PEP 507WS
Introduction to Microelectronics and Photonics

Department of Physics and Engineering Physics
Stevens Institute of Technology
Semester: Srping 2018

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Course Description: This course covers the physics of semiconductors covering the basics of different types of lattices, primitive cells, Miller indices, density of states, Fermi levels and Fermi Dirac statistics. Doping of semiconductor material and how this enhances the properties of the devices as well as the ideas of electrons and holes in semiconductors and the formation of the p-n junction which leads to the various types of devices and their uses. The physics of semiconductor devices such as diodes, bipolar junction transistors, field effect transistors, photoconductors and solar cells and how they operate is explored. The basics of the fabrication of semiconductor devices is covered including the various methods of purifying the material and the basic methods of doping, such as diffusion and ion implantation as well as lithography.

Required Materials

1. Textbook:
Solid State Electronic Devices 7th edition
Ben G. Streetman, Sanjay K. Banerjee
ISBN-13: 978-0-13-335603-8
ISBN-10: 0-13-335603-5

Grading Procedure

Grades are calculated from a weighted average of the homework and exams.

Final Exam…….40%
Midterm ……..40%

Homework 20%

Final letter grades will be calculated based on the following distribution:

Letter Grade:	% Grade:
A	90-100%
A-	85-89.9%
B+/B/B-	70-84.9%
C+/C/C-	50-69.9%
F	<50%

Homework: Each week will open Sunday night, or in the beginning the first day of the semester, read the chapter for the week as well as look at the course notes. The homework problems from the book, will be due at the end of the week. The problems can be submitted through the canvas email only using Microsofts equation editor or some other form of equation tool, or if you don't want to type everything out in work, your handwritten homework can be made into a pdf file and emailed as an attachment. **ABSOLUTELY NO IMAGE FILES OR JPEGS WILL BE ACCEPTED. IF YOU EMAIL YOUR HOMEWORK TO ME THIS WAY IT WILL NOT BE GRADED.** Everyone has access to a scanner somewhere. Also, even though you are emailing the homework, I sometimes print them out to grade them, so I will need your name, assighment number, chapter from which homework comes from at the top of the assignment. If this is not done your homework will not be graded and will be considered late. This applies to the mid-term as well as the final.

The following are the homework problems from the textbook.

Week	Chapter	Problems	Notes/Course Content
1	1	3,5,10,12,14,19	Crystal properties and growth of semiconductors
2	3	3,8,11,13,15,16	Energy bands and charge carriers in semiconductors
3	3	18,20,21,24,26	Energy bands and charge carriers in semiconductors
4	4	2,5,7,9,15,22	Excess carriers in semiconductor

5	5	2,4,7,19,24,29	Junctions
6	5	33,35,37,43,45	Junctions
7	6	1,4,8,10,12,13	Field effect transistors
8	6	17,18,19,21,25,27	Field effect transistors
9	7	3,5,7,12,13	Bipolar transistors
10	7	18,20,21,23,25	Bipolar transistors
11	8	2, 4,8, 10,11	Optoelectronic devices
12	8	13,14,16,17	Optoelectronic devices
13	9	1,2,3	Integrated circuits
14	Final	Emailed or posted	

There will be course notes in the course contents section that go along with the above chapters. The midterm questions will be posted or emailed around week 7 and due the following week. The final will be posted towards the end of the semester and due the following week. The place to ask questions is in the discussion area of the course homepage. It is highly encouraged that you ask questions, and I am happy to provide whatever help I am able to give. Please only hand in the homework that is due that week. If you are inclined to finish the course in the first few weeks that is great but you still must submit the homework when it is due. If you start handing in homework ahead of time I will just delete them.

For those interested other reference books there is a series titled Modular Series on Solid State Devices by Addison Wesley with the first five being applicable to this course and Solid State Electronics by Streetman et. al.