

SEMESTER –II
PHY02(T)
Electromagnetism, Electronics – I

(Lectures:90)
(Full Marks: 75)

UNIT- I (30 Lectures)

Electric field due to a continuous charge distribution. Gauss' law in electrostatics (both differential and integral form). application of Gauss' law: Electric field due to a point charge, uniformly charged rod, uniformly charged spherical shell and solid sphere, uniformly charged infinite plane sheet. Dielectric medium, Polarization, Displacement vector, Gauss' law in a dielectric medium.

Work done in electrostatic field expressed as line integral, conservative nature of electrostatic field. Electrostatic potential and potential energy due to a charge distribution, calculation of potential and field of an electric dipole, charged circular discs, charged hollow and solid spheres. Method of electrical images. Electric field near the surface of a grounded conducting plane using method electrical images.

Vector form of Biot-Savart law; calculation of magnetic field due to a straight conductor carrying current, circular coil carrying current and a solenoid.

Magnetic dipole moment and its relation to angular momentum, gyromagnetic ratio, magnetization vector, magnetic susceptibility and permeability (linear cases only), hysteresis, B-H curve.

UNIT-II (20 Lectures)

Non-steady currents and continuity equation, rise and decay of current in LR and CR circuits, time constants, transients in LCR circuit.

Alternating current: Complex impedance, reactance; impedance of LCR series and parallel circuits, resonance, Q-factor, power dissipation, power factor.

Power supply: Single phase and three phase electrical power supply, delta and star connections.

Integral and differential forms of Faraday's law, mutual and self inductance and their relation for a solenoid, transformer, energy in a static magnetic field, Maxwell's displacement current, Maxwell's equations in free space and in a medium with deduction.

UNIT-III (20 Lectures)

Basic circuit analysis: Kirchhoff's laws and applications. Superposition theorem, Thevenin's theorem and Norton's theorem. Two port analysis of an electrical network, hybrid parameters and hybrid parameter equivalent diagram.

Rectifier: Full wave rectifier, calculation of ripple factor, and rectification efficiency, filter circuits.

BJT: Characteristics of BJT, CB and CE configurations, active and saturation regions, load line analysis, Q point. Current amplification factors in CB and CE configuration, h parameters of transistors and h-parameter equivalent diagram (CB and CE).

UNIT IV (20 Lectures)

Analog and Digital signals, binary system, binary to decimal and decimal to binary, binary arithmetic-addition and subtraction, signed binary numbers, two's complement scheme.

Logic gates: OR, AND, NOT gates and their realisation with diodes and transistor, NOR and NAND as universal gates.

Boolean algebra (elementary aspects only), de' Morgans theorems.

Text Books:

1. **Electromagnetics:** BB Laud, New Age International Publishers, Latest edition.
2. **Electricity and Magnetism:** DC Tayal, Himalayan Publisher, Latest edition.
3. **Basic Electronics:** DC Tayal, Himalayan Publishers, Latest edition.

Reference Books:

1. **Electricity and Magnetism-** K.K. Tewari, S Chand, New Delhi, 2011.
2. **Basic Electronics: Devices, Circuits and Its Fundamentals:** S Kal, Prentice Hall India, New Delhi, First Edition, 2002.
3. **Principles of Electronics:** V. K. Mehta and R. Mehta, S. Chand & Co., New Delhi, 2005.
4. **Fundamental principles electronics:** B.Ghosh, Books and Allied (P) LTD, Kolkata , Latest edition.
5. **Undergraduate Physics Vol-II:** AB Bhattacharya and R Bhattacharya, New Central Book Agency, Kolkata, Reprint, 2008.

SEMESTER –II
PHY02 (P)
Experimental Physics-I
(Full Marks : 25)

(Minimum eight experiments to be performed)

List of experiments:

1. Determination of the value of acceleration due to gravity ('g') by using bar pendulum pendulum.
2. Determination of the value of acceleration due to gravity ('g') by using Kater's pendulum
3. Determination of the moment of inertia of a regular solid (called unknown body) about its axis through its centre of gravity by using torsional pendulum.
4. Determination of the rigidity modulus of a cylindrical body by static torsion apparatus.
5. Determination of the co-efficient of viscosity of liquid by capillary tube method.
6. Determination of the surface tension of a liquid by Jaeger's method.
7. Determination of the frequency of a tuning fork by Melde's method.
8. To verify the inverse square law in magnetism.
9. Determination of the resistance per unit length of the potentiometer wire by Carey-Foster method.
10. Determination of the value of the capacitance of an unknown capacitor by using the de-Sauty's bridge.

Text Books

1. B.Sc. Practical Physics, C.L. Arora, S Chand and Co., 2005.
2. A Text Book of Practical Physics, S. Ghosh, New Central Book Agency, Kolkata, 2004.
3. A Text Book on Practical Physics, K.G. Mazumdar, Shreedhar publisher, kolkatta. 2006.