SANKALCHAND PATEL UNIVERSITY
।। अथातो ज्ञानजिज्ञासा ।।

FACULTY OF SCIENCE

M.Sc. Mathematics (SEM-I)

In Effect from Academic Year 2016-17

Subject Code: 1SC2040106	Subject Title: CLASSICAL MECHANICS

Course Objective:

- How to use Newton's laws of motion to solve advanced problems involving the dynamic motion of classical mechanical systems.
- How to use differential equations and other advanced mathematics in the solution of the problems considered in item 1.
- How to use conservation of energy and linear and angular momentum to solve dynamics problems.
- How to represent the equations of motion for complicated mechanical systems using the Lagrangian and Hamiltonian formulations of classical mechanics.

Teaching scheme (hours) per week		Credit			Theory Marks		Practical Marks		Total
Lecture	Tutorial	Theory	Practical	Total	Uni. Assessment	Cont. Assessment	Uni. Assessment	Cont. Assessment	
3	1	4	-	4	60	40	--	--	100

Subject Contents			
Unit. No	Topic	Total Hours	Weight (%)
1	Lagrangian formulation: D'almbert's principle, Principle of virtual work, Classification of constraints, Lagrange's equation for holonomic systems and illustrations.	16	25
2	Euler-Lagrange equation, Hamilton's variational principle, Derivation of Lagrange's equation from Hamilton's variational principle, Generalized momentum, Mechanics in configuration space, General conservation theorem and illustration.	16	25
3	Hamilton's canonical equation of motion, Relation with Lagrange's equation, Conservation theorems, Variational principle approach to Hamilton's equation of motion, Variational principle and Hamilton's equation and examples.	16	25
4	Canonical transformations, Generating functions, Symplectic conditions, Infintesimal canonical transformations and examples. Poisson bracket formulation, General equation of motion and its formal solution, Constants of motion, Symmetry group.	16	25

Course Outcome:

On successful completion of the course, students should be able to

- Explain the difference between Newtonian mechanics and Analytic mechanics solve the mechanics problems using Lagrangian formalism, a different method from Newtonian mechanics

- Discuss the connection between classical mechanics and quantum mechanics from Hamiltonian formalism
- Apply the Variational principle to real physical situations

List of References:

- "Classical Mechanics with Introduction to Nonlinear Oscillations and Chaos", Bhatia, Narosa Publ.
- "Classical Mechanics", C. R. Mondal, Prentice Hall of India Pvt. Ltd.
- "Classical Mechanics", Tai L. Chow, John Wiley and Sons Inc.
- "Classical Mechanics-System of Particles and Hamiltonian Dynamics", Walter greiner, Springer.
- "Classical Mechanics", H. Goldstein, C. Poole and J. Safko, Pearson Education, Inc.