Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NECD534	Numerical Methods in Electromagnetics	3	0	0	3

Course Objective

To familiarize the students with the basic as well as advanced numerical and analytical techniques in electromagnetics for different boundary value problem with respect to real time situation. The course prepares PG students where the advance topics like spectral domain, finite difference time domain, mode matching, method of separation variable, etc. will be covered, particularly those including an in-depth description.

Learning Outcomes

By the end of the course, the students should be able

- to solve challenging boundary value problems involving planer and 3D antennas, filter and other waveguide problems.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Maxwell's Equation, Circuit field relations, Boundary conditions, Power & Energy and Time harmonic electromagnetic fields, Classification of EM Problems and Some Important Theorem etc	7	Students will be able to understand and solve the maxwell's equations and electromagnetic fields.
2	Wave equation and solution, Auxiliary vector potential, Construction of solution, Solution of inhomogeneous vector potential wave equations, Mode Matching Techniques for waveguide structure and solution construction, method of separation variable methods.	12	Students will be able to understand and solve the wave equations
3	Spectral Domain Methods, Mesh generation in Rectangular and Arbitrary Domain, Transmission Line Matrix method, Method of Line: Solution to Laplace Equation, Wave Equation and Time Domain Solution.	8	Students will be ale to understand and solve the spectral domain methods and its applications.
4	Variational Method: Construction of Functional from PDEs, Rayleigh Ritz Method, Weighted Residual Method, Eigen Value Problems and Practical Applications. Application to Study Open Ended Waveguide Problem. Moment Method, Finite Element Method: Solution to Poisson, Laplace and Wave Equation.	7	Students will be able to understand and solve the different variational methods and its application
5	Finite Difference Method: Finite Difference Schemes, Differencing of Parabolic, Hyperbolic and Elliptic PDEs, Accuracy and Stability in PD, Application in Guided Structure, Wave Scattering (FDTD), Absorbing Boundary Conditions, Finite Differencing for Non-Rectangular System.	8	
	Total	42	

Text Books:

1. C. A. Balanis, 'Advanced Engineering Electromagnetics', Jhon Wiley & Sons, USA.
2. R. F. Harrington., 'Time Harmonic Electromagnetics Field', Jhon Wiley & Sons and IEEE, USA.

Reference Books:

1. Matthew N.O. Sadiku, 'Numerical Techniques in Electromagnetics, 3e, 2009, A&M University, Texas, USA
2. Journal Papers of IEEE Trans. on Antenna and Propagation & IEEE Transaction on Microwave Theory and Techniques.