Course Type	Course Code	Name of Course	L	T	P	Credit
DC	PHC208	ELECTRODYNAMICS	3	0	0	9

Course Objective

The Objective of the course is to teach students about the propagation of electromagnetic waves in linear media (vacuum, dielectric, and conductor).

Learning Outcomes

Upon successful completion of this course, students will:

- Understand the concept of electrostatics and its applications with different principles.
- Know the concept of magnetostatics and its applications with different laws.
- Learn the principle behind the generation of electromagnetic waves.
- Familiarize with different principles and phenomena when electromagnetic wave propagates in different media.
- Have knowledge about the generation of electromagnetic radiation.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	**Electrostatics:** Differential form of electrostatic field equation, Poisson and Laplace equations, boundary value problems, Examples of image method and Green's function method, solutions of Laplace equation in cylindrical and spherical coordinates by orthogonal functions, dielectrics, polarization of a medium, electrostatic energy, Multipole Expansion.	13	The students will learn the concept of electrostatics and its applications with different principles.
2	**Magnetostatics:** Biot-Savart law, Ampère's law, differential equation for static magnetic field, vector potential, magnetic field from localized current distributions, examples of magnetostatic problems, Faraday's law of induction, magnetic energy of steady current distributions.	08	This unit will help students in understanding the concept of magnetostatics and its applications with different laws.
3	**Maxwell's Equations:** Displacement current, Maxwell's equations, vector and scalar potentials, gauge symmetry, Coulomb and Lorentz gauges, electromagnetic energy and momentum, conservation laws, inhomogeneous wave equation and Green's function solution. Plane waves in a dielectric medium, reflection and refraction at dielectric interfaces, frequency dispersion in dielectrics and metals, dielectric constant and anomalous dispersion, wave propagation in one dimension, group velocity, metallic wave guides, boundary conditions at metallic surfaces, propagation modes in wave guides, resonant modes in cavities.	18	This will help to learn the principle behind the generation of electromagnetic waves. Also students will familiarize with different principles and phenomena when electromagnetic wave propagates in different media like vacuum, dielectric and conductor.
4	Introduction to radiation theory	03	From this unit students will learn the principle behind the generation of electromagnetic radiation.
	Total	**42**	

Textbooks:

1. Introduction to Electrodynamics; Griffiths; PHI Learning; 2009
2. Classical Electrodynamics; J. D. Jackson; John Wiley; 2007
3. Classical Electrodynamics; Greiner; Springer; 1998

Reference Books:

1. Classical Electrodynamics, J. Schwinger, L. L. Deraad Jr., K. A. Milton, W.Y.Tsai, J. Norton, Westview Press, 1998.
2. Principles of Electrodynamics, Melvin M. Schwartz (Author), Dover Publications Inc., 1988.
3. Classical Electricity and Magnetism; Panofsky and Phillips; Dover Publications, Inc.; 1990
4. Electrodynamics of Continuous Media: Course of Theoretical Physics - Vol. 8, 2nd Edition, L.D. Landau and E.M. Lifshitz, Elsevier India, 2013.
5. Foundations of electromagnetic theory; Reitz, Milford & Christy; Pearson; 2009.
6. Classical Electromagnetic Theory; Vanderlinde; John Wiley & Sons; 1993.