1.	Title of the course	Classical Mechanics
2.	Course number	PH503L
3.	Structure of credits	3-1-0-4
4.	Offered to	PG
5.	New course/modification to	Modification To PH5103/10
6.	To be offered by	Department of Physics
7.	To take effect from	July 2022
8.	Prerequisite	Nil
9.	**Course Objective(s):** To introduce students to the Lagrangian and Hamiltonian formulations of mechanics, and to familiarize them with fundamentals of fluid mechanics, nonlinear dynamics and chaos. To develop skills in using advanced mathematics to describe physical phenomena and interpret mathematical results in physical terms.	
10.	**Course Content:** D' Alembert's principle, Euler-Lagrange equation; Generalized coordinates, constraints, principle of virtual work, Lagrangian formulation; Noether's theorem; Hamilton's equation of motion, cyclic coordinates, Lagrange multipliers; Legendre transformations, symmetry groups & Louville's theorem; Canonical transformations (Hamilton-Jacobi equations); Action-angle variables, holonomic and non-holonomic constraints, Poisson brackets, non-integrable systems; Central force, Virial theorem, nature of orbits, bound and scattering motions, scattering cross-section; Rotating frame and rigid body motion, moment of inertia tensor, Euler angles and Euler equations, top, stability conditions; Small-oscillations: eigenvalue problem, normal modes, dissipation, parametric resonance, anharmonic oscillators; Nonlinear dynamics: chaos, Lyapunov exponents; Fluid mechanics: Newtonian and non-Newtonian fluids, Navier Stokes equation.	
11.	**Textbook(s):** 1. Deshmukh P C, *Foundations of Classical Mechanics*, Cambridge University Press (2019). 2. Goldstein H, Poole C P and Safko J, *Classical Mechanics*, Pearson (2012).	
12.	**Reference(s):** 1. Landau L D and Lifschitz E M, *Mechanics (Vol. 1: Course of Theoretical Physics)*, Butterworth-Heinemann (1982). 2. Morin D, *Introduction to Classical Mechanics with Problems and Solutions*, Cambridge University Press (2009). 3. Percival I and D Richards, *Introduction to Dynamics*, Cambridge University Press (1987). 4. Rana N C and Joag P S, *Classical Mechanics*, Tata Mcgraw-Hill (2001).	