

ELEG 340: Solid-State Electronics, Fall 2008

Instructor: Prof. James Kolodzey
(kolodzey@ee.udel.edu); 203 Evans Hall
Lectures: TR 2-3:15 pm, 221 Alison Hall
Instructor Office Hours: TR, 3:30 – 5 pm

TA: Mr. Chris Kerestes <kerestec@udel.edu>
TA Office Hours: 243 DuPont
TA Office Hours: MF, 1-2pm

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: 23%
Quizzes 1 - 7: 7% each
Final Exam: 28 %

Homework will be posted on the course website (<http://www.ece.udel.edu/~kolodzey/courses/eleg340f08.html>) one week before it is due (typically the beginning of lecture on Tuesdays). Solutions will be posted after Thursday's class. Short quizzes will be given biweekly, typically on Thursdays, based on the previous few lectures and reading. Typically, quizzes will test understanding and familiarity with the subject, and homeworks will apply this knowledge. Illustrative problems will be worked in class to demonstrate techniques.

Text:

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

Topics:

Periodic structures: crystal properties (Chapter 1)

Basic Quantum Mechanics (Chapter 2)

Quiz 1

Energy Bandstructure of Periodic Solids (Chapter 3.1)

Charge Carriers in Semiconductors (Chapter 3.2-3.5)

Quiz 2

Excess Carriers (Chapter 4.1-4.3)

Charge Transport: Drift-Diffusion Equation (Chapter 4.4)

Quiz 3

p-n Junctions

Equilibrium (Chapter 5.2)

DC behavior (Chapter 5.3)

Quiz 4

Breakdown (Chapter 5.4)

AC behavior (Chapter 5.5)

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

Semiconductor heterostructures (Chapter 5.8)

Quiz 5

Optoelectronics (Chapter 8)

Photodiodes/Solar cells (Chapter 8.1)

Semiconductor LEDs/LASERS (Chapter 8.2-8.4)

Quiz 6

Bipolar Junction Transistors (Chapter 7.1-7.6, 7.9)

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

Quiz 7

(rev. 30sep08)