

ADVANCED ELECTROMAGNETIC FIELDS

22ECMC2T1

Credits: 4

Lecture: 4 periods/week

Internal assessment: 40 marks
Semester end examination: 60 marks

Prerequisites: Electromagnetic Fields and Waves

Course Outcomes

At the end of the course Student will be able to

- Understand the complex ϵ , μ , and σ in circuit and field analysis, nature of waves for different matter, theorems used in fields, modes and its properties in different types of rectangular wave guides (L2)
- Analyze wave behavior to different matter and components (L4)
- Apply theorems to construct solutions to radiation problems (L3)
- Analyze plane wave functions for calculation of various performance parameters in different kinds of rectangular wave guides (L4)

UNIT -I

Fundamental Concepts: Introduction, Basic Equations, constitutive relationships, generalized current concepts, energy and power, circuit concepts, complex quantities, complex equations, complex constitutive parameters, complex power, A-C Characteristics of matter, A-C behavior circuit elements, Singularities of field.

UNIT -II

Introduction to Waves: The Wave Equation, Waves in perfect dielectrics, Intrinsic wave constants, Waves in lossy matter, Reflection of waves, Waveguide concepts, Resonator concepts, Radiation, Antenna concepts.

UNIT -III

Some Theorems & Concepts: The Source concept, Duality, Uniqueness, Image theory, Reciprocity, Green's functions, Integral equations, Construction of solutions, The radiation field.

UNIT -IV

Plane Wave Functions: The Wave functions, Plane waves, The Rectangular waveguides, Alternative mode sets, Rectangular cavity, partially filled wave guide, dielectric- slab guide.

Learning Resources

TEXT BOOKS:

1. R. F Harrington., “Time Harmonic Electromagnetics”, McGraw Hill, 1961
2. RF Harrington, “Field Computation by Moment Methods”, New York: MacMillan, 1968
3. E.C Jordan & K.G. Balmain, “Electromagnetic Waves and Radiating Systems”, 2nd Edition, Prentice Hall India, Pvt. Ltd., New Delhi.

REFERENCE BOOKS:

1. William H. Hayt and John A. Buck, “Engineering Electromagnetics”, 8th Edition, McGraw Hill, 2010
2. C.A. Balanis, “Advanced Engineering Electromagnetics”, Wiley India, Pvt. Ltd., 2005

E- Resources

1. <https://nptel.ac.in/courses/108104087>