

UNIVERSITY OF MADRAS
B.Sc. DEGREE PROGRAMME IN MATHEMATICS
SYLLABUS WITH EFFECT FROM 2023-2024

COURSE	ELECTIVE PAPER
COURSE TITLE	ELECTIVE PHYSICS – I (134E1A)
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 – physiotherapy, ophthalmology – advantages of noninvasive surgery – ultrasonics in green chemistry.
UNIT-II	PROPERTIES OF MATTER: <i>Elasticity:</i> 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 <i>Viscosity:</i> streamline and turbulent motion – critical velocity – coefficient of viscosity – Poiseuille’s formula – comparison of viscosities – burette method, <i>Surface tension:</i> 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

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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	<ol style="list-style-type: none"> 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.Subramaniam, Applied Electronics 2nd Edn., National Publishing Co., Chennai.
REFERENCE BOOKS	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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=9mXOMzUruMQ&dt=1shttps://www.youtube.com/watch?v=m4u-SuaSu1sandt=3shttps://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work

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COURSE /Code	ODD SEMESTER - CORE Code: 134E11
COURSE TITLE	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
<p>Minimum of Eight Experiments from the list:</p> <ol style="list-style-type: none"> 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. <p><i>Note</i> : Use of digital balance permitted</p>	

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
40	60	100	