UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN PHYSICS

SYLLABUS WITH EFFECT FROM 2023-2024

337C5C

COURSE	**FIFTH SEMESTER – CORE COURSE – VII**
COURSETITLE	**ELECTRICITY AND MAGNETISM**
CREDITS	**4**
COURSE OBJECTIVES	To acquire in-depth knowledge of measuring instruments involving electric and magnetic fields.To study various magnetic properties of materials and their applications. To give an idea of the fundamentals of electromagnetic induction and alternating currents.On the successful completion of the course, students will be able to recognize basic principles and applications of electrometers.Effectively formulate the electrical circuit problem into a mathematical problem using circuits, laws and theorems.

UNITS	COURSE DETAILS
UNIT-I	**CAPACITORS AND ELECTROMETERS:** Spherical Capacitors - Cylindrical capacitors– Parallel plate capacitor – Effect of dielectric - the force of attraction between plates of a charged parallel plate capacitor – Guard Ring capacitor – Mica capacitor – uses of capacitors - Quadrant electrometer – measurement of potential, ionization current and dielectric constant.
UNIT-II	**ELECTRICAL MEASUREMENTS AND THERMOELECTRICITY:** Carey–Foster Bridge – theory – temperature coefficient of resistance –potentiometer – calibration of ammeter and high range voltmeter – thermoelectricity – laws of thermoe.m.f.– measurement of thermoe.m.f. using potentiometer–Peltier effect and Peltier coefficient – Thomson effect and Thomson coefficient – relation between π and σ – thermoelectric diagrams and their uses.
UNIT-III	**MAGNETIC PROPERTIES OF MATERIALS:** Relation between three magnetic vectors B, H and M- Intensity of magnetization - Susceptibility – Permeability – Properties, Electron theory and Langevin's theory of dia, para and ferromagnetic materials - magnetic hysteresis – Experiment to draw B-H curve – Ballistic method – Energy loss - determination of susceptibility: Gouy's method.
UNIT-IV	**ELECTROMAGNETIC INDUCTION:** Magnetic induction due to a straight conductor carrying current – Moving coil ballistic galvanometer – damping correction –absolute capacity of a condenser using B.G – Ampere's circuital Law-Faradays Laws of electromagnetic induction – vector form - self – inductance by Anderson's Bridge method – Mutual inductance – Experimental determination - coefficient of coupling

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UNIT-V	**ALTERNATING CURRENT:** Peak, average and RMS value of current and voltage– form factor – ac circuit containing resistance and inductance – ac circuit containing resistance and capacitance – series and parallel resonance circuits –Q factor – power in an ac circuit containing LCR – Wattless current – choke coil - Transformer – construction, theory and uses – energy loss – skin effect.
TEXT BOOKS	1. Brij Lal and Subrahmanyam, Electricity and Magnetism, S. Chand & Co, New Delhi (2016) 2. R. Murugesan, Electricity and Magnetism, S. Chand & Co, New Delhi(2016)
REFERENCE BOOKS	1. D. N. Vasudeva, Electricity and Magnetism, S. Chand & Co, New Delhi(2016) 2. K. K. Tewari, Electricity and Magnetism, S. Chand & Co, New Delhi (2016) 3. Fundamentals of Electricity and Magnetism – B.D.Duggal and C.L. Chhabra, Vishal Publishing Co(2004)
WEBLINKS	1. https://www.askiitians.com/revision-notes/physics/current-electricity.html 2. https://www.askiitians.com/revision-notes/physics/electromagnetic-induction-and-alternating- current/

COURSE OUTCOMES:

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

COURSE OUTCOMES	**CO1**	Define And Derive The Laws Of Electricity And Magnetism
	CO2	Update The Knowledge Of Properties And Magnetism
	CO3	Expertise The Skills To Manufacture Devices
	CO4	Understand The Properties Of Electric And Magnetic Materials
	CO5	Acquire Experimental Skills To Construct Technically Useful Devices.

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes**(CO)**for each course with program outcomes**(PO)** inthe3- point scale of STRONG(**S**),MEDIUM(**M**) andLOW(**L**).

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