



<b>Phys 4201</b>	<b>CLASSICAL ELECTRODYNAMICS-I</b>	<b>(CR3)</b>
<b>Preq.</b>	<b>Phys 1004</b>	

### Objectives

*This course gives understanding of the basic concepts of classical electrodynamics.*

### Syllabus

The basic concepts (Electric charge, Coulomb's law, the electric field, the electrostatic potential, Gauss's law, application of Gauss's law etc), the electric dipole, multipole expansion of electric fields, the Dirac delta function, Poisson's equation, Laplace's equation, Laplace's equation in one independent variable, solution to Laplace's equation, conducting sphere in a uniform electric field, electrostatic images, Polarization in dielectrics, field outside a dielectric medium, the electric field inside a dielectric, Gauss's law in a dielectric: the electric displacement, electric susceptibility and dielectric constant, point charge in a dielectric fluid, boundary conditions on the field vectors, boundary-value problems involving dielectrics, method of images for problems involving dielectrics, Potential energy of a group of point charges, electrostatic energy of a charge distribution, energy density of an electrostatic field, related problems, Electric Current and Magnetostatics: Nature of the current, current density: equation of continuity, Ohm's law: conductivity, steady currents in continuous media, approach to electrostatic equilibrium, the definition of magnetic induction, forces on current-carrying conductors, the law of Biot and Savart, elementary applications of the Biot and Savart law, Ampere's circuital law, the magnetic vector potential, the magnetic field of a distant circuit, the magnetic scalar potential, magnetic flux, related problems.

### Recommended Books

1. *Foundation of Electromagnetic Theory* by J. R. Reitz, F. J. Milford and R. W. Christy (4<sup>th</sup> Edition), Addison-Wesley (2009)
2. *Introduction to Electrodynamics*, David J. Griffiths (4<sup>th</sup> Edition), Prentice Hall (2013).
3. *Classical Electrodynamics*, J.D. Jackson, third edition, John Wiley (2012)
4. *Elements of Electromagnetics* by M. N. O. Sadiku (5<sup>th</sup> Edition), Oxford (2009).