Unit I

Chapter 1 : Quantum Physics 1-1 to 1-35

Syllabus : (Prerequisites : Dual nature of radiation, Photoelectric effect, Matter waves, wave nature of particles, de-Broglie relation, Davisson-Germer experiment) de Broglie hypothesis of matter waves; properties of matter waves; wave packet, phase velocity and group velocity; Wave function; Physical interpretation of wave function; Heisenberg uncertainty principle; non existence of electron in nucleus; Schrodinger's time dependent wave equation; time independent wave equation; Particle trapped in one dimensional infinite potential well, Quantum Computing.

Unit II

Chapter 2 : Crystallography 2-1 to 2-31

Syllabus : (Prerequisites : Crystal physics (unit cell, space lattice, crystal structure, simple cubic, body centered cubic, face centered cubic, diamond structure, production of x-rays), Miller indices, interplanar spacing, x-ray diffraction and Bragg's law, determination of crystal structure using Bragg's diffractometer

Unit III

Chapter 3 : Semiconductor Physics **3-1 to 3-41**

Syllabus : (Prerequisites : Intrinsic and extrinsic semiconductors, energy bands in conductors, semiconductors and insulators, semiconductor diode, I-V characteristics in forward and reverse bias)

Direct & indirect band gap semiconductor; Fermi level; Fermi-Dirac distribution; Fermi energy level in intrinsic & extrinsic semiconductors; effect of impurity concentration and temperature on Fermi level; mobility, current density; Hall effect; Fermi Level diagram for p-n junction (unbiased, forward bias, reverse bias); applications of semiconductors: LED, Zener diode and Photovoltaic cell

Unit IV

Chapter 4 : Interference in Thin Film **4-1 to 4-52**

Syllabus : (Prerequisites : Wavefront and Huygens' principle, reflection and refraction, interference by division of wavefront, Young's double slit experiment) Interference by division of amplitude, interference in thin film of constant thickness due to reflected and transmitted light, origin of colours in thin film, wedge-shaped film, Newton's rings Applications of interference - determination of thickness of very thin wire or foil, determination of refractive index of liquid, wavelength of incident light, radius of curvature of lens, testing of surface flatness, anti-reflecting films and highly reflecting film

Unit V

Chapter 5 : Superconductors and Supercapacitors **5-1 to 5-24**

Syllabus : (Prerequisites : Electric current, flow of electric charges in a metallic conductor, drift velocity, mobility and their relation with electric current, Ohm's law, electrical resistance, V-I characteristics (linear and non-linear), electrical resistivity and conductivity, temperature dependence of resistance)

Superconductors : Critical temperature, critical magnetic field, Meissner effect, Type I and Type II and high Tc superconductors

Supercapacitors : Principle, construction, materials and applications, comparison with capacitor and batteries, energy density, power density

Unit VI

Syllabus : (Prerequisites : Paramagnetic materials, diamagnetic materials, ferromagnetic materials, crystal physics, conductors and insulators, free charges and bound charges inside a conductor, dielectric and electric polarization, capacitors and capacitance) Liquid Crystals : Nematic, smectic and cholesteric phases, liquid crystal displays Multiferroic. : Type I and Type II multiferroics and applications Magnetoresistive oxides : Magnetoresistance, GMR and CMR materials, introduction to spintronics

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