B.Sc. PHYSICS SYLLABUS UNDER CBCS w.e.f. 2023-24

B.Sc. Physics Theory I Year (Semester –I)

DSC–I - Mechanics and Oscillations

Total periods:		60
Theory:	4 Hours/Week	4 Credits
Practical:	3 Hours/Week	1 Credit

UNIT - I

Vector Analysis

Scalar triple product, vector triple product. Scalar and vector fields, gradient of a scalar field and its physical significance. Divergence and curl of a vector field and related problems. Vector integration, line, surface and volume integrals. Stokes, Gauss and Greens theorems - simple applications.

UNIT – II

Mechanics of Particles

Laws of motion, motion of variable mass system, motion of a rocket, multi-stage rocket, conservation of energy and momentum. Collisions – elastic and inelastic collisions, collisions in one dimension, collisions in two and three dimensions, concept of impact parameter, scattering cross-section, Rutherford scattering formula (qualitative interpretation)

Mechanics of rigid bodies

Definition of Rigid body, rotational kinematic relations, equation of motion for a rotating body, angular momentum and inertial tensor. Euler's equation, precession of a top, Gyroscope. Coriolis force and it's applications.

UNIT- III

Central forces

Central forces – definition and examples, properties - areal velocity, motion confined to a plane, conservative nature of central forces, conservative force as a negative gradient of potential energy. Equation of motion under a central force, gravitational potential and gravitational field, motion under inverse square law, derivation of Kepler's laws, Coriolis force and its expressions.

Special theory of relativity

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

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UNIT-IV

Oscillations

Simple harmonic oscillator (SHO) and solution of the differential equation. Physical characteristics of SHM. Conservation of energy of SHO. Torsion pendulum - measurements of rigidity modulus, compound pendulum - measurement of 'g'. Combination of two mutually perpendicular simple harmonic vibrations of same frequency and different frequencies, Lissajous figures. Damped harmonic oscillator, solution of the differential equation of damped oscillator. Energy considerations, logarithmic decrement, relaxation time, quality factor, differential equation of forced oscillator and its solution, amplitude resonance, velocity resonance.

Note: Problems should be solved at the end of every chapter of all units.

Text Books

1. Berkeley Physics Course. Vol.1, **Mechanics** by C. Kittel, W. Knight, M.A. Ruderman - *Tata- McGraw hill Company Edition 2008.*
2. **Fundamentals of Physics.** Halliday/Resnick/Walker *Wiley India Edition 2007.*
3. **First Year Physics** - *Telugu Academy.*
4. **Introduction to Physics for Scientists and Engineers.** F.J. Ruche. *McGraw Hill.*
5. **College Physics-I** - T. Bhimasankaram and G. Prasad. *Himalaya Publishing House*

Reference Books

1. **Fundamentals of Physics** by Alan Giambattista et al *Tata-McGraw Hill Company* Edition,2008.
2. **University Physics** by Young and Freeman, *Pearson Education, Edition 2005.*
3. **Sears and Zemanski's University Physics** by Hugh D. Young, Roger A. Freedman *Pearson Education Eleventh Edition.*
4. **An introduction to Mechanics** by Daniel Kleppner & Robert Kolenkow. *The McGraw Hill Companies.*
5. **Mechanics.** Hans & Puri. *TMH Publications.*
6. **Engineering Physics.** R.K. Gaur & S.L. Gupta. *Dhanpat Rai Publications.*
7. R P Feynman, RB Lighton and M Sands - **The Feynman Lectures in Physics, Vol.-1,** BI Publications,
8. **Mechanics** - J.C. Upadhyaya.
9. **Mechanics** - P.K. Srivastava, New Age International.

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B.Sc. (Physics) – I Year
Semester -I
Paper – I :: Mechanics & Oscillations Practicals
(DSC – Compulsory)

1. Measurement of errors – Simple Pendulum.
2. Calculation of slope and intercept of a Y= mX +C by theoretical method (Simple Pendulum experiment)
3. Study of a compound pendulum - determination of 'g' and 'k'.
4. Determination of Y by uniform bending.
5. Determination of Y by non-uniform bending.
6. Moment of Inertia of a fly wheel.
7. Rigidity moduli by Torsion Pendulum.
8. Determination of surface tension of a liquid through capillary rise method.
9. Determination of surface tension of a liquid by any other method.
10. Determination of Viscosity of a fluid.
11. Observation of Lissajous figures from CRO – Frequency ratio. Amplitude and Phase difference of two waves.
12. Study of oscillations of a mass under different combinations of springs – series and parallel
13. Study of oscillations under Bifilar suspension – Verification of axis theorems

Note: Minimum of eight experiments should be performed. Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

Suggested Books

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi.)
2. S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).
3. Worsnop and Flint- "Advanced Practical physics for students".
4. "Practical Physics" R.K Shukla, Anchal Srivastava.

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B.Sc. PHYSICS SYLLABUS UNDER CBCS w.e.f. 2023-24

B.Sc. Physics Theory I Year (Semester –II)

DSC–II Thermal Physics

Total periods: 60
Theory: 4 Hours/Week 4 Credits
Practical: 3 Hours/Week 1 Credit

Unit-I

Kinetic theory of gases

Introduction – Postulates of Kinetic theory of gases, Deduction of Maxwell's law of distribution of molecular speeds, Deduction of V_{rms}, V_{avg} and V_{mp} from Maxwells's speed distribution law. Transport Phenomena – Viscosity of gases – thermal conductivity – diffusion of gases.

Thermodynamics

Basics of thermodynamics - PV indicator diagram – uses, Carnot engine (qualitative), Kelvin's and Clausius' statements of 2nd law of Thermodynamics. Thermodynamic scale of temperature. Entropy - physical significance, Change in entropy in reversible and irreversible processes, Entropy and disorder, Entropy of universe. Temperature-Entropy (T-S) diagram – Efficiency of Carnot heat engine using T-S diagram. Change of entropy of a perfect gas (in terms of PV, VT & PT), change of entropy when ice changes into steam.

UNIT – II

Thermodynamic potentials and Maxwell's equations

Thermodynamic potentials, Derivation of Maxwell's thermodynamic relations. Clausius-Clapeyron's equation. Derivation for ratio of specific heats, derivation for difference of two specific heats for perfect gas and Vanderwaal's gas. Joule Kelvin effect – expression for Joule Kelvin coefficient for perfect and Vanderwaal's gas.

Low temperature physics

Joule Kelvin effect – liquefaction of gas using porous plug experiment - Expression for Joule Thomson cooling. Joule expansion – Distinction between adiabatic and Joule Thomson expansion. Principle of regenerative cooling, Liquefaction of helium - Kapitza's method, Adiabatic demagnetization – Production of low temperatures. Principle of refrigeration - Vapor compression type.

UNIT – III

Quantum theory of radiation

Black body - Ferry's black body. Distribution of energy in the spectrum of Black body. Steafan's law, Wein's law, Wein's displacement law, Rayleigh-Jean's law. Quantum theory of radiation - Planck's law. Deduction of Wein's law, Rayleigh-Jeans law, Stefan's law from

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Planck's law. Measurement of radiation using pyrometers, Disappearing filament optical pyrometer-Experimental determination. Angstrom pyrheliometer-determination of solar constant, effective temperature of sun.

UNIT – IV

Statistical Mechanics

Introduction, postulates of statistical mechanics. Phase space, concept of ensembles and some known ensembles, classical and quantum statistics and their differences, concept of probability, Maxwell-Boltzmann's distribution law - Molecular energies in an ideal gas. Bose-Einstein distribution law – Application of B-E distribution law to photon gas. Fermi-Dirac distribution law, comparison of three distribution laws.

Note: Problems should be solved at the end of every chapter of all units.

TEXT BOOKS

1. Fundamentals of Physics. Halliday/Resnick/Walker. C. Wiley India Edition 2007.
2. Second Year Physics – Telugu Academy.
3. Modern Physics by R. Murugeshan and Kiruthiga Siva Prasath (for statistical Mechanics) S. Chand & Co.

REFERENCE BOOKS

1. Modern Physics by G. Aruldhas and P. Rajagopal, Eastern Economy Education.
2. Berkeley Physics Course. Volume-5. Statistical Physics by F. Reif. The McGraw-Hill Companies.
3. An Introduction to Thermal Physics by Daniel V. Schroeder. Pearson Education Low Price Edition.
4. Thermodynamics by R.C. Srivastava, Subit K. Saha & Abhay K. Jain Eastern Economy Edition.
5. Modern Engineering Physics by A.S. Vasudeva. S. Chand & Co. Publications.
6. Feynman's Lectures on Physics Vol. 1,2,3& 4. Narosa Publications.
7. Fundamentals of Optics by Jenkins A. Francis and White E. Harvey, McGraw Hill Inc.
8. B.B. Laud "Introduction to statistics Mechanics" (Macmillan 1981)
9. F. Reif: Statistical Physics (McGraw-Hill, 1998)
10. K. Haung: Statistical Physics (Wiley Eastern 1988)

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B.Sc. (Physics) – I Year
Semester - II
Paper – II :: Thermal Physics Practicals
(DSC – Compulsory)

1. Co-efficient of thermal conductivity of a bad conductor by Lee's method.
2. Measurement of Stefan's constant.
3. Specific heat of a liquid by applying Newton's law of cooling correction.
4. Heating efficiency of electrical kettle with varying voltages.
5. Calibration of thermo-couple
6. Cooling Curve of a metallic body
7. Resistance thermometer
8. Thermal expansion of solids.
9. Study of conversion of mechanical energy to heat.
10. Determination of the Specific of a solid (graphite rod)

Note: Minimum of eight experiments should be performed. Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

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