Programme	Bachelor of Science in Solid State Physics (BS SS Physics)	Course Code	SSP-301	Credit Hours	3 (3-0)
Course Title	**Classical Mechanics**				

Course Introduction

This course is designed:

To develop the basic knowledge of classical world using the laws of Physics

To develop the understanding of two bodies central force problems

To give understanding of kinematics and dynamics of rigid bodies

Development of Hamiltonian equation and use of canonical transformation in classical physics

Learning Outcomes

By the end of this course, students should:

1. Have a deep understanding of Newton's laws,
2. Be able to solve the Newton equations for simple configurations using
3. various methods,
4. Understand the foundations of chaotic motion

	Course Content	Assignments/Readings
Week 1	**Unit-I** 1.1 Elementary Principles 1.1.1 Brief Survey of Newtonian mechanics of a system of particles, constraints, Alembert's principle	What are constraints?
Week 2	**Unit-II** 2.1 Lagrange's equation and its applications. Virtual work.	Apply lagrange's equation
Week 3	**Unit-III** 1.1 Variational Principles 3.1.1 Calculus of variation and Hamilton's principle	Apply Hamilton's principle
Week 4	**Unit-IV** 4.1 Derivation of Lagrange's equation from Hamilton's principle.	Practice
Week 5	**Unit-V** 1.1 Two Body Central Force Problem	Equation of motion and applications

	5.1.1 Low and least action, two body problem and its reduction to one body problem. Equation of motion and solution for one body problem	
Week 6	**Unit-VI** 6.1 Kepler's Laws Laboratory and centre of mass systems, Rutherford scattering	Practice
Week 7	**Unit-VII** 7.1 Kinematics of Rigid Body Motion 7.1.1 Orthogonal transformations, Eulerian angles	Euler’s equation
Week 8	Mid Term Exams	
Week 9	**Unit-VIII** 8.1 Euler's theorem, The coriolis force	Euler’s formula and applications
Week 10	**Unit-IX** 1.1 Rigid Body Equation of Motion 9.1.1 Angular momentum, Tensors and dyadic	Tensor analysis
Week 11	**Unit-X** 10.1 Moment of inertia, Rigid body problems and Euler's equations.	Exercise
Week 12	**Unit-XI** 11.1 Hamilton Equation of Motion 11.1.1 Legendre transformation and Hamilton equations of motion	Legendre equations
Week 13	**Unit-XII** 12.1 Conservation theorems	Practice
Week 14	**Unit-XIII** 13.1 Canonical Transformations 13.1.1 Examples of canonical transformations	Apply canonical tranformations
Week 15	**Unit-XIV** 14.1 Lagrange and Poison brackets, Liouville's theorem.	Presentations
Week 16	Final Term Exams	
Textbooks and Reading Material		
1. H. Goldstein, 'Classical Mechanics', 2nd. Edn., Addison Wesley, Reading, Massachusetts (1980).		

2. V.I. Arnold, Mathematical Methods of Classical Mechanics Springer verlag, New York (1980).

3. S.N. Rasband, 'Dynamics', John Wiley & Sons, New York (1983).

4. R.A. Matzner & L.C. Shepley, 'Classical Mechanics', Prentice Hall Inc., London (1991).

5. N.M.J. Woodhouse, 'Introduction to Analytical Dynamics', Oxford Science Publications, Oxford (1987).

Teaching Learning Strategies

1. Course Teaching
2. Presentations
3. Quiz

Assignments: Types and Number with Calendar

1.
2.
3.
4.

Assessment

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2.	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.