

ELECTROMAGNETICS AND TRANSMISSION LINES – ESE319

SYLLABUS

ABET COURSE OUTCOMES:

Fundamental aspects of electromagnetic wave propagation and radiation, with application to the design of high speed digital circuits and communication systems. Topics include: solutions of Maxwell's equations for characterization of EM wave propagation in unbounded and lossy media; radiation of EM energy; guided wave propagation with emphasis on transmission line theory.

PRE-REQUISITES REQUIREMENTS: - ESE271

Students should have a good understanding of complex algebra, vector calculus and, basic circuit analysis techniques.

Goal for this course.

The goal is to establish a fundamental understanding of electromagnetic wave propagation and its importance in the design of electronic circuits and communication systems.

Objectives that are related to this Goal.

1. Transmission line fundamentals
2. Application to high speed digital circuits and communication systems
3. Electromagnetic wave propagation
4. Radiation and antennas

Week 1.	Introduction, EM spectrum, EM puzzles, complex numbers RLC circuits, speed of signal transmission,
Week 2.	Current flow in conductors, space and time Transmission lines, Telegrapher's equations
Week 3.	Terminations, reflection coefficient, Smith Chart
Week 4.	Lossy and dispersive line. Vectors and co-ordinate systems
Week 5.	Electrostatics – Coulomb, Gauss's
Week 6.	Dielectric materials, capacitance Magnetostatics, magnetic fields, Amperes's law
Week 7.	Magnetic forces, emf, inductance, Boundary conditions and Laplace Equation
Week 8.	Time varying fields
Week 9.	Maxwell's equations, time harmonic EM wave
Week 10.	EM wave propagation - plane wave solution , polarization
Week 11.	EM wave propagation in lossy medium, Reflection and transmission
Week 12.	Radiation fields: Short dipole antenna – antenna characteristics, Radiation power and resistance
Exams	Two tests and Final

COURSE TEXTBOOK:

Fundamentals of Applied Electromagnetics (6th ed), Fawwaz T. Ulaby, Eric Michielssen, Umberto Ravaioli, Prentice Hall (2010), ISBN-13: 9780132139311