

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Electronics and Telecommunication)			
Subject Code & Name	Instructions Hours per Week			Credits			
ETR5C3 EMF AND TRANSMISSION LINE	L	T	P	L	T	P	Total
Duration of Theory Paper: 3 Hours	3	1	2	3	1	1	5

Learning Objectives:

- 1) To analyze field potentials due to static charges
- 2) To evaluate static magnetic fields
- 3) To understand how materials affect electric and magnetic fields
- 4) To understand the relation between the fields under time varying situations
- 5) To understand principles of propagation of uniform plane waves.
- 6) To understand principles of Transmission Lines

Prerequisites: Matrix and Vector Algebra

COURSE CONTENTS

Unit I

Vector Analysis: General Treatment on Cartesian, cylindrical, spherical and general curvilinear co-ordinate systems with reference to vectors, operation of Gradient, Divergence, Curl, Laplacian, Gauss's Divergence theorem, Stoke's theorem.

Unit II

Electrostatics: Review of electric field quantities and their definitions. Gauss's flux theorem, Poisson's equation and Laplace equation, Uniqueness theorem, Green's theorem, Coulomb's law, dipole moment. Electrostatic field in dielectric: polarization, electric flux density, boundary conditions, capacitor and capacitance, electrostatic shielding, energy stored in electric fields.

Unit III

Magnetic Fields and Electromagnetic Induction: Magnetic flux and flux density, static currents in conducting media, Ampere's circuital law, Biot-Savart law, boundary conditions between magnetic media, magnetic force, magnetic potential, magnetic force and torque, Lorentz force on straight and long current carrying conductors in magnetic field, magnetic force between two long and parallel current carrying conductors, Magnetic dipole and dipole moment, energy stored in magnetic field. Faraday's law for induction (transformer and motion), inductor and inductance (self and mutual).

Unit IV

Maxwell's Equations & Electromagnetic Waves: Maxwell's equations, equation of continuity displacement current, Maxwell's equation in point and integral forms, time-varying potentials, wave equations, uniform plane waves in dielectrics and conductors, power loss in a plane conductor, energy storage, Sinusoidally time varying uniform plane wave in free space & conductors, Poynting's vector theorem.

Unit V

Transmission Lines : Introduction of transmission line, line equations, equivalent circuit , line impedance, input impedance, measurement of secondary constants, line sections, reflection coefficient , SWR and power, Smith chart and its applications, some applications of transmission lines.

Learning Outcomes:

Upon completing the Course Student will able:

To familiarize the student to the concepts, calculations and pertaining to electric, magnetic and electromagnetic fields & Transmission Line so that an in depth understanding of antennas, electronic devices, Waveguides is possible.

BOOKS RECOMMENDED:

- [1]. Engineering Electromagnetics, William H. Hayt; Mc-Graw Hill.
- [2]. Theory and Problems of Electromagnetics, Joseph A. Edminister; McGraw Hill.
- [3]. Element of electromagnetics Electromagnetic, Mathew N.O Sadiku, Oxford University Press.
- [4]. Elements of Engineering Electromagnetics, N. Rao, Prentice Hall.
- [5]. Electromagnetics for Engineers, Fawwaz T. Ulaby, Pearson Education.

List of Practical Assignments:

- [1]. To Study Vector Analysis with Matlab.
- [2]. To Study the Surface and Volume Integrals with Matlab.
- [3]. To study E Field of Linear Charge with Matlab.
- [4]. To Study E Field of Surface Charge with Matlab.
- [5]. To Study Electric Flux Density with Matlab.
- [6]. To Study Electric Flux through a Surface with Matlab.
- [7]. To Study Magnetic Field of a Current Sheet with Matlab.
- [8]. Measuring the Characteristics of a line.
- [9]. Measuring the Attenuation of a line.
- [10]. Measuring the input Impedance of the line.
- [11]. Measuring Phase Displacement between the Current & Voltage at input of line.
- [12]. To Study Stationary Waves.