EE 339 – Solid-State Electronic Devices

Spring 2009

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Office hours: 5.442 ACES, MW 11am - noon
Class hours: MWF 10:00-11:00am, BUR 136
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TA Office hours: TBD
Grader: Ciyuan Qiu

Objectives: The students will (1) develop understanding the basics of semiconductor physics (energy bands, charge carriers, doping, conductivity and mobility), and (2) will apply this knowledge to understand the operating principles of key semiconductor devices (e.g. p-n junction diode, transistor).

Prerequisites:
M 427K (e.g., integral calculus, differential equations, Fourier series, vectors, vector calculus, gradients), and PHY 303L & 103N (primary laws of motion, wave phenomena, electricity and magnetism, optics) with a grade of at least C in each.

Course topics:
- Crystal properties and growth of semiconductors
- Introduction to quantum (wave) mechanics
- Crystal physics from the quantum perspective: energy bands, charge carriers, transport of charge carriers in electric/magnetic field
- Excess carriers in semiconductors (generation-recombination, diffusion, p- and n-type doping)
- p-n junctions (fabrication; equilibrium conditions; electrical characteristics; capacitance and switching)
- Metal-semiconductor junctions
- Field-effect transistors (FET): e.g. bipolar junction transistor; metal-oxide-semiconductor field-effect transistor; survey of junction FET, metal-semiconductor FET
- Optoelectronic devices (photodiodes, LED, semiconductor lasers)

Textbook:
- Ben G. Streetman & Sanjay Banerjee, *Solid State Electronic Devices (Fifth or Sixth Edition)*

Grading:
20% Homework, 20% First exam, 20% Second exam, 40% Final exam.

Homework Policy:
Collaboration on homework questions is allowed. Every student needs to submit an independent homework solution. Homework can be turned in during class or slid under my office door at ACES 5.442. There will be a 10% penalty for homeworks that are turned in late up until a week after it is due. Solutions to the homework assignments will be made available the week after it is due. Homework assignments will not be accepted after solutions are made available (i.e. no credit will be given for those assignments).

Course notes:
Course notes will be provided for most lectures. The web-based course management system "Blackboard" will be used to post course notes, homework assignments and solutions.

College Drop/Add Policy:
An engineering student must have Dean's approval to add/drop after the fourth class day of the semester.

Academic dishonesty:
Plagiarism or any form of academic dishonesty (cheating includes, but is not limited to, copying another student's work, bringing notes into a test and copying material directly from a book, article or web site without including appropriate references, falsifying data, doing someone's work) is a violation of University rules. Penalties for scholastic dishonesty are severe and can include, but are not limited to, a written reprimand, a zero on the assignment/exam, re-taking the exam in question, an F in the course, or expulsion from the University. For University policies see:
http://www.utexas.edu/opa/news/04newsreleases/nr_200404/nr_honor040429.html

Class Web sites and student privacy:
Web-based, password-protected class sites are associated with all academic courses taught at The University. Syllabi, handouts, assignments and other resources are types of information that may be available within these sites. Site activities could include exchanging e-mail, engaging in class discussions and chats, and exchanging files. In addition electronic class rosters will be a component of the sites. Students do not want their names included in these electronic class rosters must restrict their directory information in the Office of the Registrar, Main Building, Room 1.

Students with Disabilities:
The University of Texas at Austin provides upon request appropriate academic accommodations for qualified students with disabilities. For more information, contact the Office of the Dean of Students at 471-6259, 471-4641 TTY or the College of Engineering Director of Students with Disabilities at 471-4382.