

EC443- Electromagnetic Transmitting Media

CREDIT HOURS

3 Hours

CONTACT HOURS (Hours/week)

Lecture: 2; Tutorial: 2; Lab: 2

COURSE COORDINATOR

Dr. Mohammed Abou-El Dahb

TEXT BOOK

David M. Pozar, "Microwave Engineering", John Willey & Sons, Inc.,2005

COURSE DESCRIPTION

Transmission Lines: Types, parameters, equations, voltage and currents, matched and mismatched lines, Use smith chart, single, Double, and triple stub matching, quarter wave length transformers, Baluns. Multiple reflection of EM waves between infinite parallel plates, rectangular waveguides. TE and TM modes. Cutoff frequency and propagation parameters. Power transmitted, wall losses, and dielectric losses. Circular waveguides, TE and TM modes. Cutoff frequency and propagation parameters. Power transmitted, wall losses, and dielectric losses. Cavity resonators, modes quality factor, effect of dielectric loss. Circular cavity.

PREREQUISITE:

EC 442

RELATION OF COURSE TO PROGRAM

Required

COURSE INSTRUCTION OUTCOMES

The student will be able to:

- Apply wave theory to rectangular and cylindrical waveguides, to demonstrate losses in the waveguide (wall and dielectric losses). Quality factor & losses for the cavity resonator.
- Apply wave theory on the transmission lines for the purpose of analysis & design.

TOPICS COVERED

- Transmission lines “Characteristics Impedance, Input Impedance, Transmission line equations, Termination of a transmission line (Short & open circuits)”
- Graphical method (Smith Chart).” Analysis of a Smith Chart”
- Applications of Smith Charts “Solving of the transmission lines problems., Reflection Coefficient, Input Impedance of transmission line, and Standing Wave Ratio”
- Single stub matching. “Determination of the parameters of the series or the parallel single Stub connected with T.L”
- Double stub matching “Determination of the parameters of the series or the parallel double Stub connected with T.L”

- Triple stub matching” Determination of the parameters of the Triple Stub, ($\lambda/4$)transformers, Baluns delay lines, and pulse forming transmission lines”
- Wave equation in rectangular W.G “introduction to wave guides and cut- off frequency, Wave equation, Polarization for TE and TM, Solution of wave equation”
- Solution of wave eqn. “Introduction to TM waves, Boundary Conditions of TM mode, Field components in TM mode & cutoff frequency
- TE mode & its boundary conditions “Introduction to TE mode, Field components”
- Power transmitted & dielectric losses “Average power transmitted and total power transmitted for TE & TM. Mode, Dielectric losses in rectangular W.G”
- Wall losses in rectangular W.G “ Wall losses for TM mode, Wall losses for TE mode, Wall losses for dominant mode”
- Circular Wave guide.” Wave equation in circular coordinates, Solution of wave equation, Power transmitted in circular W.G., Wall losses in circular W.G”
- Rectangular and Circular cavity resonator “Introduction to cavity resonator, Quality factor , losses”

CONTRIBUTION OF COURSE TO MEET THE REQUIREMENTS OF CRITERION 5:

Professional component Content			
Math and Basic Sciences	Engineering Topics	General Education	Other
	✓		

RELATIONSHIP OF COURSE TO STUDENT OUTCOMES:

Student Outcomes		Course aspects
A	An ability to apply knowledge of mathematics, science, and engineering	a ₁
B	An ability to design and conduct experiments, analyze and interpret data.	b ₂ b ₃ b ₄
C	An ability to design a system, component, or process to meet desired needs within realistic constraints such as economics, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability	
D	An ability to function on multi-disciplinary teams.	
E	An ability to identify, formulate, and solve engineering problems	e ₁ e ₂
F	An understanding of professional and ethical responsibility	f ₁ f ₂
G	An ability to communicate effectively	g ₃
H	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and social content	h ₁ h ₄
I	A recognition of the need for, and an ability to engage in life-long learning.	
J	A knowledge of contemporary issues within and outside the electrical engineering profession.	
K	An ability to use the techniques, skills, and modern engineering tools necessary for electrical engineering practice.	