**SEMESTER 2nd**
**MINOR COURSE**
**PHY222N: PHYSICS (ELECTRICITY AND MAGNETISM)**

**CREDITS: 04 + 02**

**THEORY (04 CREDITS)**

**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 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.

**TEXTBOOK:**

Electricity and Magnetism, Edward M. Purcell, 1986. Mc-Graw Hill Education.

**REFERENCE BOOKS:**


l. Electricity and Magnetism, J.H. Fewkes & J. Yarwood. Vol. l, 1991, Oxford Univ. 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, 3rd Edn. 1998, Benjamin Cummings


**Laboratory Course (Practical) (Credits: 02)**

l. To use a Multimeter for measuring
   (i) Resistances
   (ii) AC and DC Voltages
   (iii) DC Current
   (iv) Checking electrical fuses.
2. Ballistic Galvanometer:
   (i) Measurement of charge and current sensitivity
   (ii) Measurement of Critical Damping Resistance
   (iii) Determine a high resistance by Leakage Method
   (iv) To determine Self Inductance of a Coil by Rayleigh's Method.
3. To compare capacitances using De'Sauty's bridge.
4. Measurement of field strength B and its variation in a Solenoid/Sc Method (Determine dB/ d*).
5. To study the Characteristics of a Series RC Circuit.
6. To study the A series LCR circuit and determine its (a) Resonant Frequency. (b) Quality Factor 7. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q
8. To determine a Low Resistance by Carey Foster's Bridge.
9. To verify, the Thevenin and Norton theorem
10. To verily the Superposition, and Maximum Power Transfer Theorem

**REFERENCE BOOKS**


l. Advanced Practical Physics for students, B. L. Flint & H. T. Worsnop" 1971, Asia Publishing House.
2. A Textbook of Practical Physics, Indu Prakash and Ramakrishna. 11th Edition, 2011. Kitab Mahal, New Delhi.
3. Engineering Practical Physics, S. Panigrahi & B. Mallick, 2Ol5, Cengage Learning India Pvt. Ltd.
4. Advanced level Physics Practicals, Michael Nelson and John M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.