ESE 231: INTRODUCTION TO SEMICONDUCTOR DEVICES
Spring 2011

Stony Brook University
Department of Electrical and Computer Engineering

COURSE DESCRIPTION

The course covers physical principles of operation of semiconductor devices. Energy bands, transport properties and generation recombination phenomena in bulk semiconductors are covered first. Junctions between semiconductors and metal-semiconductor will then be studied. Equipped with an understanding of the character of physical phenomena in semiconductors, students learn the principles of operation p-n junction diodes, metal-semiconductor contacts, bipolar junction transistors, field effect transistors. This course will provide general background for subsequent courses in electronics.

Prerequisites: AMS 361 or MAT 303 and PHY 127 or 132/134 or 142 3 credits

Instructor	Ridha Kamoua, 237 Light Engineering ridha@ece.sunysb.edu
Office Hours	M 12:20Pm – 2:20pm W 12:20pm-2:20pm
Class Time	M,W: 2:20 – 3:40, Rm W4530 Library

TEXTBOOK

"An Introduction to Semiconductor Devices" Donald Neamen, McGraw Hill, 2006, ISBN 9780072987560

On-line Blackboard site:

You can access Blackboard at: http://blackboard.sunysb.edu. Homework assignments, homework and exam solutions, and other pertinent information will be posted on the course's Blackboard site. If you used Blackboard during the previous semester, your login information (Username and Password) has not changed. If you have never used Stony Brook's Blackboard system, you will need your Net ID username and password. To look up or set your Net ID, you need to login to SOLAR. For help or more information see:

http://www.sinc.stonybrook.edu/helpdesk/bb.shtml

For problems logging in, go to the helpdesk in the Main Library SINC Site or the Union SINC Site. You can also call: 631-632-9602 or e-mail: helpme@ic.sunysb.edu

GRADING SYSTEM

Homework accounts for 10% of the final grade, Class Portfolio accounts for 5%, a term paper for 5%, two exams for 25% each, and a final exam for 30%. **No Makeup Exams**

Homework	10%	
Class Portfolio, paper	5% each	Due last day of classes
Exam 1	25%	
Exam 2	25%	
Final	30%	

COURSE OUTLINE

1. ***Introductory Physical Concepts*** ***Chapters 1, 2, 3***
   - Crystal Structure of Semiconductors
   - Energy Band Model
   - Fermi Energy Level
   - Semiconductor Doping
2. ***Carrier Transport and Excess Carriers in Semiconductors*** ***Chapters 4,8***
   - Carrier Drift
   - Carrier Diffusion
   - Generation and Recombination
   - Continuity Equation
3. ***Junction Diodes*** ***Chapters 5,9***
   - ***p-n*** Junction
   - Metal-Semiconductor Junction
   - I-V Characteristics
4. ***Bipolar Junction Transistors*** ***Chapters 10***
   - Operating Principles
   - Minority Carrier Distribution
   - Ideal I-V Characteristics
   - Non-Ideal Effects
   - Small-Signal Models
5. ***MOS Transistors*** ***Chapters 6,7***
   - Operation Principles
   - MOS Capacitor
   - Metal Oxide Field Effect Transistor (MOSFET)
     a) Enhancement and Depletion MOSFETs
     b) Current-Voltage Characteristics
   - MOSFET Fabrication

Academic Integrity Statement

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Any suspected instance of academic dishonesty will be reported to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at: http://www.stonybrook.edu/uaa/academicjudiciary/

Americans with Disabilities Act

If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact Disability Support Services, ECC (Educational Communications Center) Building, room 128, (631) 632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.