TCIS, Hyderabad

Course: Classical Mechanics

Start Date: 8th August, 2017

Coordinates (Preferred): Tuesday and Thursday between 11.30 am and 01.00 pm

Instructor(s): Dr. 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 timedependent perturbation theory.

Primary Text / Reference 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

Evaluation Method (Weightage for Internal Assessment, Mid Term / Term End exams, Presentations etc.):

- Mid-semester: 40 %,
- Homework: 20%
- End-semester: 40%.