

ECE 3323 – Electromagnetics II

Textbook: Fundamentals of Applied Electromagnetics, 2004 Media Ed., Fawwaz T. Ulaby

Detailed Course Outline

I. Waveguides and Cavity Resonators

- A. Waveguide Propagation
- B. Waveguide Modes
 - 1. Transverse Electric
 - 2. Transverse Magnetic
- C. Waveguide Mode Parameters
 - 1. Cutoff Frequency
 - 2. Field Distributions
 - 3. Intrinsic Impedance
 - 4. Group/Phase Velocity
- D. Cavity Resonators
 - 1. Modes
 - 2. Resonant Frequency

II. Fiber Optics

- A. Physics of Light Guiding
- B. Transmission and Attenuation
- C. Optical Fiber Types
 - 1. Single Mode
 - 2. Multimode
- D. Properties of Optical Fibers

III. Antennas

- A. Hertzian Dipole
- B. Radiation Resistance
- C. Antenna Patterns
- D. Dipoles, Monopoles, Loops
- E. Antenna Parameters
 - 1. Gain and Directivity
 - 2. Radiation Intensity
 - 3. Efficiency
 - 4. Effective Aperture
- F. Antenna Arrays
 - 1. Array Factor
 - 2. Array Multiplication Theorem
 - 3. Broadside/Endfire Arrays
- G. Friis Transmission Formula
- H. Radar Equation and Applications

IV. Electromagnetic Compatibility

- A. Introduction to EMC
- B. Coupling Mechanisms
 - 1. Conducted Coupling
 - 2. Electromagnetic Coupling
- C. Electromagnetic Effects in High Speed Digital Circuits
- D. Printed Circuit Board Design
- E. Crosstalk
- F. Shielding

V. Computational Electromagnetics and Analytical Methods

- A. Poisson's and Laplace's Equation Solutions
- B. Separation of Variables
- C. Method of Moments
- D. Finite Difference Techniques
- E. Finite Element Techniques