Classical Mechanics I

SWAYAM Prabha Course Code: S13

PROFESSOR'S NAME	Prof. Krishna Kumar
DEPARTMENT	Physics
INSTITUTE	IIT Kharagpur
COURSE OUTLINE	Brief survey of the Newtonian Mechanics: conservation theorems and symmetry properties, inertial and non-inertial frames of reference, pseudo forces,Coriolis force. Lagrangian and Hamiltonian Mechanics: generalized coordinates, constraints, principle of least action, Lagrangian equations of motion, Lagrange multipliers and applications, Hamiltons canonical equations of motion, Rouths procedure, canonical transformations, Poisson brackets and equations of motion. The central force problem: Keplers laws, Laplace-Runge-Lenz vector, scattering in a central force field. Rigid body dynamics: infinitesimal and finite rotations, angular momentum, moment of inertia tensor, torque-free motion of a rigid body, Eulers angles, Eulers equations of motion, heavy symmetrical top. Small oscillations: normal coordinates and normal modes.

COURSE DETAILS

S. No	Module ID/ Lecture ID	Lecture Title/Topic	Duration
1	S13-Mod1	Introduction	0:55:20
2	S13-Mod2	Rotating Frame of Reference	0:57:01
3	S13-Mod3	Hamilton's Principle and Lagrange's Equation	0:53:10
4	S13-Mod4	Lagrangian for noninteracting and interacting particals	0:54:10
5	S13-Mod5	Lagrange's equation of examples	0:53:20

6	**S13-Mod6**	Conservation laws	0:56:25
7	**S13-Mod7**	Calculus of variations	0:53:06
8	**S13-Mod8**	Motion under Constraints	0:57:01
9	**Tutorial 01**	Tutorial 01	0:56:50
10	**S13-Mod9**	Lagrange Multipliers and Equation of Motion	0:56:13
11	**S13-Mod10**	System Dynamics in State Space	0:57:58
12	**S13-Mod11**	State Space Nonlinear Systems	0:58:33
13	**S13-Mod12**	Virial Theorem	0:56:43
14	**S13-Mod13**	Central Force Field	0:57:34
15	**Tutorial 02**	Tutorial 02	0:54:27
16	**S13-Mod14**	Kepler's Law	0:58:29
17	**S13-Mod15**	Laplace-Runge-Lenz Vector	0:57:47
18	**S13-Mod16**	Collisions and Scattering	1:01:03
19	**Tutorial 03**	Tutorial 03	1:00:37
20	**S13-Mod17**	Rutherford Scattering	0:57:50
21	**S13-Mod18**	Small Oscillations	1:01:11
22	**S13-Mod19**	Parametric Oscillations	1:07:26
23	**Tutorial 04**	Tutorial 04	0:50:12

References if Any: