321 CNE Course Syllabus

Course Code	321CNE
Course Name	Electromagnetic Waves
Credit Hours	3
Contact Hours	4
Instructor Name	Dr. Ashraf Mahmoud Abdelrahman

Text Book (title, author, and year)
• Engineering Electromagnetics, W. H Hayt, & John A. Buck, 8th Edition, Prentice Hall, 2010. • Field and Wave Electromagnetics, Addison-Wesley, 2nd Edition, 2006.

Specific Course Information	
Catalog Description	This course focuses on a Maxwell's field theory as applied to high-frequency radiation, propagation and circuit phenomena. Topics include radiofrequency (RF) and microwave (MW) propagation modes, transmission line aspects, Smith Chart, scattering parameter analysis, microwave filters, matching networks.
Prerequisites	CNE 221
Co-requisites	NIL
Required/Elective	required

Course Learning Outcomes	
1	To recognize fundamentals mathematical skills used for analyzing radio wave propagation.
2	To define the theory of transmission lines, and waveguides and outline how to be able to use them in basic engineering applications.
3	To explain basic concepts of electromagnetic propagation modes, free space, ground reflection, diffraction, refraction, scattering, depolarization and Doppler's effect.
4	To evaluate the radio wave propagation in the Earth's atmosphere.
5	To derive Poynting theorem from Maxwell`s equations and apply Maxwell's equations to the solution of problems encountered in the field of radio wave engineering.
6	To carry out experiments for propagation models, transmission lines and waveguide.
7	To demonstrate the ability to use IT-based tools for simplifying the calculations of propagation channel parameters.
8	To show the ability for good written communication through lab reports and mini-projects.

Mapping course LOs to the SLO.												
Course LOs #	Student Learning Outcomes											
	a1	a2	b1	b2	b3	b4	b5	c1	c2	c3	d1	d2
1	√											
2	√											
3			√									
4			√	√								
5			√									
6				√								
7							√					
8											√	

List of Theory Topics

Time Varying Field: Maxwell's equations in point form and in integral form, Faraday's Law, Displacement Current, Retarded Potentials.
The Uniform plane wave: Wave Propagation in Free Space, Propagation in Good Conductors, Skin Effect,Wave Propagation in Dielectrics.
Poynting Theorem and Wave Power.
Wave Polarization: Linear polarization, Circular polarization, Elliptical polarization.
Plane Wave Reflection and Dispersion: Standing Wave Ratio
Transmission lines: Physical Description, Transmission Line Equations, Graphical methods.

List of Lab Experiments

1. Introduction to HFSS
2. Design, Analysis and Simulation of magic T using HFSS
3. Design, Analysis and Simulation of wave ports
4. Coaxial connection design; Analysis and Simulation
5. 180 degrees Ring Hybrid design, Analysis and Simulation
6. Design, Analysis and Simulation of coaxial stub resonator
7. Design, Analysis and Simulation of dielectric resonator
8. Rectangular wave guide simulation and analysis using HFSS