Faculty of Engineering & Technology

Electromagnetic Waves

Information :

Course Code :	COM 413	**Level :**	Undergraduate	**Course Hours :**	3.00- Hours

Department : Specialization of Electronics & Communication

Instructor Information :

Title	Name	Office hours
Lecturer	Ahmed Hosni Ali Mohamed Elghandour	4
Assistant Lecturer	Ahmed Essam Fahim Zahran	

Area Of Study :

Develop the students' knowledge about parameters of different medii.

Prepare students to analyze, design and/or evaluate the reflection coefficient for incident waves on double or multilayers for normal incidence and oblique incidence.

Prepare the students to design single and double stub lines for matching of transmission lines.

Description :

The course aims to provide a coverage of the boundary conditions and the Transmission Lines T.L equivalent circuit. Lumped and distributed elements circuits. The distributed parameters of the Transmission line, Lumped ï element model of a section of the TL .TEM T.L. Partial Differential equations for the wave propagation on a lossy and lossless T.L. Characteristics of a two conductors T.L.: Propagation Constant, attenuation constant, the characteristic impedance. Wave reflection and transmission at discontinuities. Voltage Standing Wave Ratio (VSWR), Input impedance for a Transmission Line loaded with an impedance ZL .The Smith Chart. Applications on Smith Chart. Single stub line matching on Smith Chart. The Wave equation derived from Maxwell's equations for time harmonic fields.Plane Waves in free space. Wave velocity. Wave number and Wave length. The Wave equation in a general lossy and lossless media with parameters (ủ, ε, ů) .The Waves in a conducting, semiconducting, and in dielectric media. Polarization of electromagnetic waves. The reflection coefficient of a Horizontal polarized wave. The reflection coefficient of a Vertical polarized wave. Brewster angle for the vertical polarized waves. Atmospheric refraction of electromagnetic waves. Standard parameters of the troposphere. The refractive index. Types of atmospheric refractions. The ionospheric layers. The safety levels during exposure to electromagnetic fields.

Course outcomes :

a.Knowledge and Understanding: :

1 -	Estimate the input impedance, the reflection coefficient, and Voltage Standing Wave Ratio on the transmission line with a given load impedance.
2 -	Discuss the matching problem using Smith chart and analytical methods.
3 -	Estimate the reflection coefficients for the horizontal and vertical polarized waves.
4 -	Recognize the different types of tropospheric refraction, the main characteristics of the ionosphere, and the different ionospheric layers.
5 -	Recognize the safety protection levels of exposure to electromagnetic waves.

b.Intellectual Skills: :	
1 -	Analyze the characteristics of distributed circuit, and Transmission Line Parameters.
2 -	Evaluate the stub matching problems using Smith Chart and numerical methods.
3 -	Analyze the electromagnetic wave propagation in different media.
4 -	Evaluate the electromagnetic wave reflections, refraction problems, interact with the tropospheric and ionospheric problems
5 -	Apply the safety level values during exposure to electromagnetic fields.
c.Professional and Practical Skills: :	
1 -	Solve professional problem related to microwave heating of tissues, blood, water,
2 -	Practice the guide wavelength measurements
3 -	Practice the VSWR and the reflection coefficient measurements.
d.General and Transferable Skills: :	
1 -	Communicate effectively.
2 -	Refer to relevant literatures.

Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Propagation of e.m. waves in different medii and calculation of power density	20	15	5
Reflection and transmission coefficients for normal incidence	10	6	4
Polarization, dispersion and study of oblique incidence	15	10	5
Solution of transmission line equation, and its primary and secondary parameters.	5	3	2
Relation between input, and output impedances with reference to wave impedance, and calculation of reflection coefficient and standing wave ratio.	10	6	4
The application of the Smith chart in solving all problems of the transmission line specially the matching with single and double parallel stub lines	15	10	5

Teaching And Learning Methodologies :

Interactive Lecturing
Discussion
Problem Solving
Experiential Learning

Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
ÅFinal exam	40.00		
Assignments	10.00		

o In Class Quizzes and Performance	15.00		
o Mid-Term Exams	30.00		
Oral Exam	5.00		