B.Sc. PHYSICS SYLLUBUS UNDER CBCS

w.e.f. 2015-16 (Revised in April 2016)

For Mathematics

Combinations B.Sc.

1st Semester Physics

Paper I: Mechanics& Properties of Matter

Work load:60 hrs per semester 4 hrs/week

UNIT-I (10 hrs)

1. Vector Analysis

Scalar and vector fields, gradient of a scalar field and its physical significance. Divergence and curl of a vector field with derivations and physical interpretation. Vector integration (line, surface and volume), Statement and proof of Gauss and Stokes theorems.

UNIT-II (10 hrs)

2. Mechanics of particles

Laws of motion, motion of variable mass system, Equation of motion of a rocket. Conservation of energy and momentum, Collisions in two and three dimensions, Concept of impact parameter, scattering cross-section, Rutherford scattering-derivation.

UNIT-III (16 hrs)

3. Mechanics of Rigid bodies

Definition of rigid body, rotational kinematic relations, equation of motion for a rotating body, angular momentum, Euler equations and its applications, precession of a top, Gyroscope, precession of the equinoxes.

4. Mechanics of continuous media

Elastic constants of isotropic solids and their relations, Poisson's ratio and expression for Poisson's ratio in terms of y, n, k. Classification of beams, types of bending, point load, distributed load, shearing force and bending moment, sign conventions.

UNIT-IV (12Hrs)

5. Central forces

Central forces, definition and examples, characteristics of central forces, conservative natureof central forces, conservative force as a negative gradient of potential energy, equatglobal ion of motion under a central force.Derivation of Kepler’s laws.Motion of satellites, idea of Global Positioning System (GPS).

UNIT-V (12 hrs)

6. Special theory of relativity

Galilean relativity, absolute frames.Michelson-Morley experiment, negative result.Postulates of special theory of relativity.Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation.Concept of four-vector formalism.

REFERENCE BOOKS:

1. B. Sc. Physics, Vol.1, Telugu Academy, Hyderabad
2. Fundamentals of Physics Vol. I - Resnick, Halliday, Krane ,Wiley India 2007

3. Unified Physics, Vol. 1, S.L. Gupata & S. Guptha, Jai Prakash Nath & Co, Meerut.
4. College Physics-I. T. Bhimasankaram and G. Prasad. Himalaya Publishing House.
5. University Physics-FW Sears, MW Zemansky& HD Young,Narosa Publications, Delhi
6. Mechanics, S.G.Venkatachalapathy, Margham Publication, 2003.

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)

Scheme of Valuation

Practicals	**50 marks**
Formula & Explanation	6
Tabular form +graph +circuit diagram	6
Observations	12
Calculation, graph, precautions & Result	6
Viva-Voce	10
Record	10

Suggested student activities

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

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Examples

Seminars - A topic from any of the Units is given to the student and asked to give abrief seminar presentation.

Group discussion - A topic from one of the units is given to a group of students and asked todiscuss and debate on it.

Assignment - Few problems may be given to the students from the different units andasked them to solve.

Field trip - Visit to Satish Dhawan Space Centre, Sriharikota / Thermal andhydroelectric 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, measurementskills

Model question Paper

Time : 3 hrs **Max marks : 75**

Section-A (Essay type)

Answer All questions with internal choice from all units Marks :10x5 = 50

(Two questions are to be set from each unit with either or type)

Section-B (Short answer type)

Answer any five out of 9 questions from all units (I to V) Marks: 5 x5 = 25

At least one question should be set from each unit.

QUESTION BANK

Unit -1(Vector Analysis)

Essay Questions(10M)

1. Define divergence and deduce an expression for it

2. State and prove Stoke's theorem.

3. State and prove Gauss Divergence theorem.

4. Define curl of vector field. Obtain the expression for the curl.

Short Answers(5M)

1. Write the physical significance of gradient.

2. Define scalar and vector fields. Mention few examples.

3. Explain vector integration.

4. Explain the Physical significance of Curl.

5. Define divergence and curl of a vector field.

Unit -2(Mechanics of particles)

Essay Questions(10M)

1. Derive an expression for the velocity of the rocket at any instant of time.

2. Derive Rutherford scattering cross section.

3. Explain the principle of system of variable mass.

Short Answers(5M)

1. Explain Multistage Rocket.

2. Define Impact parameter and Scattering cross-section.

3. State and prove law of conservation of linear momentum.

4. State Newton's Laws of motion.

Unit -3(Mechanics of Rigid bodies & Mechanics of Continuous Media)

Essay Questions(10M)

1. Deduce an expression for angular processional velocity of a spinning top

2.Derive Euler's equation of rotational motion for a rigid body.

3.Obtain the equation of motion of a rigid rotating body.

4. Explain the construction and working of gyroscope.

5. Derive the relation among the three elastic moduli.

6. Obtain an expression for the couple required to bend a beam

Short Answers(5M)

1. Explain the working of gyroscope with a neat diagram.

2. Write a short note on precession of equinoxes.

3. What are different types of loads?

4. Explain the terms (i) longitudinal filaments, (ii) neutral surface (iii)plane of bending

5. Explain briefly about elastic constants.

6. Write a short note on classification of beams.

Unit -4(Central forces)

Essay Questions (10M)

1. Define central force. Give two examples. Prove the conservative nature of central force.

2. State and prove Kepler's Laws of planetary motion.

5. Obtain the equation of motion of a body under central force.

6. State Kepler's laws of planetary motion. Derive the Kepler's first law.

Short Answers(5M)

1. State and prove Kepler's third law of planetary motion.

2. Define Central forces. Give examples.

3. Show that central force is conservative.

Unit -5(Special Theory of Relativity)

Essay Questions(10M)

1. Describe Michelson Morley Experiment with theory.

2. State fundamental postulates of special theory of relativity. Derive Lorentz transformations.

3. Obtain Einstein's mass-energy equation. Write any two of its verifications.

Short Answers(5M)

1. Describe Galilean transformations.
2. Explain length contraction.
3. Explain time dilation.
4. What is the significance of Michelson-Morley experiment?
5. Deduce mass – energy relation. Write any two of its verifications.