EC 471
Physics of Semiconductor Devices, Spring 2016

Professor Sahar Sharifzadeh
e-mail: ssharifz@bu.edu

Lectures:  Tu/Th 2-4 pm    Room 204 EPC
Office hours:  W 2-3 pm, Th 4-5  Room 535 PHO

Description
The goal of this course is to provide a sound understanding of the physical principals of modern semiconductor devices and to develop the fundamental knowledge needed to understand next-generation devices. By the end of the semesters, students will:

- Be familiar with concepts and definitions related to band diagrams
- Understand the physical mechanisms that contribute to the behavior of semiconductor devices
- Explain key concepts regarding device behavior
- Identify important material design parameters (e.g. doping, bandgap, mobility, physical dimensions...)
- Calculate the response for a variety of ideal device structures (e.g. diodes, MOSFETs, BJTs...)
- Qualitatively understand non-ideal behavior

Course Prerequisite
PY 313- Elementary Modern Physics or PY 354- Modern Physics

Textbooks and References

Grading Policy
- Homework:  10%
- Mid Term I:  30%
- Mid Term II:  30%
- Final Exam:  30%
Class Syllabus

Jan. 19  Crystal Structures  Chapter 1
Jan. 21  Crystal Growth  Chapter 1
Jan. 25  Introduction to Atomic Bonding and Quantum Mechanics  Chapter 2
Jan. 27  Introduction to Atomic Bonding and Quantum Mechanics  Chapter 2
Feb. 2  Energy Bands, Effective Masses, and Charge Carriers in Semiconductors  Chapter 3
Feb. 4  Charge Carrier Concentration and Carrier Drift  Chapter 3
Feb. 9  Photoexcitations and Non-Equilibrium Excess Carriers  Chapter 4
Feb. 11  Carrier Diffusion  Chapter 4
Feb. 18  The Continuity Equation, Diffusion Lengths  Chapter 4
Feb. 23  Introduction to pn Junctions  Chapter 5
Feb. 25  Midterm 1 Review  (Ch 1-4)
Mar. 1  Midterm 1  (Ch 1-4)
Mar. 3  pn Junctions Continued  Chapter 5
Mar. 5-13  Spring Recess
Mar. 15  pn Junctions in Devices  Chapter 5
Mar. 17  pn Junctions in Devices  Chapter 5
Mar. 22  Metal-Semiconductor Junctions and Heterojunctions  Chapter 5
Mar. 24  Field Effect Transistors: Fundamental Properties  Chapter 6
Mar. 29  Midterm 2 Review  (Covers up to Mar. 24)
Mar. 31  Midterm 2  (Covers up to Mar. 24)
Apr. 5  The MOSFET  Chapter 6
Apr. 7  The MOSFET  Chapter 6
Apr. 12  The MOSFET  Chapter 6
Apr. 14  Bipolar Junction Transistors  Chapter 7
Apr. 19  Bipolar Junction Transistors  Chapter 7
Apr. 21  Bipolar Junction Transistors  Chapter 7
Apr. 26  Light Emitting Diodes, Lasers  Chapter 8
Apr. 28  Final Review