Physics 5520 Electronic Processes in Semiconductors (Spring, 2011)

Instructor: Distinguished Professor Z. Valy Vardeny
215 JFB
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Schedule: Wednesday and Friday 1:25-2:45 PM
210 JFB

Office Hours: Monday 12:00-2:00 PM, or by appointment

Text Book: “Semiconductor Physics and Devices; Basic Principles”
This book was ordered and is available at the Un. bookstore.

Grades: There will be a problem set every other week.
In addition there will be a midterm exam.
In lieu of a final exam each student will be given a 30-minutes presentation
Also each student will get a semiconductor crystal that he would need to
characterize by optical, electrical and other means, with a turn-in lab report.

The weighting is given below:

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
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<tbody>
<tr>
<td>Problem Sets</td>
<td>30</td>
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<tr>
<td>Lab report</td>
<td>30</td>
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<tr>
<td>Mid-term exam</td>
<td>20</td>
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<tr>
<td>Presentation</td>
<td>40</td>
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<td>Total</td>
<td>120</td>
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The grade would be then decided based on the class average

Background: You must have taken Physics 5510: Solid State Physisics I or other equivalent
course. An understanding of basic mathematics such as matrix and vector
algebra, Fourier transform, and elementary second order differential equations is
assumed.


Outline: We will cover chapters 1-14 in the text book except chapter 12 and 13.
Detailed Outline:

Chapter 1: The crystal structure of solids (2 lectures)
Chapter 3: Introduction to quantum theory of solids (3 lectures)
Chapter 4: The semiconductor in equilibrium (4 chapters)
Chapter 5: Carrier transport phenomena (3 lectures)
Chapter 6: Nonequilibrium excess carriers in semiconductors (4 lectures)
Chapter 14: Optical effect in semiconductors (5 lectures)
Chapters 7&8: The pn junction and pn diode (2 lectures)
Private notes: The photodiode and photovoltaic effect (2 lectures)
Chapter 9: Metal-semiconductor and semiconductor junctions (2 lectures)
Chapter 10: The bipolar transistor (1 lecture)
Chapter 11: Metal-oxide semiconductor (2 lectures)

The lecturer reserves the right to change the order and time allocated to each chapter.