

Antennas and Wave Propagation

Code	Credit Hours
EE-844	3-0

Course Description

The course introduces the propagation of electromagnetic waves through different media as well as their interaction with other media. Transmission line theory and its applications will be introduced. Waveguides of rectangular geometries will be discussed. The course also covers antenna characteristics, design, analysis & its various types

Textbooks:

Advanced Engineering Electromagnetics by Costantine A. Balanis, 3rd Edition, Wiley
Antenna Theory Analysis and Design by Costantine A. Balanis, 3rd Edition, Wiley

Reference Book:

Microwave Engineering, by David M. Pozar. 4th Ed, John Wiley & Sons, Inc.

ASSESSMENT SYSTEM FOR THEORY

Quizzes	10-15%
Assignments	5-10%
Project (optional)	5-10%
Midterms	30-35%
Final Exam	40-50%

Topics covered in the Course and Level of Coverage	Duration
1. Time Varying Fields and Maxwell's Equations: <ul style="list-style-type: none"> a. Fundamentals of electromagnetic fields, Maxwell's equations, Time harmonic fields 	3hrs
1. Plane Electromagnetic Waves: <ul style="list-style-type: none"> a. Electromagnetic wave propagation, b. Wave equation, Plane wave propagation in different media: lossy dielectrics, lossless dielectrics, free space and good conductors, c. Polarization of plane waves, Poynting vector, Reflection of a plane wave at normal and oblique incidence 	6 hrs
2. Theory and Applications of Transmission Lines: <ul style="list-style-type: none"> a. General transmission line equations, b. Wave characteristics on an infinite transmission line, Transmission line parameters, c. Wave characteristics on finite transmission lines, Input Impedance and SWR, d. The Smith chart, Transmission line impedance matching, Quarter wave transformer, Single stub matching 	9 hrs
3. Waveguides: <ul style="list-style-type: none"> a. Wave propagation in rectangular waveguides b. Modes of rectangular waveguides: TE and TM, cut off frequency, Power transmission and attenuation in waveguides. 	9hrs
4. Antenna Basics: <ul style="list-style-type: none"> a. Types of antennas, Radiation mechanism, b. Fundamental Parameters of Antennas: Radiation pattern, Radiation power density, Radiation intensity, Directivity, Gain, Antenna efficiency, Half-power beam width, Polarization, Effective Area c. Antenna Working Mechanisms 	9hrs
5. Radiation from Antenna: <ul style="list-style-type: none"> a. The electric and magnetic vector potentials, Far field radiation, b. Various forms of dipole and small loop, Microstrip antennas, Array antennas c. Design in HFSS software 	12 hrs