JT 201 (Jan) 3:0 Solid State Physics
Instructor:- Shobhana N.

Crystal Structure: Bravais lattice, One, two and three-dimensions, Crystal Planes, Unit cell, Primitive cell, Close packed structures, Crystallographic point and space groups (6)

Wave Diffraction and Reciprocal Lattice: Bragg's law, Laue method, Ewald construction, Geometrical Structure Factor, Atomic form factor, Brillouin zone, Debye-Waller factor (6)

Crystal Energy and Elastic constants: Cohesive Energy, Inert gas crystals, Madelung Constant, Molecular Crystals (3)

Crystal Vibrations and thermal properties: Monoatomic lattice, lattice with two atoms per unit cell, optical and acoustic branches, phonons, phonon momentum, Inelastic neutron scattering, elastic constants of a cubic crystal, Density of normal modes in one and three-dimensions, Einstein and Debye models of specific heat of crystal, Anharmonicity, Thermal Expansion (6)

Free Electron Gas: Density of states in one-dimension, Fermi-Dirac distribution, three-dimensions, heat capacity, electrical conductivity, Fermi momentum, Wiedemann-Franz law, Dirac theory of metals, Drude model, Plasma frequency, Hall effect and magnetoresistance (6)

Band theory of crystals: Nearly free electron model, Energy gap, Bloch's theorem, Kronig-Penney model, crystal momentum, zone boundary, Number of orbitals in a band, Fermi surface, van Hove singularity
(5)

Semiconductor crystals: Band gap, holes, Effective Mass, Silicon, Germanium, Mobility in intrinsic semiconductors, direct and indirect band gap, Impurity conductivity, doping, p-n junctions (5)

Dielectrics and Ferroelectrics: Depolarization field, Lorentz field, Dielectric constant, Clausius-Mossotti relation, Lyddane-Sachs-Teller relation, Electronic polarizability, Ferroelectricity, Landau theory of phase transition, Soft optical phonons, Piezoelectricity (5)

Amorphous Solids: Glasses, Kinetics of crystal formation, Inorganic, metallic and molecular glasses, glass transition, Kauzmann paradox, Metastability, Thin films, X-ray scattering (3)

Books:
1. Solid State Physics by C. Kittel
2. Solid State Physics by N.W. Ashcroft and D. Mermin