Phys 1004	ELECTRICITY AND MAGNETISM	(CR3)
Preq.	FSc/A-Level (Physics) or equivalent	

Objectives

To develop understanding of basic concepts of electricity and magnetism and to strengthen problem solving skills.

Syllabus

Electrostatics, electric charge, conductors and insulators, Coulomb's law, Electric fields due to a point charge and an electric dipole, Electric field of continious charge distributions (cases of uniform line, ring and disk of charge), electric dipole in an electric field, electric flux, Gauss' law and its applications (planar, cylindrical and spherical symmetry). Electric Potential, Equipotential surfaces, Potential due to a point charge and a group of point charges, Potential due to an electric dipole, Electric potential of continuous charge distributions, Relation between electric field and electric potential energy. Calculating the capacitance, capacitors combinations (series and parallel), energy stored in an electric field, dielectrics and Gauss' law. Ohm's law, electric current and current density, resistance and resistivity, Resistors combinations (series and parallel), Ohm's law: a microscopic view, semiconductors and superconductors. magnetic force on a moving charge, Magnetic force on a current carrying wire, torque on a current loop, magnetic dipole moment, Magnetic field due to a current, force between two parallel currents, Ampere's law, Biot-Savart law: magnetic field due to a current, solenoids and toroids, current-carrying coil as a magnetic dipole, inductance, Faraday's law of induction, Lenz's law, motional EMF, Induced electric fields. Energy stored in a magnetic field. Magnetic properties and Alternating Fields, Gauss' law for magnetism, Spin and orbital magnetic dipole moment, magnetization, magnetic materials, Diamagnetism, Paramagnetism, Ferromagnetism, Hysteresis, Induced magnetic fields, Displacement current, electromagnetism and Maxwell's equations.

Recommended 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 Edition), (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 International edition, (2010).*
5. *Physics for Scientists and Engineers, by R. A. Serway and J. W. Jewett, Golden Sunburst Series, 8th Edition, (2010).*
6. *Physics for Scientists and Engineers, with Modern Physics, by D. C. Giancoli, Addison-Wesley, 4th Edition (2008).*