



Phys 4202	CLASSICAL ELECTRODYNAMICS-II	(CR3)
Preq.	Phys 4201	

Objectives

The second course provides some further topics of classical electrodynamics.

Syllabus

Magnetization, the magnetic field produced by magnetized material, magnetic scalar potential and magnetic pole density, magnetic intensity, magnetic susceptibility, permittivity and hysteresis, boundary conditions on the field vectors, boundary-value problems involving magnetic materials, related problems, Electromagnetic induction, the generalization of Ampere's law, energy density in the magnetic field, electromagnetic energy, the wave equation, monochromatic waves, boundary conditions, the wave equation with sources, vector and scalar potentials, gauge transformations (Lorentz gauge, Coulombs gauge), pressure of radiations, retarded scalar and vector potentials, covariant formulation of electrodynamics, transformation laws of electro magnetic fields, related problems, Propagation of Electromagnetic Waves, plane monochromatic waves in non-conducting media, polarization of waves, energy density, plane monochromatic waves in conducting media, Reflection and refraction at the boundary of two non-conducting media: normal incidence, reflection and refraction at the boundary of two non-conducting media, oblique incidence, complex Fresnel coefficients: reflection from a conducting plane, waveguides, transverse electric and transverse magnetic waves, parallel-plate waveguide, dielectric waveguides, radiation from an oscillating dipole, related problems, Plasma Physics: introduction, electrical neutrality in a plasma, particle orbits and drift motion in a plasma, magnetic mirrors, the hydromagnetic equations, plasma oscillations and wave motion.

Recommended Books

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