

Course Title	ELECTRICITY AND MAGNETISM
Course Code	MPHY-221
Credit Hours	CH3
Pre- requisites	FSc / A-Level (Physics) or equivalent
Learning outcomes	To develop understanding of basic concepts of electricity and magnetism and to strengthen problem solving skills.
Contents	Electric field and Gauss's Law: Electric charge, conductors and insulators, Induced charges, Coulomb's law, Electric fields and force, Electric field lines, electric dipole, electric flux, Gauss' law and its applications (planar, cylindrical and spherical symmetry), Charges on conductors, Electric Potential, Equipotential surfaces, potential gradient, Electrostatic accelerator. Capacitance, dielectrics and electric current: Capacitors, Capacitance, series and parallel, energy storage in capacitors, dielectrics, induced charge, Gauss's law in dielectrics, current, resistivity, resistance, Ohm's law, electromotive force, energy and power, metallic conductors, resistors in series and parallel, Kirchhoff's rules, electrical measuring meters, RC circuits, power distribution systems. Magnetic field, forces and sources: Magnetism, magnetic fields, field lines and flux, charged particle in magnetic field, applications, magnetic force on a current carrying conductor, force and torque on a current loop, DC motor, Hall effect, Magnetic field of a moving charge, magnetic field of a current element and conductor, circular loop, force between parallel conductor, Ampere's law and applications, Magnetic materials. Electromagnetic induction and inductance: Faraday's and Lenz's laws, motional electromotive force, induced electric fields, Eddy currents, Displacement current and Maxwell's equations, superconductivity, mutual inductance, self-inductance and inductors, magnetic field energy, RL, LC, LRC series circuits. Alternating current and electromagnetic waves: Phasors and alternating current, resistance and reactance, LRC series circuit, power in alternating current, resonance, transformers, Maxwell's equations, plane electromagnetic waves and speed of light, sinusoidal electromagnetic waves, energy and momentum in electromagnetic waves, standing electromagnetic waves.
Teaching-learning Strategies	Classroom teaching / Lecturing
Assignments- Types and Number	Problem sheets: 3-4
Assessment and Examinations	Mid-Term Assessment: 35% Formative Assessment: (25%): It includes classroom participation, attendance, assignments and presentations, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc. Final Term Assessment: 40%
Text Books	1. Fundamentals of Physics (Extended), by D. Halliday, R. Resnick and J. Walker, Wiley, 10th Edition, (2013). 2. Physics Vol. II (extended) by Resnick, Halliday and Krane, 5th Edition, Wiley, (2001). 3. Electricity and Magnetism by E. M. Purcell, D. J. Morin, Cambridge, (3rd Ed.), (2013). 4. University Physics with Modern Physics, by R. A. Freedman, H. D. Young, and A. L. Ford (Sears and Zeemansky), Addison-Wesley-Longman, 13th Edition, (2010). 5. Physics for Scientists and Engineers, by R. A. Serway and J. W. Jewett, Golden Sunburst Series, 8th Edition, (Physics for Scientists and Engineers, with Modern Physics, by D. C. Giancoli, Addison-Wesley, 4th Edition (2008).