TCIS Hyderabad

Course   : **Classical Mechanics**
Credits   : **4**
Coordinates   : **Tuesday & Thursday 14.00 - 15.30 hrs.**
Contact Hours : **48 hrs.**
Instructor/s   : **Prasad Perlekar**

Syllabus

- One and Two-dimensional dynamical systems : Newton's laws of motion, Harmonic oscillator, Over-damped oscillator, Simple pendulum, Time period of oscillations, Fixed points, simple bifurcations, Phase plane/space.
- Lagrangian formalism Elements of calculus of variations, Generalised coordinates, Principle of least action, Euler-Lagrange equations, Constraints, Lagrangian for a free particle and system of particles, Conservation laws, Mechanical similarity
- Central force fields and Collisions Motion in one dimension, Reduced mass, Motion in a central field, Kepler's problem, Elastic collisions, Scattering
- Small Oscillations : Free and forced oscillations, Vibrations of molecules, Damped oscillations, Resonance, Parametric resonance, Regular perturbation theory, Anharmonic oscillator, Motion in a rapidly oscillating field
- Hamiltonian formalism Hamilton's equation, Poisson brackets, Canonical transformation, Liouville's theorem, Hamilton-Jacobi theory, Action-Angle variables Integrable and NonIntegrable systems, Adiabatic invariants, and elements of time-dependent perturbation theory.

Text / References Books

- Mechanics, L.D. Landau and L.M. Lifshitz
- Nonlinear dynamics and Chaos, S.H. Strogatz
- Classical Mechanics, N.C. Rana and P.S. Joag
- Theoretical Mechanics of Particles and Continua, A.L. Fetter and J.D. Walecka

Other information

- **Grading:**
  - ❖ Mid-semester: 40 %
  - ❖ Homework: 20%
  - ❖ End-semester: 40%