

SARDAR PATEL UNIVERSITY
Programme: B.Sc (Physics)
Semester: V
Syllabus with effect from: June- 2013

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| Paper Code: US05CPHY01 | Total Credit: 3 |
| Title Of Paper: Classical Mechanics | |

| Unit | Description in detail | Weighting (%) |
|------|---|---------------|
| I | Inverse square law field, potential and Motion in a central force field Introduction, Law of gravitational and electrostatic forces, Gravitational and electrostatic fields and potentials, Lines of force and equipotential surfaces, Fields and potentials of dipole and quadrupole, Field equations, Equivalent one body problem, Motion in a central force field, General features of the motion, Motion in an inverse square law force field, Equation of orbit, Kepler's laws of planetary motion | |
| II | Lagrangian Formulation Constraints, Generalized co-ordinates, D'Alembert's principle, Lagrange's equations, A General expressions for kinetic energy, Symmetries and the laws of conservation, Cyclic or Ignorable coordinates, Illustrations, Velocity dependent potential of electromagnetic field, Raleigh's dissipation functio | |
| III | Moving coordinate systems and motion of a rigid body Coordinate systems with relative translation motions, Rotating coordinate systems, The coriolis force, Motion on the earth, Effect of coriolis force on freely falling particle, Euler's Theorem, Angular momentum and kinetic energy, The inertia tensor, Euler's equations of motion, Torque free motion, Euler's angles, Motion of a symmetric top | |
| IV | Variational Principle Configuration space, Some techniques of calculus of variation, The δ Notations, Applications of the variational principle, Hamilton's principle, Equivalence of Lagrange's and Newton's equations, Advantages of the Lagrangian Formulation – Electro-Mechanical analogies, Lagrange's undetermined multipliers, Lagrange's equations for Nonholonomic systems, Applications of the Lagrangian method of undetermined multipliers, Hamilton's equations of motion | |

Basic Text & Reference Books :-

- Introduction to Classical Mechanics
R G Takwale and P S Puranik
Tata McGraw Hill Education Pvt Ltd.
- Classical Mechanics
Herbert Goldstein, Charles P. Poole and John Safko
Third Edition, Pearson
- Classical Mechanics
Aruldhas, PHI Learning Pvt Ltd, New Delhi
- Classical Mechanics
J C Upadhyay, Himalaya Publication

