IN232 Aug 3:0

Concepts in Solid State Physics

Instructor

Chandni U.
Email: chandniu@iisc.ac.in

Teaching Assistant

NA
Email:

Department: Instrumentation and Applied Physics

Course Time: Tue, Thu 8:30-10:00

Lecture venue: IAP Lecture hall 1

Detailed Course Page:

Announcements

Brief description of the course

This is an introductory solid state physics course. Background in Quantum mechanics and statistical physics is not mandatory, making this course suitable for students from a wide background including engineering, chemistry, materials science and physics.

Prerequisites

Basic undergraduate level mathematics including Fourier transforms, Dirac delta functions, PDE, basic integration differentiation, probability, error analysis, basic statistics.

Syllabus

Quantum mechanics basics, Vibrations in solids; Electrons in Metals; Phonons; Tight binding chain; Chemical bonding in solids; Crystal structure; Real and Reciprocal Space; Scattering experiments; Waves in reciprocal space; Band structure and optical properties; Fermi surfaces; Introduction to semiconductors; Magnetism; Practical examples and review.

Course outcomes

This course will expose students to the basic concepts in solid state physics, along with relevant experimental

details. By the end of this course students will be able to appreciate the physics of metals, semiconductors and insulators. Students will also learn to evaluate advanced research articles and effectively communicate scientific ideas via writing and speaking.

Grading policy

Tests: 60% (3 tests)

Assignments: 20%

Seminar: 20%

Assignments

About 7-8 problem sets will be given at periodic intervals. These wont be graded and will be useful for students to practice and get familiarised with the kind of questions to expect in the tests. Writing assignment will involve reviewing a research article in two styles: (i) news and views style summary article on the particular research work, which places the work in perspective and (ii) critical review of the paper. This assignment will helps students get exposed to research, as well as improve their writing skills. Support will be provided to students who consider themselves weak in english/writing.

Resources

Steven H. Simon, The Oxford solid state basics, Oxford University Press, 2013.
H. Ibach and H. Luth, Solid State Physics: An Introduction to Principles of Materials Science, Springer, 4th Edition 2009.
Charles Kittel, Introduction to Solid State Physics, Wiley.