Syllabus for Master of Science

Physics

Subject Code: 02PY0408

Subject Name: Classical Mechanics

M.Sc. Year-I, Sem-I

Objective: To interpret the fundamentals of Classical Mechanics and apply it to solve fundamental problems of mechanics.

Credits Earned: 4 Credits

Course Outcomes: After completion of this course, post graduate will be able to

- Understand some fundamental laws of physics in the classical domain. This gives basic understanding to develop such laws of physics in quantum physics.
- Apply knowledge of physics as a basic science in solving real life and scientific problems
- Apply knowledge of physics to become successful in national level examinations like NET, SLAT, GATE etc.
- Engage in research in the field of pure and applied physics and involve in life-long learning

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE	IA	CSE	Viva (V)	Term work (TW)	
4	0	0	4	50	30	20	25	25	150

Contents:

Unit	Topics	Contact Hours
1.	**Newtonian mechanics and Lagrangian Formualtion:** Newton's laws of motion, Mechanics of a particle, Equation of motion of a particle, Motion of particle in an electromagnetic field, Mechanics of system of particles, Motion of a system with variable mass, D Alemberts principle, Langrage's equation, A general expression for kinetic energy, Symmetries and laws of conservation.	**14**
2.	**Hamiltonian Dynamics:** Generalised momentum and cyclic coordinates, Conservation theorems, Hamiltonian function H and conservation of energy, Hamiltonian equation, Hamiltonian equations in different coordinate system, Examples of Hamilton's dynamics.	**14**
3	**Canonical Transformations Hamilton-Jacobi's theory:** Gauge transformation, Canonical Transformation, Illustration of Canonical transformation, Hamilton Jacobi equation, Solution of Harmonic Oscillators , Problem Hamiltonian and Jacobi method,	**12**
4.	**Theory of small oscillations:** General case of coupled oscillations, Eigen vectors and eigen frequencies, orthogonality of eigen vectors, normal coordinates, small oscillations of particles on string.	**10**
5.	**Dynamics of Rigid Body:** Component of Angular velocity, Angular momentum and Inertia Tensor, Principle axes, Principle moment of inertia, Rotational Kinetic energy of Rigid body, Symmetric bodies, Moment of inertia for different body system.	**10**
	Total	**60**

References:

1. Introduction to Classical Mechanics, Takwale R.G. and P. S. Puranik, 2016.
2. Classical Mechanics, Goldstein H , Addision Wesley,2015.
3. Classical Mechanics by J C Upadhyaya, Himalaya publishing, 2014.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	20%	25%	25%	10%	10%

Instructional Method:

a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

c. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

d. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.