

AEP 550 Applied Solid State Physics

Chris Xu
276 Clark Hall

Lectures: M/W/F 9:05-9:55 AM BR 219
Office hour: M/F: 10:00-11:00 AM, W:11:00-noon

Topics:

I. Fundamentals of solid state physics (~ 6 lectures, review).

Reading materials: handout plus books by Kittel and Ziman

II. Semiconductor Physics and devices (~ 18 lectures)

Intrinsic and extrinsic semiconductors, pn-junction, metal-semiconductor junction, metal-oxide-semiconductor junction, bipolar transistor, MOSFET.

Reading materials: book by Dalven

III. Magnetic materials (~ 18 lectures)

classification of magnetic materials, classical models of magnetic materials, quantum mechanic models of magnetic materials, Hund's rule, mean field model for ferro-and ferri-magnetic materials, exchange energy, band-structure models for ferromagnetic materials.

Reading materials: books by O'Handley, Kittel, and Ashcroft and Mermin

Prerequisites:

- Electrodynamics
- Quantum mechanics
- Thermal and statistical physics

Homework and grades:

There will be ~ 5 problem sets during the semester. There will be one midterm examination during the week of Mar. 13, 2006. I am still deciding the final format, maybe a term paper or a poster presentation will do. Grades will be based on 30% HW, 30% prelim and 40% final.

Textbooks (on course reserve at Physical Sciences Library, Clark Hall):

"Introduction to Applied and Solid State Physics", Richard Dalven, 2nd Ed.
"Modern Magnetic Materials: Principles and Applications", Robert C. O'Handley

Other useful readings:

Solid state physics by Ashcroft and Mermin
Introduction to solid state physics by Kittel (Reserved)
Principles of the Theory of Solids by Ziman (Reserved)