DETAILED COURSE DESCRIPTION

Course Number PHYS 312

Course Title Classical Mechanics

Target audience The course is designed for junior level physics majors; however other engineering and science majors with the correct preparation are very welcome. Nb: this is a course that is NOT mandatory for all Physics Majors. Typically, but not always, this is a course whose audience is composed by students who intend to pursue graduate studies after the BS degree.

Prerequisites PHYS 311

Catalog description Lagrangian and Hamiltonian mechanics. Constraints. Non-inertial coordinate systems. Oscillations and normal modes. Special theory of relativity. Includes computational methods. This course is targeted toward students who intend to pursue graduate studies in physics.

(RE) Prerequisite(s): 311. (RE) Corequisite(s): Mathematics 241.

Expected previous knowledge

Concepts	Classical Mechanics at the level of PHY 311
Skills	Familiarity with calculus and calculus concepts (vectors, vector, differential and integral calculus), linear algebra (matrices, determinants etc.), differential equations (ODE).

Course Objectives

- **Develop a more generalized approach to Mechanics**, learn the essentials of **Lagrangian and Hamiltonian methods** as needed for further studies in physics and engineering.
- **Gain deeper understanding of classical mechanics**. Consolidate the understanding of fundamental concepts in mechanics such as force, energy, momentum etc. more rigorously as needed for further studies in physics, engineering and technology.
- **Advance skills and capability for formulating and solving problems**. Expand and exercise the students' physical intuition and thinking process through the understanding of the theory and application of this knowledge to the solution of practical problems.

- **Increase mathematical and computational sophistication**. Learn and apply **advanced mathematical techniques** and methods of use to physicists in solving problems. Develop some capabilities for **numerical/computational methods**, in order to obtain solutions to problems too difficult or impossible to solve analytically.

Sample Text

"Classical Mechanics", by R. Douglas Gregory, Cambridge.

"Getting started with MATLAB", by Rudra Pratap, Oxford

Minimum Material Covered

Forces of constraint, virtual work

Lagrangian formalism

Hamiltonian formalism

Non-inertial coordinate systems

Special Theory of Relativity, Minkowski space

General Theory of Small Oscillations, Normal Modes