

Course Name: Classical Mechanics and Relativity

Course Number: PHYS-0132

Department: PHYSICS

Faculty: For Science majors

Requirement: Students are expected to have a good background in Plus 2 level

Physics and Mathematics

*Syllabus*

CLASSICAL MECHANICS AND RELATIVITY

[50 lectures]

Classical Mechanics  
lectures]

[35

**Vectors:** Basic vector algebra and introduction to vector analysis. (8)

**Mechanics of a particle:** Newton's laws of motion; Principle of conservation of linear momentum; Time and Path integral of force; Conservative force field and the concept of potential; Conservation of total mechanical energy; Study of a system with time-varying mass; Rotational motion; Radial and cross-radial components of velocity and acceleration. (10)

**Dynamics of rigid bodies:** Moment of inertia and radius of gyration and their calculation for simple symmetric bodies; Parallel and Perpendicular axes theorems; Torque and the fundamental equation of rotational motion; Principle of conservation of angular momentum; Rotational kinetic energy. (9)

**Gravitation:** Newton's law of Universal gravitation; Kepler's laws of planetary motion; Direct

calculation of gravitational potential and intensity due to simple symmetric bodies; Gauss' theorem

of gravitation; Poisson's equation; Gravitational self-energy; Concept of escape velocity. (8)

### **Special Theory of Relativity**

**[15 lectures]**

Frame of reference; Galilean transformation; Basic postulates of special relativity; Lorentz transformation and its consequences - length contraction, time dilation, velocity addition formula, variation of mass and mass-energy equivalence; Relativistic dynamics; Experimental verification of special relativity.