

ECMC1T1: Time-Harmonic Electromagnetic Fields

Unit I: Fundamental Concepts

Basic Equation(Maxwell's Equations), Constitutive Relationships, The Generalized current concept, Energy and Power, Circuit concepts (Circuit field relations) Complex quantities, Complex Equations, Complex Constitutive parameters, Complex Power, AC characteristics of Matter, AC Behavior of circuit elements, Singularities of field.

Unit II: Introduction to Waves-I

The wave Equation, Waves in Perfect Dielectrics, Intrinsic wave constants, Waves in Lossy matter, Reflection of waves, Transmission Line concepts.

Unit III: Introduction of Waves-II

Waveguide concepts, Resonator concepts, Radiation concepts, Antenna concepts, On Waves in general.

Unit-IV: Theorems and Concepts-I

The source concept, Duality, Uniqueness, Image Theory, The Equivalence principle(Volume Equivalence and Surface Equivalence), Fields in Half-space, Reciprocity, Induction Theorem.

Unit V: Theorems and Concepts-II

Reaction Theorem, Green's functions, Integral Equations (Vector Potentials A, F), Construction of Solutions.

Unit VI: Plane Wave Functions

Wave functions, Plane waves, rectangular waveguide, Alternative mode sets, Rectangular cavity, partially filled waveguide, Dielectric waveguide, Surface Guided waves, Modal Expansion of Fields, Currents in waveguides, Apertures in Ground planes, Plane current sheets.

Unit VII: Cylindrical Wave Functions

Wave functions, Cylindrical waveguide, Radial waveguides, circular cavity, Other guided waves, Sources of cylindrical waves, Two-dimensional Radiation, Wave Transformations, Three-dimensional Radiation, Apertures in cylinders.

Unit III: Spherical wave Functions

Waves Functions, Spherical Cavity, Orthogonality relationships, space as a waveguide, Other Radial waveguides, Other Resonators, Sources of Spherical waves, Wave Transformations.

Text Books:

1 "Time- Harmonic Electromagnetic Fields"-R.F.Harrington, John Wiley & Sons. 2001.

Reference Books:

1."Advanced Engineering Electromagnetics" Constantine A.Balanis, John Wiley & Sons.