

ECE 471A – Spring 2014

Physics of Semiconductors - Syllabus

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Meeting time: Tuesdays and Thursdays, 2:00 – 3:20, Scott 229
Jan. 21 - Feb. 23

Course website: <https://ramct.colostate.edu/webct/logon/2210030481101>

If you are unable to log into RamCT, contact the ACNS helpdesk for support.

Office hours: contact me by email to schedule office hours.

Course Objective(s): This course is suitable for undergraduate seniors and first year graduate students majoring in engineering or physics. It introduces the fundamentals of semiconductor physics that will enable subsequent study of semiconductor devices.

Text: “Semiconductor Physics and Devices”, 3rd ed., by D. Neamen, McGraw-Hill

Description: Fundamentals of semiconductor physics: electron and hole states, energy bands, effective mass, carrier density, Fermi level, doping, drift and diffusion.

Topics to be covered:

- Week 1 (Overview Neaman Ch. 1 to 3) Crystal structures, crystallographic planes, electronic states of semiconductors.
- Week 2 E vs. k plots, direct and indirect bandgap semiconductors, density of states function, effective mass, Maxwell-Boltzmann, distribution function.
- Week 3 (Neaman Ch. 3, 4) Fermi-Dirac and Bose Einstein distribution functions. Equilibrium carrier concentrations, equilibrium thermal generation, intrinsic carrier concentration, Fermi level, dopants, extrinsic semiconductors.
- Week 4 (Neaman Ch. 4, 5) Statistics of donors and acceptors, Drift current; electrical mobility, carrier scattering.
- Week 5 Diffusion, Einstein relation, Hall effect.

Method of evaluation: One exam: 50%, Homework: 30%, Quizzes: 20%

A+ = 98-100

A = 94-97

A- = 90-93

B+ = 87-89

B = 84-87

B- = 80-83

C+ = 76-79

C = 65-75

D = 50-64

F = 0-49

The **exam** will be held in class. It is closed book, but you are allowed to bring one sheet of notes (front and back). Homework is typically due at the start of class on a Thursday one week after it is assigned, but check the website for details and updates. I plan for there to be a new assignment every week. Quizzes will be given at the start of class once or twice a week. The quizzes may cover any portion of the material covered in class.

The course will adhere to the **Academic Integrity Policy** of the CSU General Catalog (page 7, <http://www.catalog.colostate.edu/FrontPDF/1.6POLICIES1112f.pdf>) and the Student Conduct Code (<http://www.conflictresolution.colostate.edu/conduct-code>)

The University is required to provide reasonable accommodations to students with disabilities, so as not to discriminate on the basis of that disability. Students with disabilities are encouraged to contact the instructors to discuss their individual needs for accommodations. Also, you may visit Resources for Disabled Students: <http://rds.colostate.edu/> or call them at (970) 491-6385.