UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN CHEMISTRY

SYLLABUS WITH EFFECT FROM 2023-2024

224E3A

COURSE	**ELECTIVE PAPER**
COURSETITLE	**ELECTIVE PHYSICS – I**
CREDITS	**2**
COURSE OBJECTIVES	To impart basic principles of Physics that which would be helpful for students who have taken programmes other than Physics.

UNITS	COURSE DETAILS
UNIT-I	**WAVES, OSCILLATIONS AND ULTRASONICS:** simple harmonic motion (SHM) – composition of two SHMs at right angles (periods in the ratio 1:1) – Lissajous figures – uses – laws of transverse vibrations of strings – determination of AC frequency using sonometer (steel and brass wires) – ultrasound – production – piezoelectric method – application of ultrasonics: medical field – lithotripsy, ultrasonography –ultrasonoimaging- ultrasonics in dentistry – physiotheraphy, opthalmology – advantages of noninvasive surgery – ultrasonics in green chemistry.
UNIT-II	**PROPERTIES OF MATTER:** *Elasticity*: elastic constants – bending of beam – theory of non- uniform bending – determination of Young's modulus by non-uniform bending – energy stored in a stretched wire – torsion of a wire – determination of rigidity modulus by torsional pendulum *Viscosity*: streamline and turbulent motion – critical velocity – coefficient of viscosity – Poiseuille's formula – comparison of viscosities – burette method, *Surface tension*: definition – molecular theory – droplets formation– shape, size and lifetime – COVID transmission through droplets, saliva – drop weight method – interfacial surface tension.
UNIT-III	**HEAT AND THERMODYNAMICS:** Joule-Kelvin effect – Joule-Thomson porous plug experiment – theory – temperature of inversion – liquefaction of Oxygen– Linde's process of liquefaction of air– liquid Oxygen for medical purpose– importance of cryocoolers– thermodynamic system – thermodynamic equilibrium – laws of thermodynamics – heat engine – Carnot's cycle – efficiency – entropy – change of entropy in reversible and irreversible process.
UNIT-IV	**ELECTRICITY AND MAGNETISM:** potentiometer – principle – measurement of thermo emf using potentiometer –magnetic field due to a current carrying conductor – Biot-Savart's law – field along the axis of the coil carrying current – peak, average and RMS values of ac current and voltage – power factor and current values in an AC circuit

	– types of switches in household and factories– Smart wifi switches- fuses and circuit breakers in houses
UNIT-V	**DIGITAL ELECTRONICS AND DIGITAL INDIA:** logic gates, OR, AND, NOT, NAND, NOR , EXOR logic gates – universal building blocks – Boolean algebra – De Morgan's theorem – verification – overview of Government initiatives: software technological parks under MeitY, NIELIT- semiconductor laboratories under Dept. of Space – an introduction to Digital India
UNIT-VI	**PROFESSIONAL COMPONENTS:** Expert lectures –seminars — webinars – industry inputs – social accountability – patriotism
TEXT BOOKS	1. R.Murugesan (2001), Allied Physics, S. Chand and Co, New Delhi. 2. Brijlal and N.Subramanyam (1994), Waves and Oscillations, Vikas Publishing House, NewDelhi. 3. Brijlal and N.Subramaniam (1994), Properties of Matter, S.Chand and Co., New Delhi. 4. J.B.Rajam and C.L.Arora (1976). Heat and Thermodynamics (8th edition), S.Chand and Co., New Delhi. 5. R.Murugesan(2005), Optics and Spectroscopy, S.Chand and Co, NewDelhi. 6. A.Subramaniyam, Applied Electronics 2nd Edn., National Publishing Co., Chennai.
REFERENCE BOOKS	1. Resnick Halliday and Walker (2018). Fundamentals of Physics (11thedition), John Willey and Sons, Asia Pvt. Ltd., Singapore. 2. V.R.Khanna and R.S.Bedi (1998), Text book of Sound 1stEdn. Kedharnaath Publish and Co, Meerut. 3. N.S.Khare and S.S.Srivastava (1983), Electricity and Magnetism 10thEdn., AtmaRam and Sons, New Delhi. 4. D.R.Khanna and H.R. Gulati(1979). Optics, S. Chand and Co. Ltd., New Delhi. **5.** V.K.Metha (2004). Principles of electronics 6thEdn. S.Chand and company.
WEB RESOURCES	1. https://youtu.be/M_5KYncYNyc 2. https://youtu.be/ljJLJgIvaHY 3. https://youtu.be/7mGqd9HQ_AU 4. https://youtu.be/h5jOAw57OXM 5. https://learningtechnologyofficial.com/category/fluid-mechanics-lab/ 6. http://hyperphysics.phy-

	astr.gsu.edu/hbase/permot2.htmlhttps://www.youtube.com/watch?v=gT8Nth9NWPMhttps://www.youtube.com/watch?v=9mXOMzUruMQandt=1shttps://www.youtube.com/watch?v=m4u-SuaSu1sandt=3shttps://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work

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:

COURSE OUTCOMES	**CO1**	Explain types of motion and extend their knowledge in the study of various dynamic motions analyze and demonstrate mathematically. Relate theory with practical applications in medical field.
	CO2	Explain their knowledge of understanding about materials and their behaviors and apply it to various situations in laboratory and real life. Connect droplet theory with Corona transmission.
	CO3	Comprehend basic concept of thermodynamics concept of entropy and associated theorems able to interpret the process of flow temperature physics in the back ground of growth of this technology.
	CO4	Articulate the knowledge about electric current resistance, capacitance in terms of potential electric field and electric correlate the connection between electric field and magnetic field and analyze them mathematically verify circuits and apply the concepts to construct circuits and study them.
	CO5	Interpret the real life solutions using AND, OR, NOT basic logic gates and intend their ideas to universal building blocks. Infer operations using Boolean algebra and acquire elementary ideas of IC circuits. Acquire information about various Govt. programs/ institutions in this field.

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MAPPING WITH PROGRAM OUT COMES:

Map course outcomes **(CO)** for each course with program outcomes **(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	S	S	S	S	S	S	S	S
CO2	M	S	S	S	M	S	S	S	S	M
CO3	M	S	S	S	S	M	S	S	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	M	S	S	S	S	S	S	S	S	S

COURSE	**ODD SEMESTER - CORE** **Code: 224E31**
COURSETITLE	**ELECTIVE PHYSICS PRACTICAL– I**
CREDITS	**1**
COURSE OBJECTIVES	Apply various physics concepts to understand Properties of Matter and waves, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results

Minimum of Eight Experiments from the list:

1. Young's modulus by non-uniform bending using pin and microscope
2. Young's modulus by non-uniform bending using optic lever, scale and telescope
3. Rigidity modulus by static torsion method.
4. Rigidity modulus by torsional oscillations without mass
5. Surface tension and interfacial Surface tension – drop weight method
6. Comparison of viscosities of two liquids – burette method
7. Specific heat capacity of a liquid – half time correction
8. Verification of laws of transverse vibrations using sonometer
9. Calibration of low range voltmeter using potentiometer
10. Determination of thermo emf using potentiometer
11. Verification of truth tables of basic logic gates using ICs
12. Verification of De Morgan's theorems using logic gate ICs.
13. Use of NAND as universal building block.

Note : Use of digital balance permitted

METHOD OF EVALUATION:

Continuous Internal Assessment	**End Semester Examination**	**Total**	**Grade**
40	**60**	**100**	