



(Master of Science) (Mathematics)
(M.Sc.) (Mathematics) Semester (II)

Course Code	PS02EMTH52	Title of the Course	Mathematical Classical Mechanics
Total Credits of the Course	04	Hours per Week	04
This course is same as PS01EMTH52 and can be offered to the students who have not taken the course PS01EMTH52.			

Course Objectives:	1. To provide knowledge of mathematical tools for theoretical physics. 2. To acquaint students with various forms of equations of motion.
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Course Content		
Unit	Description	Weightage* (%)
1.	Constraints and their classification. Principle of virtual work, D'Ambert's principle. Various forms of Lagrange's equations of motion for holonomic systems, Examples.	25
2.	Euler-Lagrange equations in various forms (statements only), Hamilton's variational principle, derivation of Lagrange's equation from Hamilton's variational principle. Generalized momentum, cyclic coordinates, general conservation theorem, conservation of linear momentum and angular momentum in Lagrangian formalism and symmetry properties. Energy function and conservation of total energy in Lagrangian formalism.	25
3.	Hamilton's canonical equation of motion, relation with Lagrange's equation, cyclic coordinate, Routhian procedure, variational principle approach to Hamilton's equation of motion, examples.	25
4.	Canonical transformations, generating functions, symplectic condition, infinitesimal canonical transformations, examples. Poisson bracket, Lagrange bracket, formal solution of equations of motion in terms of Poisson brackets. Examples.	25

Teaching-Learning Methodology	Classroom teaching, problem solving, independent reading
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Evaluation Pattern





SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat
(Reaccredited with 'A' Grade by NAAC (CGPA 3.25)
Syllabus with effect from the Academic Year 2021-2022

Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to

1.	understand the concept of the mathematics used in classical mechanics.
2.	understand the tools of mechanics to solve real life problems.
3.	various formalisms and approaches to classical mechanics.
4.	mathematics involved in invariant quantities in theoretical physics.

Suggested References:

Sr. No.	References
1.	Goldstein, H., Poole, C. and Safko, J., Classical Mechanics, (Third Edition), Pearson Education, Inc., Indian Low Price Edition, 2018.
2.	Soni, V.S. Mechanics and Relativity, PHI Learning Pvt. Ltd.(Second Edition), 2011
3.	Upadhyay, J.C., Classical Mechanics, Himalaya Publishing House (Second Edition), 2014
4.	Waghmare, Y.R., Classical Mechanics, PHI Pvt. Ltd., 1990.

On-line resources to be used if available as reference material

1. NPTEL Course on Classical Mechanics
[NPTEL :: Physics - NOC:Introduction to Classical Mechanics](#)

