EE 277, Computational Electromagnetics

Fall 2001
Prerequisite: EE 170
Text: Computational Methods for Electromagnetics, by A. F. Peterson, S. L. Ray and R. Mittra
Time: TTh, 2:15 - 3:30 PM
Place: Engineering 232
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Grading

Homework and small projects 30%
Computer Project I - 20%
Computer Project II - 20%
Final Project and Presentation - 30%

Other Useful Texts

3. “Computational Electrodynamics,” A. Taflove
EE 277 Course Outline

1. Electromagnetic Theory — Chapter 1
   (a) Maxwell’s Equations in Time Domain — Chapter 10
   (b) Maxwell’s Equations in Frequency Domain
   (c) Integral Equations in Frequency Domain
   (d) Integral Equations in Time Domain

2. Numerical Methods in One Dimension — Class Notes
   (a) Finite-Difference Time Domain (FDTD) Method
   (b) Time-Domain Integral Equation Method
   (c) Finite-Element Method in Frequency Domain
   (d) Method of Moment for Integral Equations in Frequency Domain

3. Solution of Linear Algebraic Systems of Equations — Chapter 4
   (a) Gaussian Elimination
   (b) Krylov Methods
   (c) Sparse Systems
   (d) Computational Complexity Analysis

4. Surface Integral Equation Methods and Method of Moment (MoM)
   (a) 3-D surface integral equations — Chapter 10
   (b) 2-D surface integral equations — Chapter 2

5. Volume Integral Equation and Method of Moment (MoM)
   (a) 3-D volume integral equations — Chapter 10
   (b) 2-D volume integral equations — Chapter 2

6. Differential Equations and Finite Element Methods (FEM)
   (a) Scattering Problems (2D) — Chapter 3
(b) Scattering Problems (3D) — Chapter 11

7. **Time-Domain Differential Equation Methods**

(a) Taylor Series Expansion Derivation - Class Notes
(b) Finite-Difference Time-Domain Methods - Chapter 12
(c) Absorbing boundary conditions: Perfectly matched layer (PML) - Class Notes
(d) Fourier Pseudospectral Time-Domain Methods - Class Notes
(e) Chebyshev Pseudospectral Time-Domain Methods - Class Notes