INTRODUCTION TO ELECTROMAGNETIC THEORY

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TYPE OF COURSE : Rerun | Core | UG
COURSE DURATION : 8 weeks (29 Jul'19 - 20 Sep'19)
EXAM DATE : 29 Sep 2019

INTENDED AUDIENCE : 1st & 2nd year B. Tech. in Civil, Mechanical, Aeorospace and B.Sc. Students.

COURSE OUTLINE :

This course introduces students to handling electromagnetic theory using vector calculus. This enables students to handle problems that are more complicated than they are used to from their school days. Due to general nature of the mathematics they learn in this course, what they learn here will help them in their future courses like fluid dynamics that use similar mathematics.

ABOUT INSTRUCTOR :

Dr. Manoj Kumar Harbola joined the Department in 2000. He obtained his doctoral degree at the City University of New York, USA, working under the supervision of Prof. Viraht Sahni. Subsequently he carried out postdoctoral research at the University of North Carolina, Chapel Hill, USA before joining the Centre for Advanced Technology, Indore as a Scientist. He is a theoretical physicist , whose chief interest lies in Electronic Structure of Atoms, Molecules and Solids using Density Functional Methods.

COURSE PLAN :

Week 01 : Coulomb's law Divergence of electric field Gauss' law Curl of electric field Stokes' theorem Electrostatic potential.

Week 02 : Laplace's equation for electrostatic potential Laplace's equation in other fields Uniqueness of solution of Laplace's equation Poisson equation and uniqueness of its solution Method of images for planar surfaces Work and energy in electrostatics.

Week 03 : Conductors and capacitors Reciprocity theorem Polarization and bound charges Linear dielectrics Electric displacement Fields in dielectrics .

Week 04 : Magnetic field due to a magnet Magnetic field due to a steady current Divergence and curl of magnetic field Ampere's law The vector potential Magnetization and bound currents.

Week 05 : Magnetic fields in matter Magnetic field in matter Faraday's law Induced electric field Energy in magnetic field Displacement current.

Week 06 : Maxwell's equations Work done by electromagnetic field Poynting's theorem Momentum in electromagnetic field Angular momentum in electromagnetic field Electromagnetic waves: the wave equation.

Week 07 : Wave equation Plane electromagnetic waves Energy carried by electromagnetic waves Pressure due to electromagnetic waves Reflection and transmission of electromagnetic waves Reflection and transmission of electromagnetic waves.

Week 08 : Review and Problem Solving.