W.E.F. 2016-17

B.Sc. PHYSICS SYLLABUS UNDER CHOICE BASED CREDIT SYSTEM
B.Sc. 1ˢᵗ Semester Physics
Paper I: Mechanics & Properties of Matter
(For Non-Mathematics Combinations)

Work load: 60hrs per semester   **4 hrs/week**

UNIT-I(16 hrs)

1. Mathematical Background

Scalars and vectors - vector addition - scalar and vector products of vector and their physical significance - vector calculus - gradient of a scalar point function - divergence and curl of vector - statements of Stokes and Gauss theorems -examples (no derivations).

2. Motion of System

Collisions - Elastic and inelastic collisions - Collisions in one and two dimension - Rocket propulsion - Center of mass - Motion of the centre of mass - Impact parameter - Scattering cross-section, Rutherford scattering (No derivation - Qualitative ideas only)

UNIT-II(12 hrs)

3. Mechanics of Rigid body

Rigid body, rotational kinematic relations. Rotational kinetic energy and moment of inertia - moment of inertia in simple cases (Rod, disc, sphere and cylinder) - No derivations. Parallel & Perpendicular axes theorems - Torque - relation between torque and angular momentum. Angular momentum of a particle - Torque and angular momentum for a system of particles - conservation of angular momentum - Translation and rotational motion of system - Elementary ideas about gyroscopic motion (No derivation – Qualitative ideas only) - Precession of the equinoxes.

UNIT-III(10 hrs)

4. Central Forces

Central force – Definition & examples - General Characteristics of central forces - Conservative nature of central forces, Planetary motion - Kepler's laws (Statements & Explanation), Newton's law of gravitation from Kepler's law, Geostationary Satellite Motion. Uses of communication satellites.

UNIT-IV(10 hrs)

5. Fluid Flow

The flow of ideal fluids - Stream line motion - Equation of continuity - Bernoulli's equation - Simple applications - Torricelli's theorem - The Venturimeter - Pitot's tube - Viscosity and the flow of real fluids - Poiseuille's equation.

UNIT-V (12 hrs)

6. Relativistic Effects

Moving reference frames - Inertial and Non-inertial reference frames - Galilean relativity – Special theory of relativity - Statements of the two basic postulates - (Elementary treatment and application only) Lorentz transformation equations - length contraction - time dilation -

addition of velocities - Momentum and relativistic mass – Mass-Energy equation, rest mass & momentum of a particle.

REFERENCE BOOKS:
1. B.Sc. Physics, Vol.1 -Telugu Academy, Hyderabad.
2. Physics for Biology and Premedical Students –D.N. Burns & SGG Mac Donald.
3. Unified Physics Vol.I Mechanics, Waves and Oscillations – Jai Prakash Nath & Co. Ltd., Meerut.
4. Properties of Matter - D.S. Mathur, S. Chand & Co, New Delhi ,11thEdn., 2000
5. Properties of Matter - Brijlal & Subrmanyam , S.Chand & Co. 1982

Practical paper 1: Mechanics & Properties of Matter
Work load: 30 hrs per semester

2 hrs/week

Minimum of 6 experiments to be done and recorded
1. Viscosity of liquid by the flow method (Poiseuille's method).
2. Young's modulus of the material of a bar (scale) by uniform bending.
3. Young's modulus of the material a bar (scale) by non- uniform bending.
4. Surface tension of a liquid by capillary rise method.
5. Determination of radius of capillary tube by Hg thread method.
6. Viscosity of liquid by Searle's viscometer method.
7. Bifilar suspension –moment of inertia of a regular rectangular body.
8. Determination of moment of inertia using Fly-wheel.
9. Determination of the height of a building using a sextant.
10. Rigidity modulus of material of a wire-dynamic method (torsional pendulum).

Suggested student activities
Student seminars, group discussions, assignments, field trips, study project and experimentation using virtual lab

Examples

Seminars	- A topic from any of the Units is given to the student and asked to give a brief seminar presentation.
Group discussion	- A topic from one of the units is given to a group of students and asked to discuss and debate on it.
Assignment	- Few problems may be given to the students from the different units and asked them to solve.
Field trip	- Visit to Satish Dhawan Space Centre, Sriharikota / Thermal and hydroelectric power stations / Science Centres, any other such visit, etc.
Study project	- Web based study of different satellites and applications.

Domain skills:
Logical derivation, experimentation, problem solving, data collection and analysis, measurement skills.

*** Documental evidence is to be maintained for the above activities.

MODEL PAPER

THREE YEAR B.Sc DEGREE EXAMINATION

CHOICE BASED CREDIT SYSTEM

I SEMESTER: PART II: PHYSICS

Paper I: Mechanics & Properties of Matter
(For Non Mathematics Combinations)

Time: 3 Hours   Max. Marks: 75

Section-A (Essay type)

Answer All questions   **Marks :5X10 = 50**

1. a) Explain gradient of scalar field and curl of vector field with physical significance.
<div align="center">OR</div>
   b) Derive the expressions for the final velocities for the two dimensional elastic
      collision between two bodies

2. a) Prove the parallel and perpendicular axes theorems.
<div align="center">OR</div>
   b) Define Torque and angular momentum for a system of particles and derive the
      relation between them.

3. a) Define a central force. Give two examples. Prove that a central force is a
      conservative.
<div align="center">OR</div>
    b) State Kepler's laws. Derive Newton's law of gravitation from Kepler's third law.

4. a) Derive the Bernoulli's equation for the ideal fluids.
<div align="center">OR</div>
   b) Define the coefficient of viscosity. Derive the Poiseuille's equation for the flow of
      real fluids.

5. a) State the basic postulates of special theory of relativity. Write the Lorentz
      transformation equations and discuss the special cases.
<div align="center">OR</div>
   b) What is relativistic mass. Derive the mass-energy equation.

Section-B (Short answer type)

Answer any three questions   **Marks: 3X5 = 15**

6. Define scalar and vector products, give examples.
7. Write a note on precession of the equinoxes.
8. What is a geostationary satellite and write its uses.
9. Prove the Torricelli's theorem.
10. Explain the length contraction.

Section-C

Answer any two questions   **Marks: 2X5 = 10**

11. If A= ix + j y^2 +k yz find div A at point (2, -2, 2).

12. 2 Kg. mass moving with a velocity of 10m/s collides with another 6 Kg. mass moving in opposite direction with a velocity of 20 m/s. During collision they stick together. Find their common velocity.

13. A 500 gm stone is revolved at the end of a 0.4 m long string at the rate of 12.5 rad/s. What is its angular momentum?

14. The mean distance of mars from sun is 1.524 times the distance of the earth from the sun. Compute the period of revolution of mars around sun.

15. Find the velocity with which a body has to move so that its mass will be double to its rest mass.