

## **DSC 1A Mechanics Credit 4**

### **Vectors**

Scalar and vector products. Derivatives of a vector with respect to a parameter.

### **Laws of Motion**

Newton's Laws of motion. Dynamics of a system of particles. Centre of Mass. Momentum and Energy, Conservation of momentum. Work and energy. Conservation of energy.

### **Rotational Motion**

Angular velocity and angular momentum. Torque. Conservation of angular momentum.

### **Gravitation**

Newton's Law of Gravitation. Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant). Kepler's Laws (statement only).

### **Oscillations**

Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages.

### **Elasticity**

Hooke's law - Stress-strain diagram - Elastic moduli-Relation between elastic constants - Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants - Work done in stretching and work done in twisting a wire - Twisting couple on a cylinder

### **Special Theory of Relativity**

Constancy of speed of light. Postulates of Special Theory of Relativity. Length contraction. Time dilation. Relativistic addition of velocities.

## **DSC 1A – Mechanics Lab Credit 2**

### **List of Practicals (Choose any 5)**

1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope.
2. To determine the Height of a Building using a Sextant.
3. To determine the Moment of Inertia of a Flywheel.
4. To determine the Young's Modulus of a Wire by Optical Lever Method.
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. To study the Motion of a Spring and calculate (a) Spring Constant, (b)  $g$ .