Lecture Plan

Name of the college: Government College of Arts, Science and Commerce, Sanquelim – Goa.

Name of Faculty: Ms. Anushka Panjikar	**Subject:** Physics	
Paper code: PHY-304 : Electromagnetic Theory	**Program:** TY BSc	**Division: -**
Academic year: 2025- 2026	**Semester: VI**	**Total Lectures: 60T**

Course Objectives: This course covers a comprehensive range of topics in electromagnetism, providing students with a solid understanding of the principles and applications in this field.

Expected Course Outcome: Student will be able to 1. Understand the fundamental principles of electrostatics. 2. Develop problem-solving skills for various electrostatic scenarios. 3. Understand the macroscopic and microscopic response of materials to electric fields. 4. Calculate work done in various electrostatic scenarios and Analyse the behaviour of magnetic fields in different materials and Familiarize with Maxwell's equations & their significance.

Student Learning Outcome: By the end of this course, students will be able to understand and apply the fundamental principles of electrostatics and magnetism, analyze material responses to electric and magnetic fields, solve related problems including calculating electrostatic work, and appreciate the significance of Maxwell's equations.

Month	Lecture From	Lecture To	No. of lectures allotted	Topic, Subtopic to be covered	Exercise/ Assignment	ICT Tools	Reference books
DECEMBER	01-12-25	06-12-25	1L	**Introduction**			
DECEMBER	08/12/25	13/12/25	3L	1. Coulomb's law, Electric field 2. electrostatic potential, Continuous Charge distribution, field lines, flux 3. Gauss' law with applications	Group discussion	Powerpoint presentation	Reitz, Milford, Christy, Foundations of Electromagnetic Theory
DECEMBER	15/12/25	23/12/25	2L	TARANG	Group discussion	Powerpoint presentation	Reitz, Milford, Christy, Foundations

				1. the electric dipole-field and potential. 2. The electrostatic potential, Poisson's equation, Laplace's equation, Laplace's equation in one independent variable			of Electromagnetic Theory
DECEMBER	24/12/25	01/01/26	0	CHRISTMAS VACATION			
JANUARY	02/01/26	03/01/26	2L	1. solutions to Laplace's equation in spherical co-ordinates (zonal harmonics)			

				2. conducting sphere in a uniform electric field			
JANUARY	05/01/26	10/01/26	1L	1. Polarization, Fields outside a dielectric medium, electric field inside a dielectric	Group discussion	Powerpoint presentation	Reitz, Milford, Christy, Foundations of Electromagnetic Theory
JAN	12/01/26	17/01/26	4L	1. **ISA 1** 2. Gauss's law in a dielectric, the electric displacement vector, electric susceptibility, dielectric constant and their constitutive relations.	Group discussion	Powerpoint presentation	Reitz, Milford, Christy, Foundations of Electromagnetic Theory

				3. Boundary conditions on the field vectors 4. Dielectric sphere in a uniform electric field.			
JAN	19/01/26	24/01/26	4L	1. Molecular field in a dielectric, induced dipoles, A simple model, polar molecules 2. Langevin- Debye formula 3. permanent polarization, ferroelectricity. 4. Work and Potential energy of discrete and continuous charge distributions,	MCQ Quiz	Powerpoint presentation	Reitz, Milford, Christy, Foundations of Electromagnetic Theory
JAN	26/01/26	31/01/26	3L	1. Energy density of an electric field. 2. Steady currents, current density, Biot-Savart's law and its applications,	MCQ Quiz	Powerpoint presentation	Reitz, Milford, Christy, Foundations of Electromagnetic Theory

				3. Ampere's circuital law, magnetic vector potential,			
FEB	2/02/26	7/02/26	4L	1. magnetic field of a distant circuit 2. magnetic dipoles, dipole moment and the field of a point magnetic dipole, 3. magnetic scalar potential. **4.** Magnetization, magnetic field produced by magnetized material, magnetic pole density,	MCQ Quiz	Powerpoint presentation	Reitz, Milford, Christy, Foundations of Electromagnetic Theory
FEB	09/02/26	14/02/26	4L	**1. ISA 2 – WRITTEN TEST** 2. sources of the magnetic field, magnetic intensity H (Auxiliary magnetic field),	MCQ Quiz	Powerpoint presentation	Reitz, Milford, Christy, Foundations of Electromagnetic Theory

				The field equations, magnetic susceptibility and permeability, Hysteresis 3. Boundary conditions on B and H vectors 4. Magnetic circuits			
FEB	16/02/26	21/02/26	4L	1. Molecular field inside matter, Brief discussion on different classes of magnetic materials 2. Ferromagnetic domains 3. Magnetic energy of coupled circuits **4.** Energy density in the magnetic field, Hysteresis Loss.	MCQ Quiz	Powerpoint presentation	Reitz, Milford, Christy, Foundations of Electromagnetic Theory
FEB	23/02/26	28/02/26	4L	1. Faraday's Law of electromagnetic induction	MCQ Quiz	Powerpoint presentation	Reitz, Milford, Christy, Foundations

				2. Generalization of Ampere's Law-Displacement current 3. Maxwell's equations and their empirical basis, 4. Electromagnetic energy-Poyntings theorem.			of Electromagnetic Theory
MARCH	2/03/26	7/03/26	4L	1. General equation of plane electromagnetic waves. **REVISION**	MCQ Quiz	Powerpoint presentation	Reitz, Milford, Christy, Foundations of Electromagnetic Theory
MARCH	9/03/26	14/03/26	4L	**1. ISA 3 – WRITTEN TEST**	MCQ Quiz	Powerpoint presentation	Reitz, Milford, Christy, Foundations of Electromagnetic Theory

MARCH	16/03/26	21/03/26	4L	**REVISION**	MCQ Quiz	Powerpoint presentation	Reitz, Milford, Christy, Foundations of Electromagnetic Theory
MARCH	23/03/26	31/03/26	5L	1. Revision 2. REVISION 3. REVISION 4. REVISION	Test		

				5. REVISION			

Assessment Rubrics

Component	Max Marks
ISA 1 Assignment	10
ISA 2 Written Test	10
ISA 3 Written Test	10
Practical	NA
Semester End Exam	80