

Subject Code:1SC2050203

Subject Title: Electrodynamics

COURSE OBJECTIVE:

Physics is a science to understand the nature. This course is designed to get basic understanding of the physical world.

LEARNING OUTCOMES:

Students' knowledge will be improved in the field of electrodynamics.

Teaching scheme (hours) per week		Credit		University Examination		Internal Examination		Total
Theory	Practical	Theory	Practical	Theory	Practical	Theory	Practical	
4	--	4	--	60	--	40	--	100

Unit	Content	Lectures	Weight (%)
1	Maxwell's equations in matter, Continuity equation, Poynting theorem – Momentum conservation, Maxwell's stress tensor – Angular momentum. Electromagnetic Waves in Vacuum: Wave equation for E and B fields, Monochromatic plane waves – Energy & momentum in electromagnetic waves, Polarization of electromagnetic waves: linear and circular polarization. Electromagnetic waves in matter: Propagation in linear media- Boundary conditions Reflection and Refraction – Snell's law. Reflection and Transmission at normal and oblique incidence – Fresnel's equations.	15	25
2	Radiation from Moving point charges: Lienard-Wiechert potentials- Fields of a moving point charge- Power radiated by a point charge (Larmor formula), Radiation from a slowly moving charges, Radiation from relativistically moving charges, Larmor's generalization to relativistic case – Synchrotron radiation – Bremsstrahlung radiation. Thomson Scattering – Scattering of radiation from quasi free charges – Cerenkov radiation, Radiation Reaction: Abraham – Lorentz formula – Physical basis of radiation reaction.	15	25
3	Total internal reflections, EM waves in isotropic linear conducting media – Reflection at conducting surface. Wave Guides and Resonant Cavities: Bounded waves – TE, TM, TEM modes, Rectangular wave guides – Circular cylindrical wave guides – Resonant cavities, Q of a cavity Dielectric wave guides (Optical fiber): H E Modes.	15	25
4	Electromagnetic Radiation: Electromagnetic potentials Scalar and vector potentials Gauge transformations Gauge conditions (Lorentz and Coulomb gauges). Retarded Potentials-Jefimenko's equations for the E and B fields. Radiations from extended sources: Electric dipole radiation Magnetic dipole and electric quadrupole radiations, Center-fed linear antenna- Hertzian dipole antenna – Small loop antenna. Rayleigh's scattering at long wavelength and blueness of sky- Scalar diffraction theory.	15	25

Basic Reference book:

1. Classical Electrodynamics by J D Jackson, 2nd Ed; Wiley Eastern Ltd. 1975.
2. Introduction to Electrodynamics by David J Griffiths, 3rd Ed Prentice Hall, India, 2002.
3. Classical electromagnetic Theory by Jack Vanderlinde, John Wiley & sons, Inc. 1993.
4. Elements of Electromagnetics by Sadiku 2nd Ed. Oxford Univ. Press. Inc. 1995.
5. Classical Electrodynamics by Griener, Springer Verlag, New York, Inc. 1998.