Physics 4047 - Introduction to Solid State Physics (Fonseca)

- Number of Credits: 3
- Prerequisites:
- Luis F Fonseca
- Office: FB 127
- University of Puerto Rico – Rio Piedras Campus
  Department of Physics

Text

- Introductory Solid State Physics, Charles Kittel (Wiley) 7th edition (1996)

Bibliography

- Introductory Solid State Physics, Mayers
- Solid State Physics. J. R. Hook and H.E Hall
- Elementary Solid State Physics, A Omar

Minimum Required Facilities

- Traditional lecture room

Instructional Strategy

- Lectures

Student Evaluation

- Standard A to F grading system. Grading will depend on performance in periodic problem sets.

Description

This is an introductory course in Solid State Physics for Physics majors. Topics included are: Crystal structure,crystal binding, elastic properties, lattice vibrations and thermal properties. The free electron gas model. Semiconductors. Optical properties of solids. Cooperative phenomena, ferromagnetism, ferroelectricity.

Objectives

After the completion of this course the student will able to understand the basic concepts of solid state physics. During the semester the student: will develop a

comprehensive understanding of the basic issues in solid state physics, learn about the contributions of electrons and ions to the properties of the solids, will understand the intimate interplay between experiment and theory in the area of solid state physics and will learn about the relevance of solid state physics to the modern technology.

Contents

Electron motion in electric and magnetic fields
Hall effect
Energy Bands
Origin of the energy gap
Bloch funtions
Kronin-Penney Model
Energy bands
Effective mass
Semiconductors
Holes
Crystal momentum
Electron and holes statistics
Intrinsic semiconductors
Donors and acceptors
Conductivity
Optical Properties
Optical reflectance
Index of refraction
Plasmons
Dielectric function of an electron gas
Light absorption in semiconductors
Photo and electro-luminescence
LEDs
Defects
Cooperative Phenomena
Ferroelectricity and magnetism
Phase transitions