

**Second Semester of BE - I**  
**APH1201: APPLIED PHYSICS – II Syllabus**  
(Electrical, Electronics and Computer Science)

**Lecture: 3 Hours, Tutorial: 1 Hour, Total: 4 lecture hours**  
**Practical: 3 Hours**  
**12 weeks: 48 lectures**

**Theory: 100 Marks**  
**Practical/Term Work/Viva: 50 Marks**  
**Total: 150 Marks**

**1. Quantum mechanics:**

Schrodinger equation, step potential function, potential barrier and penetration, harmonic oscillator, allowed and forbidden energy bands, Kronig Penney model, the energy band and bond model, drift current, electron effective mass, concept of a hole, k-space diagrams of Si and GaAs

**2. Statistical mechanics:**

Statistical distributions(three different kinds), Maxwell Boltzmann distribution, molecular energies in an ideal gas, Bose Einstein distribution, Rayleigh Jeans formula, Planck's radiation law, specific heats of solids, Fermi Dirac distribution, free electrons in metals, the density of states, specific heat of electrons, thermionic emission, the Schottky effect.

**3. Conductivity of metals:**

Ohm's law and relaxation time of electrons, relaxation and collision time, mean free path, electron scattering and resistivity of metals, superconductivity and applications.

**4. Semiconductor Physics:**

Mechanism of conduction in semiconductors, the chemical bond in Si and Ge and its consequences, the energy gap, the conductivity of intrinsic semiconductors, carrier densities in n and p type semiconductors

**5. Semiconductor Physics:**

Minority and majority carrier densities in semiconductors, drift current and diffusion current, continuity equation for minority carriers.

**6. Fibre optics: (For Computer Science and Electronics Engineering Only)**

Principles of fibre, structure and classification of optical fibres, The numerical aperture, fibre optics communication system, Advantages of optical fibre communication, applications and use.

**7. Principles of electrostatics and magnetostatics:**

Polarization, the field of a polarized object, the electric displacement, linear dielectrics, the vector potential, the field of a magnetized object, the auxiliary field

**8. Electrostatics:**

Maxwell's equations inside matter, boundary conditions, Poynting's theorem, Maxwell's stress tensor, conservation of momentum

**9. Electrodynamics:**

Monochromatic plane waves in vacuum, energy and momentum of EM waves, propagation through linear media, electromagnetic waves in conductors (the modified wave equation, monochromatic plane waves in conducting media)

**10. Electron optics:**

Motion in electric field, force acting on a charged particle, the analogy between the motion of charged particles in electromagnetic fields and propagation of light beam in transparent media, centered electron systems, the basic equation of electron optics for axially symmetric fields, focusing in axially symmetric fields, the Helmholtz- Lagrange equation, the thin lens, electron multiplier

**11. Electron Optics:**

Motion in a magnetic field, motion in uniform magnetic field, axially symmetric magnetic fields, short coil focusing, the electron microscope, focusing in crossed electric and magnetic fields, strong focusing. Mass spectroscopy and electromagnetic separation of isotopes.

**Practicals: Practicals based on the above syllabus and related topics.**

**Books for reference:**

1. Electrical engineering materials: A.J.Dekker, Prentice Hall.
2. Motion of charged particles in electric and magnetic fields: L.A.Artsimovich and S.Y.Lukyanov, Mir Publishers.
3. Concepts of modern Physics: A.Beiser, Tata McGraw Hill.
4. Engineering Physics: by D R Joshi, Tata McGraw Hill Education
5. Semiconductor Physics and devices: D.A.Neamen, Tata McGraw Hill.
6. Introduction to Electrodynamics: D.J.Griffiths, Prentice Hall of India