Cluster University, Srinagar

Physics syllabus
Theory: 4 Credits ***Marks: 60***

Semester-II

Electricity and Magnetism

Credits: Theory- 04 **Theory: 60 Lectures: Marks: 60**

Unit-I

Vector Analysis: Review of vector algebra (Scalar and Vector product), gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors (statement only). Electrostatics: Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Differential form of Gauss Law.

Unit-II

Applications of Gauss theorem. Electric field due to a point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor. Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere. Calculation of electric field from potential. Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Energy per unit volume in electrostatic field.

Unit-III

Displacement vector. Gauss's theorem in dielectrics. Parallel plate capacitor completely filled with dielectric. Magnetism: Magnetostatics: Biot-Savart's law & its application: straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law. Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia, para, and ferro-magnetic materials.

Unit-IV

Electromagnetic Induction: Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field. Maxwell's equations and Electromagnetic wave propagation: Equation of continuity of current, Displacement current, Maxwell's equations, Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, polarization.

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Convener,
Board of Undergraduate Studies (Physics)
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Text Books

Electricity and Magnetism, Edward M. Purcell, 1986, McGraw Hill Education.

Reference Books:

1. Electricity and Magnetism, J. H. Fawkes & J. Yarwood. Vol. I, 1991, Oxford University Press
2. Electricity and Magnetism, D. C. Tayal, 1988, Himalaya Publishing House
3. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole
4. D. J. Griffiths, Introduction to Electrodynamics, Benjamin Cummings.

Electricity and Magnetism Lab **Marks: 30**

Credits: 02

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1. To use a multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) AC and DC current, (c) capacitance, (d) frequency, and checking electrical fuses
2. Ballistic Galvanometer
   (i) Measurement of charge and current sensitivity
   (ii) Measurement of Critical damping resistance
3. Determination of high resistance by leakage method/substitution method
4. To determine self inductance of a coil by Rayleigh's method
5. To find the coefficient of mutual inductance of two coils
6. To compare capacitances using De' Sauty's bridge
7. To study the variation of magnetic field with distance along the axis of a circular coil carrying current by plotting a graph.
8. To find the value of B_H the horizontal component of earth's magnetic field using a deflection and a vibration magnetometer
9. To study the characteristics of a series RC circuit
10. To study a series LCR circuit and determine its (a) Resonant frequency, (b) Quality factor Q
11. To study a parallel LCR circuit and determine its (a) Anti-Resonant frequency, (b) Quality factor Q.
12. To determine a low resistance by Carrey Foster's bridge.

Reference Books:

1. Advanced practical Physics for students, B. L. Flint and H. T. Worsnop, 1971, Asia publishing house.

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2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, Heinemann Educational Publishers.
3. Engineering Practical Physics, S. Panigrahi & B. Mallick, 2015, Cengage Learning India Pvt. Ltd.

Text Books:

1. A text book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi
2. B. Sc. Practical Physics, C. L. Arora, S. Chand & Company Ltd. New Delhi.
3. Practical Physics, S. L. Gupta and V. Kumar, Pragati Prakashan, Meerut.
4. Advanced Practical Physics, S. P. Sing, Pragati Prakashan, Meerut.

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