Physics-II
PH (EE)-401
Contacts : 3L + 1T
Credits : 4

Module-I

Quantum mechanics:
• Generalized co-ordinates, Lagrange's equation of motion and Lagrangian, generalized force potential, moment and energy. Hamilton's Equation of motion and Hamiltonian. Properties of Hamilton and Hamilton's equation of motion. **[6]**

•Concept of probability and probability density, operator, Commutator, Formulation of quantum mechanics and Basic postulates, Operator correspondence, Time dependent Schrodinger's equation, formulation of time independent Schrodinger's equation by method of separation of variables, Physical interpretation of wave function Ψ(normalization and probability interpretation), Expectation values, Application of Schrodinger equation-Particle in an infinite square well potential (1-D and 3-D potential well), Discussion on degenerate levels. **[10]**

Module-II

Statistical mechanics:
•Concept of energy levels and energy states. Microstates, Macrostates and thermodynamic probability, equilibrium macrostate. MB, FD, BE statistics (no deduction necessary), fermions, bosons (definitions in terms of spin, examples), physical significance and application, classical limits of quantum statistics. Fermi distribution at zero and non –zero temperature. **[4]**

Module-III

Dielectric Properties:
•Dielectric Material: Concept of Polarization, the relation between D, E and P, Polarizability, Electronic, Ionic, Orientation & Space charge polarization, behavior of Dielectric under alternating field, Dielectric losses. **[3]**

The Magnetic properties:
•Magnetization M, relation between B, H & M. Bohr megneton, Diamagnetism-Larmor frequency & susceptibility, Curie law, Weiss molecular field theory & Curie-Weiss law, Hysteresis loss, Antiferromagnetism, Ferromagnetism & Ferrites (analitative). **[4]**

Module-IV

Crystal structure
•Crystal structure- Bravais lattice, Miller indices **[1]**

•Crystal diffraction (qualitative), Bragg's law and reciprocal lattice,Brillouin zone. (Qualitative description) **[2]**
•Free electron theory of metal –calculation of Fermi energy, density of states. **[2]**

•Band theory of solids- Bloch theorem, Kronig Penny model. **[3]**

•Electronic conduction in solids-Drude's theory, Boltzmann equation, Wiedemann Frantz law. **[3]**

•Semiconductor-Band structure, concept of electron and holes, Fermi level, density of states. **[3]**

Text Books:
1. Perspectives of Modern Physics: A. Baiser
2. Modern Physics and Quantum Mechanics E.E. Anderson
2.Refresher course in B.Sc. Physics (Vol. III): C.L. Arora
3.Fundamentlas of Physics (Vol. III): Haliday, Resnick & Krane
4.Engineering Physics: R.K. Kar
5.Classical Mechanics: a) A.K. Roychaudhuri
b) R.G. Takwal & P.S. Puranic
6. Quantum Mechanics: a) Eisberg & Resnic

b) A.K. Ghatak & S. Lokanathan
c) S.N. Ghoshal
7.Statistical Mechanics and Thermal Physics: a) Sears and Salinger
b) Avijit Lahiri
c) Evelyn Guha
8.Solid Sate Physics: a) A.J. Dekker
b) C. Kittel
c) Aschroft & Mermin
d) S.O. Pillai