UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN PHYSICS

SYLLABUS WITH EFFECT FROM 2023-2024

COURSE	**FIRST SEMESTER –CORE THEORY 1**
COURSE TITLE	**PROPERTIES OF MATTER AND ACOUSTICS**
COURSE CODE	**137C1A**
CREDITS	4
COURSE OBJECTIVES	Study of the properties of matter leads to information which is of practical value to both the physicist and the engineers. It gives us information about the internal forces which act between the constituent parts of the substance. Students who undergo this course are successfully bound to get a better insight and understanding of the subject.

UNITS	COURSE DETAILS
UNIT-I	**ELASTICITY:** 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:**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:** *Surface tension*: definition – molecular forces– excess pressure over curved surface – application to spherical and cylindrical drops and bubbles – determination of surface tension by Jaegar's method–variation of surface tension with temperature *Viscosity*:definition – streamline and turbulent flow – rate of flow of liquid in a capillary tube – Poiseuille's formula –corrections – terminal velocity and Stoke's formula– variation of viscosity with temperature
UNIT-IV	**WAVES AND OSCILLATIONS:** Simple Harmonic Motion (SHM) – differential equation of SHM – graphical representation of SHM – composition of two SHM in a straight line and at right angles – Lissajous's figures- free, damped, forced vibrations –resonance and Sharpness of resonance.

	Laws of transverse vibration in strings –sonometer – determination of AC frequency using sonometer–determination of frequency using Melde'sstring apparatus
UNIT-V	**ACOUSTICS OF BUILDINGS AND ULTRASONICS:** 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
PROFESSIONAL COMPONENTS: Expert lectures –seminars — webinars – industry inputs – social accountability – patriotism	
TEXT BOOKS	1. D.S.Mathur, 2010, Elements of Properties of Matter, S.Chand and Co. 2. BrijLaland N. Subrahmanyam, 2003, Properties of Matter, S.Chand and Co 3. D.R.Khanna andR.S.Bedi, 1969, Textbook of Sound, AtmaRamand sons 4. BrijLal and N.Subrahmanyam, 1995, A Text Book of Sound, Second revised edition,Vikas Publishing House. 5. R.Murugesan,2012, Properties of Matter, S.Chandand Co.
REFERENCE BOOKS	1. C.J. Smith, 1960, General Properties of Matter, Orient Longman Publishers 2. H.R. Gulati, 1977, Fundamental of General Properties of Matter, Fifth edition,R. Chand and Co. 3. A.P French, 1973, Vibration and Waves, MIT Introductory Physics, Arnold-Heinmann India.
WEB RESOURCES	1. https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work 2. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html 3. https://www.youtube.com/watch?v=gT8Nth9NWPM 4. https://www.youtube.com/watch?v=m4u-SuaSu1sandt=3s 5. https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work

	6. https://learningtechnologyofficial.com/category/fluid-mechanics-lab/ 7. http://www.sound-physics.com/ 8. http://nptel.ac.in/courses/112104026/

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	75	100	

COURSE OUTCOMES:

At the end of the course, the student will be able to:

COURSEOUTCOMES	**CO1**	Relate elastic behavior in terms of three modulii of elasticity and working of torsion pendulum.
	CO2	Able to appreciate concept of bending of beams and analyze the expression, quantify and understand nature of materials.
	CO3	Explain the surface tension and viscosity of fluid and support the interesting phenomena associated with liquid surface, soap films provide an analogue solution to many engineering problems.
	CO4	Analyze simple harmonic motions mathematically and apply them. Understand the concept of resonance and use it to evaluate the frequency of vibration. Set up experiment to evaluate frequency of ac mains
	CO5	Understand the concept of acoustics, importance of constructing buildings with good acoustics. Able to apply their knowledge of ultrasonics in real life, especially in medical field and assimilate different methods of production of ultrasonic waves

MAPPING WITH PROGRAM OUT COMES:

Map course out comes **(CO)** for each course with program out comes **(PO)** in the 3-point scale of STRONG(**S**), MEDIUM(**M**) and LOW(**L**).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	S	M	M	S	M	S
CO2	M	S	S	S	M	M	S	M	S	S
CO3	S	M	S	M	S	S	M	S	S	S
CO4	S	S	S	S	S	M	S	M	M	M
CO5	M	M	S	S	M	S	S	S	S	M