SARDAR PATEL UNIVERSITY
Programme: B.Sc (Physics)
Semester: IV
Syllabus with effect from: November/December-2012

Paper Code: US04CPHY02	**Total Credit: 3**
Title Of Paper: Solid State Physics	

Unit	Description in detail	Weighting (%)
I	**Basic Elements of Crystallography** Introduction, Lattice points and space lattice, The basics and crystal structure, Unit Cell, Unit Cell versus Primitive Cell, Unit Cell and lattice parameters, Crystal types, Two dimensional crystal lattice, Seven crystal system, Symmetry Operations (Translational, Point, & Hybrid), Metallic crystal structures, Relation between the density of crystal materials and lattice constants, Directions planes and Miller Indices of crystal planes, Important features of Miller indices in a cubic crystal, Separation between lattice planes in cubic crystal	
II	**Atomic Cohesion, Crystal Binding, Atomic Size** Introduction, Force between atoms, Cohesion of atoms and cohesive energy, Calculation of cohesive energy, Calculation of lattice energy of ionic crystals, Calculation of Madelung constant of ionic crystals, The Born–Haber cycle, Bonding in solids, Primary Bonds (Covalent, Metallic, Ionic and Mixed), Secondary bonds (van der Waals and Hydrogen Bond), Properties of primary and secondary bonds, Wave mechanical concept of atom, Atomic size, Ionic radii, Empirical ionic radii, variation of ionic radii, Covalent radii, Metallic radii, van der Waals radii	
III	**Thermal & Dielectric Properties of Solids** Introduction, The specific heat of solid, The classical lattice heat capacity, The Einstein Model, The density of states, The Debye theory of heat capacity, Thermal conductivity of solids, Thermal conductivity due to electrons and phonons, Thermal resistance of solids, Dipole moment, Polarization, The electric field of a dipole, Local electric field at an atom, Dielectric constant and its measurement, Polarizability, The classical theory of electronic Polarizability, Dipolar Polarizability	
IV	**Structure of Polymers and its Applications** Introduction, Hydrocarbon molecules, Polymer molecules, The chemistry of polymer molecules, Molecular weight, Molecular shape, Molecular structure, Molecular Configurations, Thermoplastic and thermosetting polymers, Copolymers, Mechanical Behavior of polymers (Stress-Strain behavior, Macroscopic deformation, Viscoelastic deformation, Fracture of polymers, Miscellaneous mechanical characteristics), Mechanisms of deformation for strengthening of polymers (deformation of semi-crystalline polymers, factors that influence the mechanical properties of semi-crystalline polymers, deformation of elastomers), Polymer Types (Plastics, Elastomers, Fibers)	

Basic Text & Reference Books:-

- Solid State Physics
  M A Wahab, Narosa Publishing House.
- Solid State Physics
  S O Pillai,, New Age International Publisher
- Material Science and Engineering
  W D Callister Jr. Wiley India (P) Ltd.
- Introduction to Solid State Physics
  C Kittel, (5th Edition) Wiley Eastern Ltd.
- Elements of Solid State Physics
  J P Srivastava, Prentice-Hall of India