Government PG College, Ambala Cantt

Session: 2023-2024 (Odd semester)

Name of Assistant Professor: Dr. Samiksha Kumari

Class: B.Sc Ist year (Sem-I) Medical

Subject: Physics (Paper: Elementary Mechanics, PHY-103)

SYLLABUS

Max. Marks:50

Internal Assessment Marks: 15

End Term Exam Marks: 35

Time: 3 hours

Note: Nine questions will be set in total. Question no. 1 will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 4 parts and the answer should be in brief but not in Yes/No. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks. 20% numerical problems are to be set. Use of scientific (non-programmable) calculator is allowed.

Unit -I

Fundamentals of Dynamics: Rigid body, Moment of Inertia, Radius of Gyration, Theorems of perpendicular and parallel axis (with proof), Moment of Inertia of ring, Disc, Angular Disc, Solid cylinder.

Unit -II

Elasticity: Deforming force, Elastic limit, stress, strain and their types, Hooks law, Module of elasticity Relation between shear angle and angle of twist, Poisson’s ratio and its limiting value. Torque required for twisting cylinder.

Unit -III

Special Theory of Relativity: Michelson’s Morley experiment and its outcomes, Postulates of special theory of relativity, Lorentz Transformations, Lorentz contraction, Time dilation, Relativistic transformation of velocity, relativistic addition of velocities, variation of mass-energy equivalence.

Unit -IV

Gravitation and central force motion: Law of gravitation, Potential and field due to spherical shell and solid sphere. Motion of a particle under central force field, Normal coordinates and normal modes, Normal modes of vibration for given spring mass system, possible angular frequencies of oscillation of two identical simple pendulums of length (l) and small bob of mass (m0 joined together with spring of spring constant (k).

Recommended Books/e-resources/LMS:

1. Mechanics “Berkeley Physics Course Vol. I”, Charles Kittel, Tata McGraw-Hill

2. Mechanics, D.S. Mathur, S. Chand and Company Limited, 2000

3. Elements of Properties of Matter, D.S. Mathur, S .Chand & Com. Pt. Ltd., New Delhi

4. Physics, Resnick, Halliday & Walker, Wiley

5. Physics for scientists and Engineers with Modern Phys., J.W. Jewett, R.A. Serway, 2010, Cengage Learning

6. An introduction to mechanics, D. Kleppner, R.J. Kolenkow, 1973, McGraw-Hill.

7. Properties of Matter, R. Murgeshan, S. Chand & Com. Pt. Ltd., New Delhi

8. Classical Mechanics, J.C. Upadhyaya, Himalaya Publishing House

9. B.Sc. Practical Physics, C.L. Arora, S. Chand Publisher, New Delhi

10. Advanced Level Practical Physics, M. Nelkon and Ogborn, Henemann Education Books Ltd., New Delhi

11. Practical Physics, S.S. Srivastava and M.K. Gupta, Atma Ram & Sons, Delhi

12. Practical Physics, S.L. Gupta and V. Kumar, Pragati Prakashan Meerut

13. Modern Approach to Practical Physics, R.K. Singla, Modern Publishers, Jalandhar

14. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, Asia Publishing House.

Course Objective:

1. Able to develop the understandings of fundamental principles of Mechanics.

2. Students will demonstrate knowledge of classical mechanics, electromagnetism and modern physics and be able to apply this knowledge to analyze a variety of physical phenomena

3. Understand the Relative motion, Inertial and non-inertial reference frames.

4. Able to understand about the interaction of forces between solids in mechanical systems, Centre of mass and inertia tensor of mechanical systems.

6. Able to understand the vector theorems of mechanics and interpretation of their results.

7. Understand the motion of the objects in different frame of references.

8. Develop understanding of special theory of relativity and its applications to understand length contraction, time dilation, relativistic momentum, relativistic energy, mass- energy relationship and Michelson Morley experiment.

Course Learning Outcomes:

After completing this course, the learner will be able to:

1. Understand the dynamics of system of particles, Determination of moment of inertia using Theorems of parallel and perpendicular axis. Application of both translational and rotational dynamics motions simultaneously in analyzing rolling with slipping

2. Differentiate between elastic and plastic bodies. Elastic constants, determination and their physical significance. Torque and its significance in rotatory motion

3. Familiar about the special theory of relativity and its applications. Michelson’s Morley experiment and its findings.

4. Analyze the two body Central Force problem and its applications

5. Learn to present observations, results, analysis and different concepts related to experiments of Mechanics

Lesson Plan

Minor (One class in one week)

Session Started: 24 July 2023

Session Ended: 30 Nov 2023

Diwali Break: 10-16 Nov 2023

|  |  |
| --- | --- |
| **Week** | **Topic** |
| **1** | **Unit I: Fundamentals of Dynamics**: Rigid body, Moment of Inertia, Radius of Gyration,  |
| **2** | Theorems of perpendicular and parallel axis (with proof),  |
| **3** | Moment of Inertia of ring, Disc, Angular Disc, Solid cylinder, |
| **4** | **Unit II: Elasticity:** Deforming force, Elastic limit, stress, strain and their types, Hooks law,  |
| **5** | Modulus of rigidity, Relation between shear angle and angle of twist |
| **6** | Poisson’s ratio and its limiting value. Torque required for twisting cylinder |
| **7** | Doubts and Discussions , Revision  |
| **8** | **Unit III (Special Theory of Relativity):** Michelson’s Morley experiment and its outcomes,  |
| **9** | Postulates of special theory of relativity, Lorentz Transformations, |
| **10** | Lorentz contraction, Time dilation, Relativistic transformation of velocity,  |
| **11** | relativistic addition of velocities, variation of mass-energy equivalence, Doubts and Discussions |
| **12** | **Unit IV (Gravitation and central force motion):** Law of gravitation, Potential and field due to spherical shell and solid sphere.  |
| **13** | Motion of a particle under central force field, Normal coordinates and normal modes, |
| **14** | Normal modes of vibration for given spring mass system,  |
| **15** | possible angular frequencies of oscillation of two identical  |
| **16** | simple pendulums of length (l) and small bob of mass (m0 joined together with spring of spring constant (k). |
| **17** | Revision & Tests |