

Program: Certificate Course		Part A: Introduction		
1	Course Code	Class: B.Sc.	Semester: First	Session: 2023-2024
2	Course Title	PSC-01T/ PGE-03T		
3	Course Type	MECHANICS		
4	Pre-requisite (if any)	Theory		
5	Course Learning Outcomes (CLO)	As per norms		
		After completion of the course students will be able to: <ul style="list-style-type: none"> • Get knowledge about the vectors and differential equations used in physics. • Get an idea of different types of motions and conservation laws. • Get an idea about rotational motion and various properties of matter like elasticity and viscosity. • Understand various types of oscillatory motion and GPS system. • Get an idea about Frame of reference and special theory of relativity. • Solve numerical problems based on entire syllabus. 		
6	Credit Value	Theory : 3		
7	Total Marks	Max. Marks: 100	Min Passing Marks : 40	

Part B: Content of the Course		
Total Hours: 45		
Unit	Topic	Number of Hours
I	Vectors: Derivatives of a vectors, Scalar and vector products of two and three vectors, Gradient, divergence and curl of vectors fields, Idea of Polar and Axial vectors. Ordinary Differential Equations: Basic idea of 1st order homogeneous differential equations, 2nd order homogeneous and nonhomogeneous differential equations with constant coefficients (Operator Method Only). Laws of Motion: Review of Newton's Laws of motion. Dynamics of a system of particles, Concept of Centre of Mass, determination of center of mass for discrete and continuous systems having cylindrical and spherical symmetry.	12
II	Work and Energy: Work-Energy theorem for conservative forces, Force as a gradient of Potential Energy, Conservation of momentum and energy, Elastic and in-elastic Collisions. Rotational Dynamics: Angular velocity, Angular momentum, Torque, Conservation of angular momentum, Moment of Inertia, Theorem of parallel and perpendicular axes (statements only), Calculation of Moment of Inertia of discrete and continuous objects (rod, disc, cylinder, solid sphere).	11
III	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, Elementary idea of Surface tension and Viscosity, flow of fluids, coefficient of viscosity, Stoke's law, expression for terminal velocity. 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 (statements only), Satellite in circular orbit and	11

	applications, Geosynchronous orbits.	
IV	Oscillations: Simple harmonic motion, Differential equation of SHM and its solutions, Kinetic and Potential Energy, Total Energy and their time averages, Compound pendulum, Differential equations of damped oscillations and forced oscillations (Conceptual only). Special Theory of Relativity: Frame of reference, Galilean Transformations, Inertial and Non-inertial frames, Outcomes of Michelson Morley's Experiment, Postulates of Special Theory of Relativity, Length contraction, Time dilation, Relativistic transformation of velocity, Relativistic variation of mass, Mass-energy equivalence, Transformation of Energy and Momentum.	11