Birla Institute of Technology and Sciences, Pilani- K.K.Birla Goa campus
Instruction Division
First Semester 2012 - 2013

Course Handout

Course Title : Classical Mechanics

Course No.: PHYF211/PHYC212

Instructor-in-charge: Prasanta Kumar Das

Contact (office & phone): B-314 & 0832-2580-448(O)

1. Course description: This course introduces students to the formal methods for solving mechanics problems. The ideas developed here helps student to make a connection to the more abstract ideas/methods developed in quantum mechanics. The methods of classical mechanics are often become quite useful in thermodynamics and condensed matter physics.

2. Text Book:

- **TB.** *Classical Mechanics* by Goldstein, Poole and Safko, Third Edition, Pearson Education Pvt. Ltd(8th Indian Reprint), 2004.

3. Reference Books:

- **RB1.** *Classical Mechanics* by N. C. Rana and P. S. Joag, Tata McGraw-Hill, 1991.
- **RB2.** *Classical Mechanics* by R. G. Takwale and P. S. Puranik, Tata McGraw-Hill, 2008.
- **RB3.** *Lagrangian and Hamiltonian Mechanics* by M. G. Calkin, Allied Publishers (1st Indian Reprint) 2000).

4. Evaluation Scheme(TBA: To Be Announced)

EC No.	Evaluation Component(EC)	Duration	Weightage(%)	Date & Time	Remarks
1.	Terminal Test 1	1 hour	20 %	13.09.11	Closed Book
2.	Terminal Test 2	1 hour	20 %	26.10.11	Open Book
3.	Comprehensive Exam.	3 hours	40 %	1.12.11	Closed Book
4.	Problem set & Quiz		10%		
5.	Attendance($> 90\%$)		10 %		

5. Home Assignments: They will be given in the class.

6. Make-up: Only genuine cases will be considered.

7. Chamber consultation hours: To be announced in the class.

8. Notices: See the the moodle.

9. Course Plan:

Lecture Numbers.	Topics to be covered	chapter/section
1	Review, Mechanics of a system of particles	Gold. 1.1, 1.2
2	Constraints, Principle of virtual works	Gold. 1.3, Cal. 2
3-4	D'Alembert's principle and Generalised coordinates	Cal. 2
5-6	Lagrange's equation	Gold. 1.4-1.6
7	Hamilton's principle and calculus of variation	Gold. 1.4-1.6
8	Lagrange's equation from Hamilton's equation	Gold. 1.4-1.6
9	Variational formulation	Gold. 2.5
10,11	Conservation and symmetry	Gold. 2.6-2.7
12,13,14	Rotating frames of reference	Rana 3.0-3.4
15,16	Two body central force problem	Gold 3.1-3.4
17	The differential eqn. for the orbit	Gold. 3.5
18	The Kepler problem, the Runge-Lenz vector	Gold. 3.7,3.9
	TEST 1	
19	The Runge-Lenz vector	Gold. 3.9
20	The Rutherford scattering cross section	Gold. 3.10
21,22	Legendre's transformations and Hamilton's equations of motion	Gold. 8.1
23,24	Cyclic coordiantes and conservation theorems	Gold. 8.2
25	Derivation from a variational principle	Gold. 8.5
26	The principle of least action	Gold. 8.6
27	Canonical transformations	Gold. 9.1-9.3
28	The simpletic approach, Poisson approach	Gold. 9.4-9.5
29,30	Poisson bracket formulation and Revision	Gold. 9.6
	TEST 2	
31,32	The angular momentum of Poisson's bracket Symmetry groups, Liouville's theorem	Gold. 9.7-9.9
33,34	The Hamilton Jacobi eqn and Action-angle variables	Gold. 10,10.6,10.7
35,37	Rigid body kinematics, Euler angles, Euler's theorem	Gold. 4.1,4.2,4.4,4.6
38,40	Finite rotations, frames of reference, kinetic energy and angular momentum	Gold. 4.7,4.8 Rana 12.3-12.5
41	Moment of inertia tensor	Rana 12.6:a-e
42,43	Angular momentum in Lab and C.O.M frame Euler equations, free rigid body	Rana 12.8 Rana 12.10,12.12

Instructor
PHYF211/PHYC221