

APPLIED PHYSICS-I

L T P

4 - 2

RATIONALE

Applied physics includes the study of a large number of diverse topics all related to things that go in the world around us. It aims to give an understanding of this world both by observation and prediction of the way in which objects will behave. Concrete uses of physical principles and analysis in various fields of engineering and technology are given prominence in the course content.

DETAILED CONTENTS

1. Unit and Dimensions. (8 hrs)

- 1.1 Physical quantities
- 1.2 Fundamental and derived units
- 1.3 Systems of unit (CGS, MKS and SI units)
- 1.4 Dimensions and dimensional formulae of physical quantities (area, volume, velocity, acceleration, momentum, force, impulse, work, power, energy, surface tension, coefficient of viscosity and strain)
- 1.5 Principle of homogeneity
- 1.6 Dimensional equations and their uses with examples.
- 1.7 Limitations of dimensional analysis.

2. Force and Motion (9 hrs + 6 hrs + 8 hrs)

- 2.1 Scalar and vector quantities - examples, addition and multiplication of vectors, scalar product and vector product of vectors
- 2.2 Force, resolution and composition of forces – resultant, parallelogram law of forces, friction, law of friction and type of friction.
- 2.3 Equilibrium of forces, Lami's theorem
- 2.4 Newton's Laws of motion – concept of momentum, determination of force equation from Newton's second law of motion, Newton's third law of motion Conservation of momentum, impulse and impulsive forces, simple numerical problems.
- 2.5 Projectile, horizontal and oblique projections and equation of Trajectory (Derivation) Derivation of time of flight, maximum height and horizontal range
- 2.6 Circular motion (Definition) Relation between linear and angular velocity and linear acceleration and angular acceleration
- 2.7 Centripetal force (derivation) and centrifugal force Banking of roads.

9 hrs

- 2.8 Rotational Motion 6 hrs
Definition of torque, moment of inertia, radius of gyration, Derivation of rotational kinetic energy and angular momentum, Conservation of angular momentum (qualitative) related problems.

- 2.9 Planetary Motion 8 hrs
Newton's law of gravitation, Kepler's law of planetary motion, Escape velocity (derivation), Artificial satellites and related problems.

3. Work, Power and Energy (8 hrs)

- 3.1 Work: definition and its units.
- 3.2 Work done against friction in moving an object on horizontal and inclined plane (incorporating frictional forces)
- 3.3 Power: definitions and its units, calculation of power in simple cases.
- 3.4 Energy: Definitions and its units: Types: Kinetic energy and Potential energy, with examples and their derivation.
- 3.5 Principle of conservation of mechanical energy (for freely falling bodies), transformation of energy from one form to another and related problems.

4. Properties of Matter (9 hrs)

- 4.1 Elasticity, definition of stress and strain
- 4.2 Different types of modulus of elasticity
- 4.3 Pressure- its units, gauge pressure, absolute pressure, atmospheric pressure (Relation between them), Bourdon's pressure gauge, Fortin's barometer
- 4.4 Surface tension- its units, measurement of surface tension by capillary tube method, applications of surface tension, effect of temperature and impurity on surface tension.
- 4.5 Fluid motion, stream line and turbulent flow.
- 4.6 Viscosity and coefficient of viscosity, Effect of temperature on viscosity

5. Temperature and its measurement (8 hrs)

- 5.1 Difference between heat and temperature on the basis of K.E. of Molecules.
- 5.2 Principles of measurement of temperature and different scales of temperature.
- 5.3 Bimetallic and Platinum resistance thermometer: their merits and demerits
- 5.4 Pyrometers – Disappearing filament optical pyrometer

6. Transfer of Heat (8 hrs)

- 6.1 Modes of transfer of heat (conduction, convection and radiation with examples)
- 6.2 Coefficient of thermal conductivity
- 6.3 Properties of heat radiation. Prevost's theory of heat exchange
- 6.4 Laws of black body radiations: Stefan's law, Kirchoff's law, Wien's law

LIST OF PRACTICALS

1. To find the thickness of wire using a screw gauge
2. To find volume of solid cylinder and hollow cylinder using a vernier caliper
3. To determine the thickness of glass strip and radius of curvature of a concave surface using a spherometer
4. To find the surface tension of a liquid by capillary rise method.
5. To determine the atmospheric pressure at a place using Fortin's Barometer.
6. To determine the time period of simple pendulum and plot a graph between l & t
7. Verify parallelogram Law of forces.

RECOMMENDED BOOKS

1. Concept of Physics, Prof. H.C. Verma, Part-1 (Bharti Bhawan)
2. Concept of Physics, Prof. H.C. Verma, Part-2 (Bharti Bhawan)
3. A Text Book of Applied Physics : Egale Parkashan, Jullandhar