Pandit Deendayal Petroleum University **School of Liberal Studies**

16BSP504					Electromagnetic Theory					
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

- **T**o introduce various co-ordinate system and review of Maxwell's equations.
- To familiarize the students about the electric field in material space and learn to solve boundary value problems
- To expose the students to various concepts and properties of magneto-static field
- To identify, formulate and solve fields and electromagnetic waves propagation problems.

UNIT 1 Review of Vector Calculus	**14 Hrs.**
Various co-ordinate system: Cartesian, Cylindrical, Spherical; Divergence, gradient and curl of the vector field in various co-ordinate system, divergence and stoke's theorem, Flux lines and flux density, Gauss's law, Displacement current density, Generalized Ampere's law, Review of Maxwell's equations, Energy Density in electrostatic field.	
UNIT 2 Electric field in material space and boundary value problems	**14 Hrs.**
Properties of materials, Convection and conduction current, Polarization in dielectrics, dielectric constant and strength, continuity equation and relaxation time, boundary conditions, Poisson's and Laplace's equation, Uniqueness Theorem, Method of Images.	
UNIT 3 Magneto-static fields	**10 Hrs.**
Biot-Savart's law, Ampere's law and its applications in 3 co-ordinate system, Magnetic flux density, Magnetic dipole, magnetization in materials, Magnetic boundary conditions, Inductors and inductance, Magnetic energy, Magnetic circuits. Application –magnetic levitation.	
UNIT 4 EM wave propagation and waveguides	**12 Hrs.**
Plane waves in free space-good conductors, lossless dielectrics, power and the Poynting Vector, Reflection of plane wave at normal incidence and Oblique Incidence, Application – microwaves, Introduction to wave guides, TM and TE modes, Wave propagation in the guide, wave guide resonators, Optical fibre.	
Max. 50 Hrs	

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - define and recognize different co-ordinate systems and techniques of vector calculus to understand different concepts of electromagnetic field theory

CO2 - explain fundamental laws governing electromagnetic fields and evaluate the physical quantities of EM fields in different media using the fundamental laws.

CO3- demonstrate an ability to solve various boundary value problems dealing with real world problems.

CO4 - design electromagnetic energy storage devices and choose suitable materials required to assemble such storage devices.

CO5 – deduce and justify the concepts of electromagnetic waves, means of transporting energy or information, in the form of radio waves, TV signals etc.

CO6 - solve the numerical based on the various concepts of electromagnetic field theory.

TEXT/REFERENCE BOOKS

1. Berkeley Series Vol II (Electricity and Magnetism) E.M. Purcell (Tata McGraw-Hill).
2. Electromagnetics by B B laud, new age international (P) Ltd.
3. Electricity and Magnetism, Edward M. Purcell, 1986 McGraw-Hill Education.
4. Elements of electromagnetics, Mathew N. O. Sadiku, Oxford University Press.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

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

Part A/Question: <Details> **<> Marks**

Part B/Question: <Details> **<> Marks**