MALAVIYA NATIONAL INSTITUTE OF TECHNOLOGY JAIPUR

DEPARTMENT OF PHYSICS

Course: Modern Physics

DETAILS OF THE COURSE

Course Type	Course Code	Course Title	Credits	Lecture	Tutorial	Practical	Studio
IC	21PHT101	Modern Physics	3	2	1	0	0

PREREQUISITE: None

COURSE OBJECTIVE(s)

This course aims to familiarize and equip the students with fundamental knowledge of quantum mechanics and electrodynamics. The learned knowledge would enable the students to tackle standard engineering problems.

COURSE ASSESSMENT

The Course Assessment (culminating to the final grade), will be made up of the following three components;

S. No.	Component	Weightage
a)	Internal assessment (based upon assignments, quizzes and attendance)	20%
b)	Mid-term examination	30%
c)	End Semester Examination	50%

COURSE CONTENTS

Electrodynamics - Introduction to vector analysis, gradient, divergence and curl, Gauss divergence theorem and applications, Stokes theorem and applications, laws of electromagnetism, vector potential, boundary conditions of electric and magnetic field Maxwell's equations (differential and integral forms) and their physical significance, displacement current and continuity equation, Poynting theorem and power flow, electromagnetic wave equation and its solution in free space, transverse nature of electromagnetic waves, energy and momentum in electromagnetic waves

(No. of lectures- 13)

Quantum Mechanics – Basics of quantum mechanics, wave-particle duality, concept of phase and group velocity, Heisenberg's uncertainty principle and its applications, wave function and its properties, orthogonality of wave function and expectation values, energy and momentum operators, Schrodinger equation (time dependent and time independent), probability current density, solution of Schrodinger equation for 1D and 3D infinite potential well, concepts of quantum mechanical tunneling **(No. of lectures- 13)**

TEXT BOOKS/ REFERENCE BOOKS:-

1. Introduction to Electrodynamics, David J. Griffiths, Prentice Hall
2. Modern Electrodynamics, Andrew Zangwill, Cambridge University Press
3. Quantum Mechanics, Nouredine Zettili, Wiley
4. Concepts of Modern Physics, Arthur Beiser, McGraw Hill Education
5. Quantum Mechanics, B. H. Bransden and C. J. Joachain, Pearson
6. Engineering Physics, Hitendra K. Malik and A. K. Singh, McGraw Hill Education

Lecture Plan

Lecture No.	Topics to be covered
1	Introduction to vector analysis
2	Gradients, divergence and curl
3	Gauss divergence theorem and applications
4	Stokes theorem and applications
5	Laws of electromagnetism, vector potential
6-7	Boundary conditions of electric and magnetic field
8-9	Maxwell's equations (Differential and Integral forms) and their physical significance
10	Displacement current and continuity equation
11	Poynting theorem and power flow
12	Electromagnetic wave equation and its solution in free space, transverse nature
13	Energy and Momentum in Electromagnetic waves
14	Basics of quantum mechanics
15	wave-particle duality
16	Concept of phase and group velocity
17	Heisenberg's uncertainty principle and its applications
18	Wave function and its properties
19	Orthogonality of wave function and expectation values
20	Energy and momentum operators
21-22	Schrodinger equation (time dependent and time independent)
23	Probability current density
24	Solution of Schrodinger equation for 1-D potential well
25	Solution of Schrodinger equation for 3D-box
26	Concepts of quantum mechanical tunneling