

BPE610

Computational Electromagnetics

3L:0T:0P

3 credits

Course Outcomes:

At the end of this course, students will demonstrate the ability to

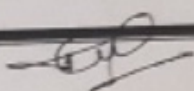
- Understand the basic concepts of electromagnetics.
- Understand computational techniques for computing fields.
- Apply the techniques to simple real-life problems.

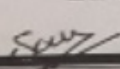
Module 1: Introduction (6 hours)

Conventional design methodology, Computer aided design aspects – Advantages. Review of basic fundamentals of Electrostatics and Electromagnetics. Development of Helmholtz equation, energy transformer vectors- Poynting and Slepian, magnetic Diffusion-transients and time-harmonic.

Invertis University, Bareilly

Effective from session 2020-21


Head of Department
Department of ECE/EE
Invertis University
Bareilly-243123, UP


Dean
Faculty of Engineering & Technology
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Module 2: Analytical Methods (6 hours)

Analytical methods of solving field equations, method of separation of variables, Roth's method, integral methods- Green's function, method of images.

Module 3: Finite Difference Method (FDM) (7 hours)

Finite Difference schemes, treatment of irregular boundaries, accuracy and stability of FD solutions, Finite-Difference Time-Domain (FDTD) method- Uniqueness and convergence.

Module 4: Finite Element Method (FEM) (7 hours)

Overview of FEM, Variational and Galerkin Methods, shape functions, lower and higher order elements, vector elements, 2D and 3D finite elements, efficient finite element computations.

Module 5: Special Topics(7 hours)

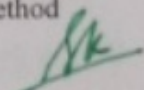
{Background of experimental methods-electrolytic tank, R-C network solution, Field plotting (graphical method)}, hybrid methods, coupled circuit - field computations, electromagnetic - thermal and electromagnetic - structural coupled computations, solution of equations, method of moments, Poisson's fields.

Module 6: Applications (7 hours)

Low frequency electrical devices, static / time-harmonic / transient problems in transformers, rotating machines, actuators. CAD packages.

Text/Reference Books

1. P. P. Silvester and R. L. Ferrari " Finite Element for Electrical Engineers" , Cambridge University press, 1996.
2. M. N. O. Sadiku, " Numerical Techniques in Electromagnetics", CRC press, 2001.


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