RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL
New Scheme Based On AICTE Flexible Curricula
Electrical Engineering, III-Semester
EE-301 Electromagnetic Field & Materials

Unit –1

Gauss law, its integral and differential forms and its applications, multipoles, potential energy, energy density in an electric field, dielectrics , electric polarization, polarizability, permittivity, Clausius – mossotti equation, electric displacement, Gauss's law in dielectrics, dielectric materials, dielectric function, refractive index and absorption coefficient, dielectric relaxation and losses. Maxwell's first equation, Divergence, poisson's and Laplace equation and their solutions. Capacitance, electrostatic energy conduction at a boundary between dielectrics.

Unit –2

Fields due to moving charge, magnetic field, Ampere's law, particles motion in E and B fields, Hall Effect, electro-static and magnetic focusing, magnetic materials:dia, para and ferromagnetic, soft and hard magnetic materials, B,M and H vectors, Ampere's law for magnetic materials, hysteresis, magnetic circuits.

Unit –3

Electromagnetic waves, plane electromagnetic waves, wave equation and solution, Poynting vector, wave propagation through dielectric and conductors, phase velocity, reflection and refraction absorption skin depth, and energy flow density of a wave. Boundary conditions.

Unit –4

Semiconducting materials, band theory of semiconductors, band-to-band transitions, theory of p-n junction and p-n devices, mobility of charge carriers.

Unit –5

Conductivity of metals, electron scattering and resistivity of metals, heat developed in a current – carrying conductor, superconductivity.

Text Books :

1. A.J.Dekkar**, "** Electrical Engg. Materails", Prentice-Hall of India Pvt. Limited, 2005.
2. C.S. Indulkar, "Electrical Engineering Materials", S.Chand & Company Limited, 2008.
3. E.C. Jordan, K.G. Balmain, "Electromagnetic Waves and Radiating Systems", second edition, Prentice Hall, 1968.

Reference Books :

1. William Hart Hayt, John A. Buck, "Engineering Electromagnetics", eight edition, Mcgraw-Hill, 2012.
2. Matthew N.O. Sadiku, "Elements of Electromagnetics", fifth edition Oxford University Press, 2010.
3. Bhag Singh Guru, Huseyin, "Electromagnetic Field Theory Fundamentals", second edition, Cambridge University Press, 2004.