

ELEG 340: Solid-State Electronics, Fall 2007

Instructor: Prof. Ian Appelbaum
(appelbaum@ee.udel.edu)
Lecture: TR 2-3:15, 221 Alison Hall
Office: 217C Evans

TAs: Xu Jing
Office Hours:
Dupont 107

Objective: Apply knowledge of Mathematics, Physics, and Engineering to:

1. Understand the origins of the unique properties of semiconductors
2. Understand charge transport mechanisms in solid-state devices
3. Understand and interpret device band diagrams
4. Understand fundamentals of operation of solid-state electronic devices such as diode junctions and bipolar or field-effect transistors.

Grading:

Weekly Homework: 15%
Quiz 1: 20%
Quiz 2: 20%
Quiz 3: 20%
Quiz 4: 20%

Homework will be posted on the course website (http://www.ee.udel.edu/~appelbau/340_07F) one week before it is due (beginning of lecture on Thursdays). NO late homework will be accepted. Solutions will be posted after Tuesday's class.

Book:

“Solid-State Electronic Devices”, Sixth Edition, Streetman and Banerjee, Prentice Hall

Topics:

Periodic structures: crystal properties (Chapter 1)

Basic Quantum Mechanics (Chapter 2)

Energy Bandstructure of Periodic Solids (Chapter 3.1)

Charge Carriers in Semiconductors (Chapter 3.2-3.5)

Quiz 1

Excess Carriers (Chapter 4.1-4.3)

Charge Transport: Drift-Diffusion Equation (Chapter 4.4)

Quiz 2

p-n Junctions

Equilibrium (Chapter 5.2)

DC behavior (Chapter 5.3)

Breakdown (Chapter 5.4)

AC behavior (Chapter 5.5)

Metal-Semiconductor Junctions: Schottky barriers/Ohmic contacts (Chapter 5.7)

Semiconductor heterostructures (Chapter 5.8)

Optoelectronics (Chapter 8)

Photodiodes/Solar cells (Chapter 8.1)

LEDs/semiconductor LASERS (Chapter 8.2-8.4)

Quiz 3

Bipolar Junction Transistors (Chapter 7.1-7.6, 7.9)

Field-Effect Transistors: JFET/MESFET/MOSFET/HEMT (Chapter 6)

Quiz 4