

UNIVERSITY OF MADRAS
B.Sc. DEGREE COURSE IN PHYSICS
SYLLABUS WITH EFFECT FROM 2020-2021

BPS-CSC01

CORE-I: PROPERTIES OF MATTER AND SOUND
(Common to B.Sc. Physics with Computer Applications)

Lecture: 60 Hours

Tutorial: 15 Hours

Credits:4

Course Objectives:

- To make the students learn and understand the properties of materials and acoustics.

Learning outcome:

After successful completion of this paper, students will be able to:

- Analyse the strength of materials in terms of their size and shape.
- Understand the fluid dynamics that gives the fundamental knowledge over many practical applications
- Analyze the phenomena of simple harmonic motion and the properties of systems executing such motions
- Know the different methods of producing ultrasonic waves and its applications
- Determine the modulus of elasticity through different experimental techniques

UNIT I: ELASTICITY (12 Hours)

Hooke's Law – Stress–Strain diagram –Elastic constants –Poisson's ratio – Relation between elastic constants and Poisson's ratio – Work done in stretching and twisting a wire – Twisting couple on a cylinder -Rigidity modulus by Static torsion– Torsional pendulum (with and without masses)

UNIT II: BENDING OF BEAMS (12 Hours)

Cantilever– Expression for Bending moment – Expression for depression at the loaded end of the cantilever–Oscillations of a cantilever – Expression for time period-Experiment to find Young's Modulus – Non-Uniform bending– Experiment to determine Young's Modulus by Koenig's method- Uniform Bending-Expression for elevation-Experiment to determine Young's Modulus using microscope

UNIT III : FLUID DYNAMICS (12 Hours)

Surface tension-: Definition – Molecular forces– Excess pressure over curved surface – Application to Spherical and Cylindrical Drops and Bubbles-Variation of Surface Tension with Temperature —Jaegar's method.

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Viscosity:-Definition-Streamline and Turbulent motion – Rate of flow of liquid in a capillary tube-Poiseuille’s formula –Corrections-Terminal Velocity and Stoke’s formula– Variation of Viscosity of a liquid with Temperature

UNIT IV: WAVES AND OSCILLATIONS (12 Hours)

Simple Harmonic Motion – Differential Equation of SHM – Graphical representation of SHM – Composition of two S.H.M in a straight line-at right angles-Lissajous's figures-Free, Damped, Forced vibrations -Resonance and Sharpness of resonance.

Laws of transverse vibration of strings- Sonometer-Determination of AC frequency using sonometer - Determination of frequency using Melde’s apparatus.

UNIT V: ACOUSTICS OF BUILDINGS AND ULTRASONICS (12 Hours)

Intensity of sound – Decibel – Loudness of sound –Reverberation – Sabine’s reverberation formula – Acoustic Intensity – Factors affecting the Acoustics of Buildings.

Ultrasonic waves – Production of Ultrasonic Waves – Piezoelectric crystal method – Magnetostriction effect – Application of Ultrasonic Waves.

Books for Study:

1. Elements of Properties of Matter, D. S Mathur, S. Chand & Co (2010)
2. Properties of Matter, BrijLal and N. Subrahmanyam, S.Chand and Co(2003)
3. Textbook of Sound, D.R.Khanna and R.S. Bedi, Atma Ram and sons (1969)
4. A Text Book of Sound, BrijLal and N.Subrahmanyam, Vikas Publishing House –
Second revised edition (1995)

Books for Reference:

1. General Properties of Matter, C.J. Smith, Orient Longman Publishers (1960).
- 2.Fundamental of General Properties of Matter, H.R Gulati, R Chand and Co, Fifth edition (1977)
- 3.Vibration and Waves, A.P French, MIT Introductory Physics, Arnold–Heinmann India (1973)