



INTRODUCTION TO CLASSICAL MECHANICS

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IIT Hyderabad

PRE-REQUISITES : B.Sc in Physics. A course on Mechanics at B.Sc. level.

INTENDED AUDIENCE : M.Sc. Students

COURSE OUTLINE :

This introductory course on Classical Mechanics covers the following topics: Euler Lagrange Equations, Small Oscillations, Central Force Problem, Rigid Body Motion.

ABOUT INSTRUCTOR :

Prof. Anurag Tripathi is Assistant Professor in the Department of Physics at IIT Hyderabad since 2015 and his area of research is Theoretical High Energy Physics. For more details visit <https://www.iith.ac.in/~tripathi/>.

COURSE PLAN :

- Week 1:** Generalised coordinates, D' Alembert's Principle, Euler Lagrange equation of motion and its applications.
- Week 2:** Hamilton's Principle. Conservation laws.
- Week 3:** Small oscillations: Free Oscillations, Damped oscillations
- Week 4:** Forced Oscillations, Resonance, Normal Coordinates.
- Week 5:** Central force problem, reduction to 1 body problem, Equation of motion and first integrals.
- Week 6:** Classification of orbits. Scattering in central field.
- Week 7:** Kinematics of rigid body motion: Degrees of freedom of rigid body, orthogonal transformations.
- Week 8:** Euler angles, Euler's theorem.
- Week 9:** Finite and infinitesimal rotations. What are tensors? Moment of inertial tensor
- Week 10:** Principle axis transformation, Euler Equation of motion
- Week 11:** Torque free motion of a rigid body. Heavy symmetrical top with one point fixed
- Week 12:** Hamilton equation of motion, Conservation theorems, Canonical transformations.