# MP-03
# CLASSICAL ELECTRODYNAMICS
(Questions will be set from each unit/section with internal choice)

| Units | Topics |
|---|---|
| I | Uniqueness theorem, solution of Laplace & Poison's equation in rectangular, cartesian and spherical polar coordinates, methods of electrical images, Greens function for potential problem and solutions of conducting and dielectric sphere in uniform electric field. |
| | Laws of magnetostatics, magnetic scalar and vector potential, magnetisation vector magnetic susceptibility and permeability, magento-static energy, uniformly magnetised sphere in magnetic field, classical theories of para, dia & ferro-magentism, magentic circuits and their comparison with electric circuits. |
| | Radiation from an accelerated charged at low velocity (Larmor's formula). Radiation from an oscillating electric dipole. Linear antenna. Radiation from a charged particle moving in a circular orbit. Electric quadrupole radiation. Radiation damping. |
| II | **Electromagnetics** |
| | Time varying fields. Maxwell's electromagnetic field equations in stationary and moving media. Electromagnetic scalar wave equations and their solution, Hertz vector. Plane Wave propagation in conducting and ionized media, Radiation pressure and momentum, Reflection, refraction, total internal reflection, polarization, scattering (Rayleigh and Thamson) and dispersion of plane a.m. waves, Elements of wave guides. |
| III | **Electromagnetic Radiation** |
| | Retarded potential. Lienard-Wiechart potentials due to uniformly moving and accelerated charges. Lorentz formula, Bremsstrahlung. |
| | Radiation from an accelerated charged at low velocity (Larmor's formula). Radiation from an oscillating electric dipole. Linear antenna. Radiation from a charged particle moving in a circular orbit. Electric quadrupole radiation, Radiation damping. |
| IV | Concept of plasma, plasma oscillation, Debye sheilding, plasma parameters, magnetoplasma, plasma confinement, hydrodynamical desorption of plasma, fundamental equations, hydromagnetic waves, magnetosonic and Alfen waves, wave phenomenon in magnetoplasma, phase and group velocity cut offs, Resonance for electromagnetic, wave propagating parallel & perpendicular to the magnetic field. Apleton Hartee formula, propagation through ionosphere and magneto-sphere Helicon, Whistles, Faraday rotation. |
| V | **Relativistic Formulations** |
| | Covariant formulation of electrodynamics, continuity equation, Lorentz force, potentials, operators, Electromagnetic field tensor. Transformation of fields. Transformation of field due to a point charge in uniform motion, Lagranging and Hamiltonian formulation of the motion of a charged particle in an electromagnetic field. Radiation from relativistically moving particles. |