FIRST-YEAR OF MASTER OF SCIENCE PHYSICS REVISED SYLLABUS ACCORDING TO CBCS NEP2020

COURSE TITLE:- CLASSICAL MECHANICS
SEMESTER-I
W.E.F. 2023-2024

Recommended by the Board of Studies in PHYSICS
And
Approved by the Academic Council

Devrukh Shikshan Prasarak Mandal's
Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce, and Vid. Dadasaheb Pitre Science College (Autonomous), Devrukh.
Tal.Sangmeshwar, Dist. Ratnagiri-415804, Maharashtra, India

Academic Council Item No: **03 dated 8 July 2023**

Name of the Implementing Institute	:	Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce, and Vid. Dadasaheb Pitre Science College (Autonomous), Devrukh. Tal. Sangmeshwar, Dist. Ratnagiri-415804,
Name of the Parent University	:	University of Mumbai
Name of the Programme	:	Master of Science
Name of the Department	:	Physics
Name of the Class	:	First Year
Semester	:	First
No. of Credits	:	04
Title of the Course	:	Classical Mechanics
Course Code	:	S502PHT
Name of the Vertical in adherence to NEP 2020	:	Major
Eligibility for Admission	:	BSc in Physics
Passing Marks	:	40%
Mode of Assessment	:	Formative and Summative
Level	:	PG
Pattern of Marks Distribution for SEE and CIA	:	60:40
Status	:	NEP-CBCS
To be implemented from Academic Year	:	2023-2024

Syllabus for First Year of Master of Science in Physics

(With effect from the academic year 2023-2024)

SEMESTER - I | **Paper No–Physics Paper– II**

Course Title: Classical Mechanics | **No. of Credits - 04**

Type of Vertical: Major | **COURSE CODE: S502PHT**

Learning Outcomes Based on BLOOM's Taxonomy:

After completing the course, the learner will be able to…

Course Learning Outcome No.	Blooms Taxonomy	Course Learning Outcome
CLO-01	Remember	Recall the concepts of central force and Lagrangian Mechanics
CLO-02	Understand	Explain the use of Lagrangian and Hamiltonian principles
CLO-03	Understand	Understand the concepts in small oscillations and eigenvalue equation
CLO-04	Understand	Understand canonical transformations and its examples
CLO-05	Apply	Solve complex problems in classical mechanics

Syllabus for First Year of Master of Science in Physics
(With effect from the academic year 2023-2024)

SEMESTER - I **Paper No.– Physics Paper–II**
Course Title: Classical Mechanics **No. of Credits - 04**
Type of Vertical: Major **COURSE CODE: S502PHT**

COURSE CONTENT			
Module No.	**Content**	**Credits**	**No. of Lectures**
01	Review of Newton's laws, Mechanics of a particle, Mechanics of a system of particles, Frames of references, rotating frames, Centrifugal and Coriolis force, Constraints, D'Alembert's principle and Lagrange's equations, Velocity-dependent potentials and the dissipation function, Simple applications of the Lagrangian formulation. Hamilton's principle, Calculus of variations, Derivation of Lagrange's equations from Hamilton's principle, Lagrange Multipliers and constraint exterimization problems, Extension of Hamilton's principle to nonholonomic systems, Advantages of a variational principle formulation.	**01**	**15**
02	Conservation theorems and symmetry properties, Energy Function and the conservation of energy. The Two-Body Central Force Problem: Reduction to the equivalent one body problem, The equations of motion and first integrals, The equivalent one-dimensional problem and classification of orbits, The virial theorem, The differential equation for the orbit and integrable power-law potentials, The Kepler problem : Inverse square law of force, The motion in time in the Kepler problem, Scattering in a central force field, Transformation of the scattering problem to laboratory coordinates.	**01**	**15**
03	Small Oscillations: Formulation of the problem, The eigenvalue equation & the principal axis transformation, Frequencies of free vibration and normal coordinates, Forced and damped oscillations, Resonance and beats. Legendre transformations & Hamilton equations, Cyclic coordinates and conservation theorems, Derivation of Hamilton's equations from a variational principle.	**01**	**15**
04	Canonical Transformations, Examples of canonical transformations, The symplectic approach to canonical transformations, Poisson brackets and other canonical invariants, Equations of motion, infinitesimal canonical transformations & conservation theorems in PB formulation, The angular momentum PB relations.	**01**	**15**
	Total	**04**	**60**

Reference Books:-

1. Classical Mechanics, H. Goldstein, Poole and Safko, 3rd Edition, Narosa Publication
2. Classical Mechanics, N. C. Rana and P. S. Joag. Tata McGraw Hill Publication.
3. Classical Mechanics, S. N. Biswas, Allied Publishers (Calcutta).
4. Classical Mechanics, V. B. Bhatia, Narosa Publishing (1997).
5. Mechanics, Landau and Lifshitz, Butterworth, Heinemann.
6. The Action Principle in Physics, R. V. Kamat, New Age Intnl. (1995).
7. Classical Mechanics, Vol I and II, E. A. Deslougue, John Wiley (1982).
8. Theory and Problems of Lagrangian Dynamics, Schaum Series, McGraw (1967).
9. Classical Mechanics of Particles and Rigid Bodies, K. C. Gupta, Wiley Eastern (2001)

Access to the Course

The course is available for all the students admitted for Master of Science in Physics.

Methods of Assessment

The assessment pattern would be 60:40, 60% for Semester End Examination (SEE) and 40% for Continuous Internal Assessment (CIA). The structure of the SEE and CIA would be as recommended by the Board of Studies and approved by the Board of Examination and the Academic Council of the college.

Pattern of Evaluation

The Examination/Evaluation pattern shall be framed by the Board of Examination with its final approval from the Academic Council of the College.