and professional development.
- O.6. Graduates will appreciate their role as engineers in society.

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Date: June 6, 2008