BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE-PILANI, HYDERABAD CAMPUS
FIRST SEMESTER 2020-2021

17-08-20

Course Handout (Part II)

In addition to part-I (General Handout for all courses appended to the timetable) this portion gives further specific details regarding the course.

Course No. : PHY F211
Course Title : Classical Mechanics
Instructor-in-Charge : Rahul Nigam

Scope & Objectives: This is an advanced course on classical mechanics which deals with some advanced techniques for solving problems of mechanics. It also deals with formulations of classical mechanics that find their use in quantum mechanics as well as classical statistical mechanics.

Learning Objectives: 1) Calculus of Variation. 2) Lagrangian formulation of Physical Theories. 3) Legendre Transformations. 4) Hamiltonian Formulation. 5) Solving first order Partial Differential Equations. 6) Phase space description of dynamics. 6) Poisson brackets and interpretations. 7) Basic Group Theory. 8) Rotation Description.

Text Book: 1) H. Goldstein, C. Poole & J. Safko, Classical Mechanics, Third Edition, Pearson Education, Inc., 2002
2) David Morin, Introduction to Classical Mechanics

Reference Books: 1) N. C. Rana and P S Joag, Classical Mechanics, Mc Graw Hill, 2006
2) Analytical Mechanics by Hand and Finch, Cambridge University Press, 1998.

Course Plan:

Lecture No.	Learning Objectives	Topics to be covered	Reference to Text book
1-2	Calculus Of Variation	Introduction to Variational Calculus	Differential Equations by G. F Simmons
3-5	Failure of Newtonian Mechanics	De Alembert's principle	1.3
6-9	Generalized Coordinates	Lagrange's equation	1.4
10-11	Illustration of the	Simple applications of	1.5 – 1.6

	applications of Lagrange's equations.	Lagrangian formulation.	
12	Conservation theorems.	Cyclic coordinates and conservation theorems.	Class Notes or 8.2
13-18	To state the two-body central force problem.	Two-body central-force motion and equivalent one-body problem.	3.1-3.7
19-20	Hamiltonian	The Hamilton's equations of motion.	8.1,2.1
21-23	Canonical Transformations	Canonical Transformations and Generating functions	.1,9.2,9.3,9.4
24-27	The Poisson Brackets	Symplectic Approach	9.5
28 – 29	To study rotation of coordinate systems and orthogonal transformations in order to understand kinematics of rigid bodies.	Orthogonal transformations and their properties	4.1 – 4.3
30-35	Hamilton Jacobi Equations, Canonical Transformations	Computation of Hamilton Principle function, Interpretation and Connection with Quantum Mechanics.	10
38-42	Theory of small oscillations.	Oscillation, eigenvalue equation.	6.1 – 6.2

Evaluation Scheme:

Component	**Duration**	**Weightage (%)**	**Date & Time**	**Nature of Component**
Test 1	30 mins	15	September 10 – September 20 (During scheduled class hour)	Open book
Test 2	30 mins	15	October 09 – October 20 (During scheduled class hour)	Open book
Test 3	30 mins	15	November 10 – November	Open book

			20 (During scheduled class hour)	
Assignment 1/2		10 each		
Comprehensive Exam	120 mins	35		

Chamber Consultation Hour: To be announced in the class.
Notices: Notices concerning the course will be put up on the **CMS.**
Make-up Policy: Make-up for the tests will be granted for genuine cases of health problems.
Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-charge