

# Syllabus of PH 1020

## Learning objectives:

*To enable the students to:*

- a) describe electromagnetic phenomena using the language of vector calculus.*
- b) determine electric and magnetic fields arising from simple configurations of static charges as well as steady currents in vacuum and in matter.*
- c) solve problems involving propagation of electromagnetic waves in vacuum and in matter.*
- d) apply the methodology of quantum mechanics to simple systems.*

## Contents:

### Unit 1: Electrostatics and magnetostatics

Maxwell's equation-I, work and energy in electrostatics, displacement and polarization, boundary conditions. Maxwell's equation-II, Ampere's law, magnetic vector potential, magnetism in matter.

### Unit 2: Electrodynamics and electromagnetic radiation

Lorentz force, Faraday's law and Lenz's law, electromagnetic induction. Displacement current, Maxwell's equations III and IV, energy stored in an electromagnetic field, electromagnetic waves in vacuum and in matter, Snell's law.

### Unit 3: Introduction to quantum mechanics

The quantum nature of radiation, interference experiment with radiation and particle beams. Postulates of quantum mechanics, Schrodinger wave equation. Applications to simple physical systems such as free particle, particle in a box and barrier penetration, spin, two-state systems.

-----

## Textbooks:

1. Introduction to Electrodynamics  
David J. Griffiths, Pearson Education India Learning Private Limited; 4 Edition (2015)
2. Intro to Quantum Mechanics  
David J. Griffiths, Pearson Education India Learning Private Limited (2015)

## References:

1. The Feynman Lectures on Physics Vol 2 and Vol 3, Richard P. Feynman and R. B. Leighton, Narosa Publishing House (2008)
2. Quantum Physics, H C Verma, TBS, 2nd edition (2012)
3. Fundamentals of Physics II - Electromagnetism, Optics, and Quantum Mechanics: 2 (The Open Yale Courses)  
R. Shankar Yale University Press; 1 edition (2016)