Department of Electrical and Computer Engineering
New Jersey Institute of Technology

ECE 374: Introduction to Semiconductor Devices (3 credits, 3 contact hours, required course)

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Course Description:  
This course addresses electronic devices on a fundamental level. Topics include semiconductor materials, p/n junctions, Schottky barriers, transistors (including bipolar junction transistors and metal-oxide-semiconductor field-effect transistors), light emitters, photodetectors and solar cells. It provides a broad background for advanced courses in electronics, photonics and integrated circuit design.

Prerequisite:  ECE students - ECE 271, instructor permission  Corequisite: none

Specific course learning outcomes (CLO): The student will be able to

1. understand major properties of semiconductor materials, explain energy band diagrams and connections with the device structures and properties;
2. understand and utilize the basic governing equations to analyze semiconductor devices; design semiconductor devices and calculate device characteristics;
3. quantitatively evaluate limitations in design of circuits based on specific semiconductor devices;
4. understand and outline major steps of semiconductor device fabrication and microelectronic industry trends.

Relevant student outcomes (ABET criterion 3):

(a) an ability to apply knowledge of mathematics, science, and engineering (CLO 1, 2, 3)
(b) an ability to design and conduct experiments, as well as to analyze and interpret data (CLO 1, 2, 3)
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (CLO 3, 4)
(f) an understanding of professional and ethical responsibility (CLO 3, 4)
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (CLO 4)
(i) a recognition of the need for, and an ability to engage in life-long learning (CLO 3, 4)
(j) a knowledge of contemporary issues (CO 4)
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (CLO 3, 4).

Computer assisted design and course specific software:
PSpice, Multisim, Kaleidagraph

This course outline serves to provide a big picture of the course. Instructional materials such as textbooks, individual topics, and grading policy are subject to revision and changes by individual instructors.
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