

A.D.D, December 2012

Physics 558: Introduction to Solid State Physics
Spring 2013
Instructor: Tony Dinsmore
Syllabus

Overview: This course will provide students with a working knowledge of solid-state materials and the theories that describe them. The syllabus covers **basic properties** of solids, important classes of **materials** (such as metals, semiconductors, insulators, magnetic materials), selected modern **technologies**, and state-of-the art **measurement methods**.

The course also seeks to provide the background knowledge necessary to understand condensed-matter seminars and to read research articles.

Meeting time/place: Tues/Thurs, 9:30-10:45 am, Hasbrouck 136.

Textbook: Required: David L. Sidebottom, Fundamentals of Condensed Matter and Crystalline Physics, 1st ed. (Cambridge). List price \$75. (Kittel's Introduction to Solid State Physics, 7th or 8th edition is also useful but is *not required* for this course.

Requirements: Attendance at class (**10%** of grade, based on participation in discussion, asking/answering questions, etc.). There will be weekly homework assignments (**35%** of grade). One midterm exam will be given (**15%** of grade) in the latter half of the semester (early to mid April). Each student will complete a final project (**40%** of grade) consisting of a written paper and presentation to the class on an agreed-upon topic in solid state physics.

Prerequisites: Phys 424 (introduction to quantum mechanics) and Physics 423 (statistical physics) or equivalent courses at the junior/senior undergraduate level.

Major Topics

- The structure of crystalline and non-crystalline materials
- Forces that hold solids together: chemical bonds, van der Waals, and other forces.
- Scattering and reciprocal space.
- Vibrations and phonons
- Thermal properties of solids
- Electronic properties of conductors, insulators, and semiconductors. Free-electron models and band theory.
- Magnetism
- Interfaces between materials (metal/semiconductor)
- Response of a solid or liquid to stress; response functions.
- Other advanced topics as time allows

Instructor:

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Depending on the size of the class and the schedules of the enrolled students, I might not hold fixed office hours. I do welcome discussions and questions, however. Please stop by my office or (preferred) e-mail me to arrange a time to meet.