Department of Electrical and Computer Engineering
University of California Davis
EEC140A Device Physics 1
Winter Quarter 2012

Instructor:
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Meeting Times:
Mon. and Wed. 12:10-2:00pm

Location:
Chemistry Building, Rm. 166

Catalog Description:
Principles of Device Physics I: (4 units) Lecture 3 hours; Discussion 1 hour.

Semiconductor device fundamentals, equilibrium and non-equilibrium statistical mechanics, conductivity, diffusion, electrons and holes, p-n and Schottky junctions, first-order metal-oxide-semiconductor (MOS) field effect transistors, bipolar junction transistor fundamentals.

Prerequisites:
Engineering 17, Physics 9D.

Textbook:
Required: *An Introduction to Semiconductor Devices* by Donald Neamen. McGraw Hill, 2006.
Additional Suggested Reading: *Semiconductor Device Fundamentals* by Robert F. Pierret. Addison Wesley, 1996.

Grading:
Homework (20%)
Midterm Exams x2 (25% each)
Final Exam (30%)

Homework Sets:
Homework sets will be posted on the course website (SmartSite), and will be expected to be turned in in-class on the due date. Late assignments will not be accepted without prior approval.

Final Exam:
Final exam is scheduled for 1:00-3:00pm Thursday March 22nd 2012. Final exam will be comprehensive. Further information will be given in-class prior to each exam.

Make-up Exams:
Make-up exams will not be given unless cases of extreme extenuating circumstances arise.

Regrading:
If you disagree with the grading on homework or exams with good reason please attach a note and return it to the instructor. The instructor will review the grading, and reassign points as necessary. Note that upon regrading the score may go up or down.

Academic Integrity:
Cheating and Plagiarism will not be tolerated. Professional integrity is an important aspect of all engineering disciplines, and understanding the material in these courses is integral to becoming a proficient and productive engineer. As such, it is imperative that you spend the time and effort to fully understand the material. Please read the UC Davis "Code of Academic Conduct" for further details: http://sja.ucdavis.edu/files/CAC.PDF

Course Content and approximate timeline:

Week	Date	Day	Lecture	Topic	Reading
1	1/9	M	1	Introduction & Crystal structure, properties of solids	Ch 1 (Sec. 1-3)
	1/11	W	2	Energy bands, density of states, carrier statistics	Ch 2 (Sec. 3.1-3.5)
2	1/16	M	-	*HOLIDAY*	-
	1/18	W	3	Intrinsic and extrinsic carriers	Ch 3 (Sec. 1-3.2)
3	1/23	M	4	Donors and acceptors	Ch 3 (Sec. 5-6)
	1/25	W	5	Carrier diffusion, generation/recombination	Ch 4 (Sec. 1, 2, 4)
4	1/30	M	6	pn junctions, fundamental features	Ch 5 (Sec. 1-2)
	2/1	W	7	**MIDTERM 1** (Chapters 1-4)	-
5	2/6	M	8	Reversed biased junctions	Ch 5 (Sec. 3)
	2/8	W	9	Schottky diodes, forward-biased junctions	Ch 5 (Sec. 4-6)
6	2/13	M	10	Ideal diode equation	Ch 9 (Sec. 1-3)
	2/15	W	11	Diode small-signal model, breakdown	Ch 9 (Sec. 4-6)
7	2/20	M	-	*HOLIDAY*	-
	2/22	W	12	Transistors, MOS capacitor	Ch 6 (Sec. 1-2)
8	2/27	M	13	**MIDTERM 2** (Chapters 5 & 9)	-
	2/29	W	14	MOS potentials and C-V characteristics	Ch 6 (Sec. 3-4)
9	3/5	M	15	Three-terminal MOS	Ch 6 (Sec. 5.1-5.2)
	3/7	W	16	MOS substrate bias effects, small-signal model	Ch 6 (Sec. 5.4-6)
10	3/12	M	17	Bipolar transistor action	Ch 10 (Sec. 1)
	3/14	W	18	Minority carrier distributions in BJT	Ch 10 (Sec. 2)
11	3/19	M	19	Common-base current gain	Ch 10 (Sec. 3, 5)