BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE-PILANI, HYDERABAD CAMPUS

FIRST SEMESTER 2021-2022

Course Handout (Part II)

20-08-2021

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 : SOURI BANERJEE

Course Description : The course begins with Lagrangian dynamics which is followed by Hamiltonian Mechanics and covers Hamilton's equations of motion. It initiates Poisson's Bracket which is a gateway to Quantum Mechanics. It ends with a rigorous coverage of rotational dynamics and heavy symmetrical top

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.

Text Book: H. Goldstein, C. Poole & J. Safko, Classical Mechanics, Third Edition, Pearson Education, Inc., 2002

Reference Books: 1) N. C. Rana and P S Joag, Classical Mechanics, Mc Graw Hill, 2006

Course Plan:

Lecture No.	Learning Objectives	Topics to be covered	Chapter in the Text Book
1-3	Drawbacks of Newtonian Mechanics	d'Alembert's principle of virtual work	1.1 to 1.3
4-6	Generalized Coordinate	Lagrange's equation	1.4
7-14	Illustration of the applications of Lagrange's equations.	Various applications of Lagrangian formulation, Foucault's Pendulum	1.5 – 1.6
15-19	To prove certain conservation theorem and introducing Hamiltonian	Cyclic coordinates and conservation theorems.	Class Notes and 2.6-2.7
18-20	Hamiltonian	The Hamilton's equations of motion and its application	Class Notes
21-23	Learn techniques of calculus of variation in order to obtain equations of motion by minimizing action.	Some techniques of calculus of variation and derivation of Lagrange's equations from Hamilton's principle	2.2 – 2.3
24-26	Canonical Transformation	The Poisson Brackets, the gateway to Quantum Mechanics	Class notes or 9.1-9.7
27-30	Hamilton-Jacobi formalism	Application to standard problems, Linking Quantum Mechanics	10.1-10.4 and Class notes

31-34	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
35-42	To obtain the kinetic energy and angular momentum of a rotating rigid body and introduce moment of inertia tensor. To introduce principal axes of inertia. Euler Angles	Angular momentum and kinetic energy of motion about a point and inertia tensor. The principal axis transformation. The Euler equation of motion and torque-free motion of a rigid body. Top Motion	5.1 – 5.7

Evaluation Scheme:

EC No.	Evaluation Component.	Duration.	Weightage	Date, Time & Venue.	Nature of Component.
1	Midsem	90 mins	35%	18/10/2021 9.00 - 10.30AM	Open book
2	Quiz	30 mins	25%	TBA	Open book (best 3 out of 4 to be taken)
4	Comprehensive Examination	TBA	40%	11/12 FN	Open book

Chamber Consultation Hour: To be announced in the class.

Notices: Notices concerning the course will be put up on the **PHYSICS** notice board.

Make-up Policy: Make-up for the tests will be granted only for genuine cases of health problems or urgency for going out of town.

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
PHY F211