

DEPARTMENT OF PHYSICS				CLASS: I B.Sc. Physics				
Sem.	Course type	Course code	Course title	Credits	Contact hours/week	CIA	Ext	Total
I	Major Core-1	20U1PMC1	PROPERTIES OF MATTER AND SOUND	3	3	25	75	100

Course Objectives:

1. To expose the students to the knowledge of materials suitable for construction of buildings based on their moduli of elasticity.
2. To impart knowledge on properties of liquids and their determination.
3. To understand the physics of sound through different experimental techniques.

Unit-I: Elasticity

Elasticity – Hooke's law – Elastic moduli – Poisson's ratio – Relation between the three moduli – Bending of beams – Expression for bending moment – Cantilever – Uniform bending theory – Non-uniform bending theory – Torsion of a body – Expression for couple per unit twist – Work done in twisting a wire – Torsional oscillations of a body – Rigidity modulus by dynamic torsion method.

Self study: Determination of Young's modulus by pin and microscope method – scale and telescope method.

Audit: Rigidity modulus by Static torsion method.

Unit-II: Viscosity

Viscosity – Coefficient of viscosity – Streamlined and Turbulent motion – Critical velocity – Rate of flow of liquid in a capillary tube – Poiseuille's formula – Theory – Experiment (variable pressure head) – Viscosity of highly viscous liquid – Terminal velocity – Stoke's method (dimensional method only) – Ostwald Viscometer.

Self study: Viscosity of gas – Meyer's formula.

Audit: Rankine's method

Unit-III: Surface Tension

Surface tension – Definitions – Units and dimensions – Explanation of surface tension on kinetic theory – Surface energy – Excess pressure inside a liquid drop and soap bubble – Excess pressure inside a curved liquid surface – Surface tension and interfacial tension by drop weight method – Theory and experiment – Angle of contact – Variation of surface tension with temperature – Determination of surface tension by Jaeger's method.

Self study: Work done in increasing the area of a surface – Work done in blowing a bubble.

Audit: Quincke's method

Unit-IV: Sound

Simple Harmonic Motion – Composition of two S.H.M at right angles– Lissajous's figures– Experimental methods for obtaining Lissajous's figures – Free, Damped and Forced vibrations.

Laws of transverse vibration of strings – Sonometer – Determination of frequency using Melde's apparatus – Intensity levels – Decibel – Noise pollution.

Self study: Uses of Lissajous's figures

Audit: Composition of two S.H.M in a straight line.

Unit-V: Ultrasonics and Acoustics

Ultrasonics – Production – Piezoelectric crystal method – Magnetostriction method – Detection – Properties and Applications – Acoustics of building – Reverberation – Sabine's Reverberation formula (No derivation) – Factors affecting acoustics of building.

Self study: Determination of velocity of ultrasonic waves in a liquid.

Audit: Sound distribution in an auditorium.

Books for Study

1. R.Murugesan , Properties of Matter, Reprint 2017, S.Chand& Co.,
Unit I: 1.1, 1.2, 1.7, 1.9, 1.12, 1.13, 1.14, 1.15, 1.16, 1.17(1), 1.19, 1.20, 1.21
Unit II: 2.1, 2.2, 2.3, 2.4, 2.6, 2.7, 2.8, 2.9, 2.13
Unit III: 3.1, 3.2, 3.3, 3.4, 3.6, 3.8, 3.9, 3.11, 3.12, 3.17, 3.18.
Unit V: 11.9, 11.10, 11.11, 11.12, 11.13, 11.14, 11.15, 11.16, 11.17, 11.18, 11.21, 11.22.
2. N.Subrahmanyam and Brijlal, A text Book of Sound, Second revised edition, 1995, Vikas Publishing House Ltd.
Unit IV: 1.3, 1.4, 1.5, 2.1, 2.4, 2.8, 2.9, 3.1, 3.2, 3.3, 3.4, 7.3, 7.4, 7.5.
3. R.Murugesan and Er.KiruthigaSivaprasath, Properties of Matter and Acoustics, 2019, S.Chand& Co.,
Unit IV: 4.9, 4.10, 4.11, 4.12, 4.13.

Books for References

1. D.S.Mathur , Elements of Properties of Matter, 2004, S.Chand& Co.,
2. Brij Lal and N.Subrahmanyam , Properties of Matter, Reprint 2004, S.Chand& Co.,
3. H.R.Gulati, Fundamentals of general Properties of Matter, 1982, S.Chand& Co.,
4. D.Halliday, Resnick and J Walker, Fundamentals of Physics, 6th edition, 2001, Wiley Eastern Ltd.

Web Resources

1. Applications of elastic behavior of materials
 (Link: <https://www.toppr.com/guides/physics/mechanical-properties-of-solids/applications-of-elastic-behaviour-of-materials/>)
2. Importance of viscosity in real life
 (Link: <https://www.careerdune.com/2017/10/importance-of-viscosity-in-real-life.html>
<http://www.scienceclarified.com/everyday/Real-Life-Chemistry-Vol-3-Physics-Vol-1/Aerodynamics.html>
<https://www.britannica.com/science/aerodynamics>)
3. Importance of surface tension and its application
 (Link: <https://blog.biolinscientific.com/why-is-surface-tension-important>)
4. Physics in Musical instruments
 (Link: http://www.physics.usyd.edu.au/teach_res/hsp/sp/mod31/m31_strings.htm)
5. Acoustic properties of building materials
 (Link: <https://theconstructor.org/building/acoustic-properties-building-materials/14449/>)

Course Designers:

1. Mrs. G.Gowri
2. Mr. T.Vivekanandan
3. Mrs. M.Megala

Lecture Schedule

Unit	Topics	Hours	Mode
Unit I	Elasticity, Hooke's law, Elastic moduli	1	Chalk and talk, Quiz and assignment
	Poisson's ratio, Relation between the three moduli	1	
	Bending of beams, Expression for bending moment, Cantilever, Uniform bending theory, Non-uniform bending theory	3	
	Torsion of a body, Expression for couple per unit twist, Work done in twisting a wire	2	
	Torsional oscillations of a body, Rigidity modulus by dynamic torsion method	2	
Unit II	Viscosity, Coefficient of viscosity, Streamlined and Turbulent motion	2	PPT, Chalk and talk, and Group discussion
	Critical velocity, Rate of flow of liquid in a capillary tube	1	
	Poiseuille's formula, Theory, Experiment - variable pressure head	2	
	Viscosity of highly viscous liquid, Terminal velocity	2	
	Stoke's method - dimensional method, Ostwald Viscometer	2	
Unit III	Surface tension, Definitions, Units and dimensions, Explanation of surface tension on kinetic theory	2	PPT, Chalk and talk, Quiz and Group discussion
	Surface energy, Excess pressure inside a liquid drop and soap bubble, Excess pressure inside a curved liquid surface	2	
	Surface tension and interfacial tension by drop weight method, Theory and experiment	2	
	Angle of contact, Variation of surface tension with temperature	2	
	Determination of surface tension by Jaeger's method.	1	
Unit IV	Simple Harmonic Motion, Composition of two S.H.M at right angles	1	PPT, Chalk and talk, Assignment
	Lissajous's figures, Experimental methods for obtaining Lissajous's figures	2	
	Free, Damped and Forced vibrations	1	
	Laws of transverse vibration of strings, Sonometer, Determination of frequency using Melde's apparatus	3	
	Decibel, Noise pollution	2	
Unit V	Ultrasonics, Production, Piezoelectric crystal method	2	Chalk and talk, Quiz and Interaction
	Magnetostriction method, Detection, Properties and Applications.	3	
	Acoustics of building, Reverberation, Sabine's Reverberation formula	3	
	Factors affecting acoustics of building	1	

Pedagogy

Chalk and Talk, PPT, Quiz, Group discussion, Seminar, Interaction, Problem solving.

Course learning Outcomes

On the successful completion of the course, students will be able to

CLOs	Course Learning Outcomes	Knowledge Level
CLO-1	Apply the principles of elasticity in construction and allied fields and able to examine the effects in them	UptoK4
CLO-2	Apply the principles of fluid dynamics in aerodynamics	UptoK3
CLO-3	Infer the importance of surface tension in real life applications	UptoK2
CLO-4	Make use of the physics of sound for musical instruments	UptoK3
CLO-5	Utilize the physical parameters related to sound in the design and construction of buildings with good acoustic properties	UptoK3

Mapping with CLOs with PSOs

#	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7
CLO-1	3	2	2	3			1
CLO-2	3	3	2	2			1
CLO-3	3	2	2				1
CLO-4	3	3	2	3			1
CLO-5	3	3	2	3			1

Mapping of CLOs with POs

#	PO1	PO2	PO3	PO4	PO5
CLO1	3	1	2		
CLO2	3	2	3	1	
CLO3	3	2	2	1	
CLO4	3	1	1		2
CLO5	3	2	2	1	

Advance application- 3;

Intermediate level-2; Basic level-1