Physics- PH-101

B.Sc.-1 (Physics)
Semester – I

Paper – I: Classical Mechanics and Theory of Relativity

Note:-
1. Nine Questions will be set in total.

2. Question number 1 will be compulsory and will be based on the conceptual aspects of entire syllabus. This question may have five parts and the answer should be in brief but not in Yes/ No.

3.   Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.

4.   20% numerical problems are to be set.

5.   Use of scientific (non-programmable) calculator is allowed.

Unit 1: Basic concepts of Classical mechanics
 Mechanics of single and system of particles, Conversion law of linear momentum, Angular momentum and mechanical energy for a particle and a system of particles, Centre of Mass and equation of motion, Constrained Motion.

Unit2: Generalized Notations
 Degrees of freedom and Generalized coordinates, Transformation equations, Generalized Displacement, Velocity, Acceleration, Momentum, Force and Potential, Hamilton's variational principle, Lagrange's equation of motion from Hamilton's principle, Linear Harmonic oscillator, Simple pendulum, Atwood's machine.

Unit 3: Theory of relativity
 Frame of reference, limitation of Newton's law of motion, Inertial frame of reference, Galilean transformation, Frame of reference with linear acceleration, Classical relativity-Galilean invariance, Transformation equation for a frame of reference- inclined to an

inertial frame and Rotating frame of reference, Non-inertial frames-The accelerated frame
of reference and rotating frame of reference , Effect of centrifugal and coriolis
 forces due to Earth's rotation, Fundamental frame of reference, Michelson-
 Morley's experiment, concept of Einstein's relativity.

Unit 4: Applications of theory of relativity

 Special theory of relativity, Lorentz co-ordinate and physical significance of Lorentz invariance, Length Contraction, Time Dilation, Twin Paradox, Velocity addition theorem, Variation of mass with velocity, Mass energy equivalence, Transformation of relativistic momentum and energy, relation between relativistic momentum and energy, Mass, velocity, momentum and energy of zero rest mass.

Reference:

1. Classical Mechanics by H. Goldstien (2nd Edition).

2. Berkely Physics Course. Vol. 1. Mechanics by E.M.Purcell
3. Concepts of Modern Physics by Arthur Beiser

4. Mechanics by D.S. Mathur