

SEMESTER II

PHY (N)-102

Electromagnetism

CREDIT: 3

BLOCK 1 Electrostatics

Unit –1: **Electrostatics:** Quantization of charge and Millikan's oil-drop experiment, Coulomb's law application

Unit –2: **Electric field and Potential:** Intensity and potential, Gauss' theorem, simple applications,

Unit –3: **Electric field and Potential II:** Potential and field due to an arbitrary charge, long charged wire, sphere, disc, electric dipole, and energy stored in an electric field

BLOCK 2 Dielectric properties of matter

Unit –4: **Polarization:** Dielectric polarization and polarization charges, Gauss's law in dielectrics

Unit –5: **Dielectric:** Vectors D and E and their boundary conditions, capacitors filled with dielectrics.

Unit –6: **Dielectric Susceptibility** Dielectric Susceptibility and permittivity, Clausius-Mossotti relation, Langevin theory of polar dielectric

BLOCK 3: Magnetism

Unit –7: **Basic Magnetism:** Lorentz force, Bio-Saverts law, Magnetic force between current elements, Ampere's circuital law, Maxwell correction in Ampere's law

Unit –8: **Vector potential and Magnetic flux:** Curl and divergence of B , Vector potential, Magnetic flux, Calculation of B for circular and solenoidal currents. Torque on a current loop in a uniform magnetic field, Magnetic dipole

Unit –9: **Magnetic dipole:** Torque on a current loop in a uniform magnetic field, Magnetic dipole, Energy stored in a magnetic field, Ballistic galvanometer

Unit –10: **Magnetization:** Intensity of magnetization, relation between B , H , and M , illustration in the case of bar magnet,

Unit –11: **Magnetic susceptibility:** Magnetic susceptibility, dia, para and ferromagnetic materials, Curie's law. Hysteresis in a ferromagnetic material.

BLOCK 4: Introduction to Electrodynamics

Unit –12: **Steady Current:** Electric Current, Drift Velocity, Current density, equation of continuity, electric Resistivity and conductivity, Wiedemann-Frenz law.

Unit –13: **Alternative current:** Mean and r.m.s. values of current and emf with sinusoidal wave form, Reactance, impedance, phase-angle, power dissipation in AC circuit, power factor, vector diagram, series LR, CR and LCR circuits Resonance in a series LCR circuit, Q-factor, principle of ideal Transformer