



Phys 3402	SOLID STATE PHYSICS-II	(CR3)
Preq.	Phys 3401	

Objectives

To equip students with fundamental concepts of solid state physics.

Syllabus

Free Electron Fermi Gas: Energy levels in one dimension, effect of temperature on the Fermi-Dirac distribution, free electron gas in three dimensions, heat capacity of the electron gas, experimental electrical resistivity of metals, motion in magnetic fields, Hall effect, thermal conductivity of metals, ratio of thermal to electrical conductivity. Energy Bands: Nearly free electron model, origin of the energy gap, magnitude of the energy gap, Bloch functions, wave equation of an electron in a periodic potential, crystal momentum of an electron, solution of the central equation, empty lattice approximation, approximate solution near a zone boundary, number of orbital in a band, metals and insulators. Homogeneous Semiconductors: Band gap, equation of motion, effective mass, physical interpretation of the effective mass, effective masses in semiconductors, silicon and germanium, intrinsic carrier concentration, intrinsic mobility, impurity conductivity, donor states, acceptor states, thermal ionization of donors and acceptors.

Recommended Books

1. *Introduction to Solid State Physics* by C. Kittel (8th Edition), Wiley (2012).
2. *Elementary Solid State Physics* by M. A. Omar, Addison-Wesley (1987).
3. *Physics of Solids*, by J. B. Ketterson, Oxford, (2016).
4. *Solid State Physics* by N. W. Ashcroft and D. Mermin, Holt-Sanders (1976)
5. *Solid State Physics* by J. R. Hook and H. E. Hall (2nd Edition), Wiley (2013)
6. *Solid State Physics* by J. S. Blakemore, Cambridge (1991)