

CLUSTER UNIVERSITY SRINAGAR

PHYSICS

Semester - I

(Credits: Theory-4, Practicals-2)

THEORY

Unit-I

Cartesian co-ordinate system, spherical & cylindrical coordinate system with expression for velocity and acceleration, Ordinary differential equations: 1st order homogeneous differential equations. Second order homogeneous differential equations with constant coefficients.

Laws of motion: Inertial and non-inertial frames of references, uniformly rotating frame, Coriolis force & its applications, Newton's laws of motion, dynamics of a system of particles, centre of mass.

Unit-II

Momentum and energy: Conservation of linear momentum in system of particles. Work and energy, Conservation of energy. Motion of rockets (principle and equation) . Rotational motion: Angular velocity and angular momentum. Torque. Conservation of angular momentum in system of particles.

Special theory of relativity: Galilean and Lorentz transformations. Postulates of special theory of relativity. Length contraction. Time dilation. Relativistic addition of velocities.

Unit-III

Gravitation: Newton's laws of Gravitation. Motion of a particle in a central force field (motion in a plane, angular momentum is conserved, areal velocity is constant). Kepler's Laws. Satellite in circular orbit and applications. Geosynchronous orbits. Weightlessness. Basic idea of global positioning system (GPS).

Oscillations: Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and potential energy. Total energy and their time averages. Damped oscillations.

Unit-IV

Elasticity: Hooke's, Stress-strain diagram. Elastic moduli – Relation between elastic constants. Poisson's ratio-expression for Poisson's ratio in terms elastic constants. Work done in stretching and work done in twisting a wire – Twisting couple on a cylinder. Determination of rigidity modulus by static torsion-Torsional pendulum. Determination of elastic constants by Searle's method

Text Book:

Mechanics Berkeley Physics course, Volume-I: Charles Kittel, et.al. 2007, Tata McGraw-Hill.

Reference Books:

1. University Physics. F. W. Sears, M. W. Zemansky and H. D. Young, 13/e, 1986. Addison-Wesley
 2. Physics-Resnick, Halliday & Walker 9/e, 2010, Wiley.
 3. Engineering Mechanics, Basudeb Bhattacharya, 2nd edn., 2015, Oxford University Press
 4. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole
 5. Special Theory of Relativity, Robert Resnick, Addison-Wiley
 6. Mechanics, D. S. Mathur
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PRACTICAL

1. Study of laws of parallel and perpendicular axis for moment of inertia.
2. To determine the moment of inertia of a flywheel
3. To determine the Young's Modulus of a wire by optical lever method.
4. Young's Modulus of a material of a rectangular bar by bending.
5. To determine the modulus of rigidity of a wire by Maxwell's needle.
6. To determine the elastic constants of a wire by Searle's method.
7. To determine g by Bar pendulum.
8. To determine g by Kater's pendulum.
9. Study of oscillations under a bifilar pendulum.
10. To determine g and velocity for a freely falling body using digital timing technique.
11. To study the motion of a spring and calculate (a) spring constant (b) value of g.
12. Moment of inertia of an irregular of an irregular body about an axis through its centre of gravity with a torsional pendulum.

Reference Books:

1. Advanced practical Physics for students, B. L. Flint and H. T. Worsnop, 1971, Asia publishing house.
2. Advanced level Physics practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, Heinemann Educational Publishers.
3. Engineering Practical Physics, S. Panigrahi & B. Mallick, 2015, Cengage Learning India Pvt. Ltd.

Text Books:

1. A text book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi
2. B. Sc. Practical Physics, C. L. Arora, S. Chand & Company Ltd. New Delhi.
3. Practical Physics, S. L. Gupta and V. Kumar, Pragati Prakashan, Meerut.
4. Advanced Practical Physics, Vol. I & II, S. P. Sing, Pragati Prakashan, Meerut.