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:
Tony Dinsmore, UMass Physics Department
Office: Has 404
Tel: 545-3786
E-mail: dinsmore@physics.umass.edu

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.