CURRICULUM DEVELOPMENT PLAN: Prof. Monika Bassi
B.Sc. (H) PHYSICS, First Year, Semester I, NEP-UGCF
(Odd Semester, 2023-2024,)
No. of Theory Periods per week = 3
Unique Paper Code: 2222011102

Name of Paper & Code	Allocation of Lectures	Month wise schedule followed by the Department	Tutorial/assignment/ Presentation etc.
Mechanics (DSC 2)			
Unit 1 **Fundamentals of Dynamics:** Inertial and Non-inertial frames, Newton's Laws of Motion and their invariance under Galilean transformations. Momentum of variable mass system: motion of rocket. Dynamics of a system of particles. Principle of conservation of momentum. Impulse. Determination of Centre of Mass of discrete and continuous objects having cylindrical and spherical symmetry. Differential Analysis of a static vertically hanging massive rope.	7	August-September	• Syllabus Overview • Reference Books • Derivations • Problem solving • Assignments • Previous years Question Papers' problems • Students' difficulties
Work and Energy: Work and Kinetic Energy Theorem. Conservative forces and examples (Gravitational and electrostatic), non-conservative forces and examples (velocity dependent forces e.g. frictional force, magnetic force). Potential Energy. Energy diagram. Stable, unstable and neutral equilibrium. Force as gradient of the potential energy. Work done by non-conservative forces.	4	September	• Derivations • Problem solving • Assignments • Students' difficulties • Class Test • Previous years Question Papers' problems
Collisions: Elastic and inelastic collisions between two spherical bodies. Kinematics of 2 → 2scattering in Centre of Mass and Laboratory frames.	3	September	• Derivations • Problem solving • Assignments

			• Students' difficulties • Class Test • Previous years Question Papers' problems
Unit 2 **Rotational Dynamics:** Angular momentum of a particle and system of particles. Torque. Principle of conservation of angular momentum. Rotation about a fixed axis. Determination of moment of inertia of symmetric rigid bodies (rectangular, cylindrical and spherical) using parallel and perpendicular axes theorems. Kinetic energy of rotation. Motion involving both translation and rotation.	8	October	• Derivations • Problem solving • Assignments • Students' difficulties • Class Test • Previous years Question Papers' problems
Non-Inertial Systems: Non-inertial frames and fictitious forces. Uniformly rotating frame. Centrifugal force. Coriolis force and its applications.	4	October	• Derivations • Problem solving • Assignments • Students' difficulties • Class Test • Previous years Question Papers' problems
Unit 3 **Central Force Motion:** Central forces, Law of conservation of angular momentum for central forces, Two-body problem and its reduction to equivalent one-body problem and its solution. Concept of effective potential energy and stability of orbits for central potentials of the form kr^n for n = 2 and -1 using energy diagram, discussion on trajectories for n = −2. Solution of the Kepler Problem, Kepler's Laws for planetary motion, orbit for artificial satellites	7	October-November	• Derivations • Related Problems • Students' difficulties • Previous years Question Papers' problems • Revision session prior to Home Examinations •
Unit 4: **Relativity**: Postulates of Special Theory of Relativity, Lorentz Transformations, simultaneity, length contraction, time dilation, proper length and proper time, life time of a relativistic particle (for example	12	November-December	• Derivations • Related problems • Revisions • Practice Examinations

muon decay time and decay length). Space-like, time-like and light-like separated events, relativistic transformation of velocity and acceleration, variation of mass with velocity, mass-energy equivalence, transformation of energy and momentum.			• Discussion of Practice Examinations and last year Examination Papers • Tips for Final exams