BSP302T					Electricity and magnetism					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
4	0	0	4	4	25	50	25	--	--	100

COURSE OBJECTIVES

- To provide the basic understanding of vector calculus and its application in electricity and magnetism
- To develop understanding and to provide comprehensive knowledge in the field of electricity and magnetism.
- To develop the concepts of electromagnetic induction and related phenomena
- To introduce the Maxwell's equations and understand its significance

UNIT 1 REVIEW OF VECTOR CALCULUS **8 Hrs.**

Properties of vectors, Introduction to gradient, divergence, curl, Laplacian, Introduction to spherical polar and cylindrical coordinates, Stokes' theorem and Gauss divergence theorem, Problem solving.

UNIT 2 ELECTRICITY **14 Hrs.**

Coulomb's law and principle of superposition. Gauss's law and its applications. Electric potential and electrostatic energy Poisson's and Laplace's equations with simple examples, uniqueness theorem, boundary value problems, Properties of conductors, method of images Dielectrics- Polarization and bound charges, Displacement vector Lorentz force law (cycloidal motion in an electric and magnetic field).

UNIT 3 MAGNETISM **16 Hrs.**

Magnetostatics- Biot & Savart's law, Amperes law. Divergence and curl of magnetic field, Vector potential and concept of gauge, Calculation of vector potential for a finite straight conductor, infinite wire and for a uniform magnetic field, Magnetism in matter, volume and surface currents, Field H, classification of magnetic materials Faraday's law in integral and differential form.

UNIT 4 ELECTROMAGNETIC INDUCTION AND MAXWELL'S EQUATIONS **18 Hrs.**

Laws of electromagnetic induction, self-inductance and its calculation for a long solenoid and two long parallel wires, mutual inductance, Neumann's formula, calculation of mutual inductance for two solenoids, relation between self and mutual inductances in case of a toroid, idea of displacement current and Maxwell's modification of Ampere's law, Maxwell's equations and their significance, propagation of electromagnetic waves in free space and isotropic non-conducting dielectric medium, Poynting vector and Poynting's theorem.

Max. <56> Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Acquire basic knowledge about vectors and its applications

CO2 - Understand and learn the laws of electricity and magnetism

CO3 - Explain the physical significance of the concepts and laws of electricity and magnetism

CO4 - Describe the electromagnetic induction and related concepts, and make calculations using Faraday and Lenz's laws

CO5 - Correlate the concepts learned so far with the Maxwell's equations

CO6 - Develop the skills in solving various real world problems in electricity and magnetism.

TEXT/REFERENCE BOOKS

1. Halliday, Resnick, Walker, Fundamentals of Physics (Wiley)
2. Griffiths, David J. Introduction to Electrodynamics. 3rd ed. Upper Saddle River, NJ: Prentice Hall, 1998. ISBN: 9780138053260.
3. Purcell, Edward M. "Electricity and Magnetism." In Berkeley Physics Course. 2nd ed. Vol. 2. New York, NY: McGraw-Hill, 1984. ISBN: 9780070049086.
4. Feynman, Richard P., Robert B. Leighton, and Matthew Sands. The Feynman Lectures on Physics. 2nd ed. Vol. 2. Reading, MA: Addison-Wesley, 2005. ISBN: 9780805390452.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A/Question: 3 Questions from each unit, each carrying 3 marks 36 Marks

Part B/Question: 2 Questions from each unit, each carrying 8 marks 64 Marks