MALAVIYA NATIONAL INSTITUTE OF TECHNOLOGY JAIPUR

DEPARTMENT OF PHYSICS

Course: Classical Physics

Course Type	Course Title	Credits	Lecture	Tutorial	Practical	Studio
IC	Classical Physics	3	2	1	0	0

COURSE CONTENTS

To equip students with basic concepts and techniques related to Newtonian Mechanics of point particles and extended objects.

Kinematics and dynamics - Polar coordinates, Velocity and acceleration in polar coordinates, Inertial frames, Newton's laws of motion and their applications, Friction, Constrained motion and Pseudo forces, Dynamics of system of particles, Conservation of momentum, Center of mass, Momentum of variable mass system: Motion of rocket. Work energy theorem, Kinetic energy, Conservative and Non-conservative forces, Potential energy, Law of conservation of energy, Work done by a non-conservative force, Elastic and inelastic collisions, Center of mass and laboratory frames.

(No. of lectures- 8)

Oscillations - Simple Harmonic Motion, Compound Pendulum, Damped Harmonic Motion, Forced oscillations: Transient and steady states, Resonance: sharpness of resonance and quality factor. **(No. of lectures- 5)**

Rotational motion and Elasticity - Conservation of Angular Momentum, Rotation about a fixed axis, Moment of Inertia, Theorem of parallel and perpendicular axes, determination of moment of inertia of simple objects, Rotations about moving axis, Gyroscope, Elastic deformation: Hooke's Law, Stress, strain, Young's Modulus, Sheer Modulus, Bulk Modulus, Section Modulus. **(No. of lectures- 8)**

Fluids - Definition of Fluid, Fluid Dynamics, Pressure difference in accelerating fluid, Bernoulli's equation, viscosity, Surface tension, equation of continuity and Euler's equation, Navier-Stokes theorem. **(No. of lectures- 5)**

TEXT BOOKS/ REFERENCE BOOKS

1. *An Introduction to Mechanics* by Kleppner and Kolenkow, McGraw Hill Education
2. *Mechanics* by D. S. Mathur, S. Chand
3. *Engineering Mechanics: Statics and Dynamics* by J. L. Meriam and L. G. Kraige, Wiley
4. *Fluid Mechanics* by Landau L.D. & Lifschitz E.M, Butterworth-Heinemann
5. *Engineering Physics* by D. R. Joshi, McGraw Hill Education
6. *Vector Mechanics for Engineers: Statics and Dynamics* by F. P. Beer and E. R. Johnston, McGraw Hill Education

Lecture Plan

Lecture No.	Topics to be covered
	Unit 1: **Kinematics and Dynamics**
1.	Polar coordinates. Velocity and acceleration in polar coordinates
2.	Inertial frames, Pseudo forces
3.	Friction
4.	Constrained motion
5.	Dynamics of system of particles - centre of mass, conservation of momentum, laboratory frames
6.	Momentum of variable mass system: Motion of rocket
7.	Work energy theorem, Kinetic energy, Conservative and Non-conservative forces
8.	Law of conservation of energy, Potential energy, work done by a non-conservative force
	Unit 2: **Oscillations**
9.	SHM
10.	Compound Pendulum.
11.	Damped harmonic motion
12.	Forced Oscillations: transient and steady states
13.	Resonance: sharpness of resonance and quality factor.
	Unit 3: **Rotational motion and Elasticity**
14.	Conservation of Angular Momentum,
15.	Fixed axis rotations: Moment of inertia, parallel and perpendicular theorem
16.	Determination of moment of inertia of simple objects
17.	Rotations about moving axis
18.	Gyroscope
19.	Elastic deformation: Hooke's Law, Stress, strain
20.	Young's Modulus, Shear Modulus, Bulk Modulus
21.	Torsional energy stored by a mechanical couple
	Unit 4: **Fluids**
22.	Definition of Fluid, Pressure difference in accelerating fluid
23.	Viscosity, Navier-Stokes theorem
24.	Continuity equation and Euler's equation
25.	Bernoulli's equation
26.	Surface tension