

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Electrical Engineering - NOC:Computational Electromagnetics

Subject Co-ordinator - Prof. Uday Khankhoje

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Chain rule of differentiation  
Lecture 2 - Gradient, Divergence, and Curl operators  
Lecture 3 - Common theorems in vector calculus  
Lecture 4 - Corollaries of these theorems  
Lecture 5 - Mathematical History  
Lecture 6 - Different regimes of Maxwell's equations  
Lecture 7 - Different ways of solving them  
Lecture 8 - Maxwell's Equations  
Lecture 9 - Boundary Conditions  
Lecture 10 - Uniqueness Theorem  
Lecture 11 - Equivalence Theorem  
Lecture 12 - Simple Numerical Integration  
Lecture 13 - Interpolating a Function  
Lecture 14 - Gauss Quadrature  
Lecture 15 - Line Charge Problem  
Lecture 16 - Solving the Integral Equation  
Lecture 17 - Basis Functions  
Lecture 18 - Helmholtz Equation  
Lecture 19 - Solving Helmholtz Equation  
Lecture 20 - Huygen's principle and the Extinction theorem  
Lecture 21 - Formulating the integral equations  
Lecture 22 - Conclusions of surface integral equations  
Lecture 23 - Motivations for Green's functions  
Lecture 24 - A one-dimensional example  
Lecture 25 - 1-D example  
Lecture 26 - 2-D wave example  
Lecture 27 - 2-D wave example  
Lecture 28 - 2-D example  
Lecture 29 - 2-D example

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- Lecture 30 - 3-D example
- Lecture 31 - Motivation for MoM
- Lecture 32 - Linear Vector Spaces
- Lecture 33 - Formulating Method of Moments
- Lecture 34 - Surface Integral Equations
- Lecture 35 - Surface Integral Equations
- Lecture 36 - Surface Integral Equations
- Lecture 37 - Surface Integral Equations
- Lecture 38 - Volume Integral Equations
- Lecture 39 - Volume Integral Equations
- Lecture 40 - Volume Integral Equations
- Lecture 41 - Volume Integral Equations
- Lecture 42 - Surface integral equations for PEC
- Lecture 43 - Surface v/s volume integral equations
- Lecture 44 - Definition of radar cross-section
- Lecture 45 - Computational Considerations
- Lecture 46 - History and Overview of the FEM
- Lecture 47 - Basic framework of FEM
- Lecture 48 - 1D Basis Functions
- Lecture 49 - 2D Basis Functions
- Lecture 50 - Weak form of 1D-FEM - Part 1
- Lecture 51 - Weak form of 1D-FEM - Part 2
- Lecture 52 - Generating System of Equations for 1D FEM
- Lecture 53 - 1D wave equation
- Lecture 54 - 1D Wave Equation
- Lecture 55 - 1D Wave Equation
- Lecture 56 - 1D Wave Equation
- Lecture 57 - 2D FEM Shape Functions
- Lecture 58 - Converting to Weak Form (2D FEM)
- Lecture 59 - Radiation Boundary Condition
- Lecture 60 - Total field formulation
- Lecture 61 - Scattered field formulation
- Lecture 62 - Comparing total and scattered field formulation
- Lecture 63 - Matrix assembly - Part 1
- Lecture 64 - Matrix assembly - Part 2
- Lecture 65 - Computing Far Field
- Lecture 66 - Numerical Aspects of 2D FEM
- Lecture 67 - Summary of FEM Procedure
- Lecture 68 - Introduction to FDTD

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Lecture 69 - 2D FDTD Formulation  
Lecture 70 - 2D FDTD Formulation  
Lecture 71 - 2D FDTD Formulation  
Lecture 72 - Stability Criteria - Part 1  
Lecture 73 - Stability Criteria - Part 2  
Lecture 74 - Stability Criteria - Higher Dimensions  
Lecture 75 - Accuracy Considerations - 1D  
Lecture 76 - Accuracy Considerations - Higher Dimensions  
Lecture 77 - Dealing with non-dispersive dielectric media  
Lecture 78 - Dealing with dispersive dielectric media  
Lecture 79 - Debye Model - Part 1  
Lecture 80 - Debye Model - Part 2  
Lecture 81 - Absorbing Boundary Conditions - 1D  
Lecture 82 - Absorbing Boundary Conditions - 2D  
Lecture 83 - Implementing ABC in FDTD  
Lecture 84 - Failure of ABC  
Lecture 85 - Perfectly Matched Layers (PML) - Introduction  
Lecture 86 - Implementing PML using Coordinate Stretching  
Lecture 87 - PML - Phase Matching  
Lecture 88 - PML - Tangential Boundary Conditions  
Lecture 89 - Perfectly Matched Interface  
Lecture 90 - PML theory - Summary  
Lecture 91 - Implementing PML into FDTD - Part 1  
Lecture 92 - Implementing PML into FDTD - Part 2  
Lecture 93 - Sources in FDTD - Currents  
Lecture 94 - Sources in FDTD - Part 2  
Lecture 95 - Summary of FDTD  
Lecture 96 - MEEP  
Lecture 97 - Inverse Problems - Introduction  
Lecture 98 - Inverse Problems - Mathematical Formulation  
Lecture 99 - Inverse Problems - Challenges  
Lecture 100 - Inverse Problems - Non-Linearity  
Lecture 101 - Inverse Problems - Summary  
Lecture 102 - Antennas - Potential formulation  
Lecture 103 - Antennas - Hertz Dipole - Part 1  
Lecture 104 - Antennas - Hertz Dipole - Part 2  
Lecture 105 - Antennas - Radiation Patterns  
Lecture 106 - Antennas - Motivation for CEM  
Lecture 107 - Antennas - Pocklington's Integral Equation - Part 1

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- Lecture 108 - Antennas - Pocklington's Integral Equation - Part 2
- Lecture 109 - Antennas - Source Modeling
- Lecture 110 - Antennas - Circuit Model
- Lecture 111 - Antennas - MoM details
- Lecture 112 - Antennas - Mutual Coupling - Part 1
- Lecture 113 - Antennas - Mutual Coupling - Part 2
- Lecture 114 - Hybrid Methods - Motivation
- Lecture 115 - Finite Element-Boundary Integral - Part 1
- Lecture 116 - Finite Element-Boundary Integral - Part 2
- Lecture 117 - Finite Element-Boundary Integral - Part 3