EC544- Antenna Engineering

CREDIT HOURS

3 Hours

CONTACT HOURS (Hours/week)

Lecture: 2; Tutorial: 2; Lab: 2

COURSE COORDINATOR

Dr. Mohammed Abou-El Dahb

TEXT BOOK

Balanis, Antenna theory analysis and design, 2005 by John Wiely & Sons, Inc.

COURSE DESCRIPTION

Linear array theory :uniform linear arrays (broadsideو endfire, electronic scanning) . Non uniform linear arrays (binomial, chebycheff), Planar arrays. Circular arrays. Aperture on conducting & nonconducting planes. Horn antennas. E-sectoral, H-sectoral, and pyramidal horns, Parabolic reflectors (surface geometry, feeders). Loop antennas. Traveling wave antennas. Rhombic antenna.

PREREQUISITE:

EC 443

RELATION OF COURSE TO PROGRAM

Required

COURSE INSTRUCTION OUTCOMES

The student will be able to:

- Introduce the various antenna types.
- Briefly discuss some forms of the various antenna types.
- Introduce the radiation characteristic requirements for many applications.
- Discuss the performance of some antenna types experimentally.

TOPICS COVERED

- Linear arrays “Two-element array. N-element Uniform linear arrays(broadside Linear, and Endfire linear arrays”
- “N-element Uniform linear arrays (electronic scanning linear arrays). Non uniform linear arrays, Array factor of even or odd number of elements,”
- Non uniform linear arrays “Design procedure, Directivity and beam width, Graphical representation of array factor of binomial array”
- Non uniform linear arrays “Dolph-Tschebyscheff arrays, Design procedure, Directivity and beam width, Graphical representation of the array factor,”
- Planar arrays and circular arrays “Properties of planar array, Array factor of planar array, Directivity and beam width ,Array factor of circular array,”

- Radiation from aperture on conducting and on free space "Hugen's principles, Magnetic current, Equivalence principle, Auxiliary potential functions, procedures of calculating the far fields"
- Radiation from a uniform illuminated rectangular and circular aperture "Far fields, Beam width and directivity for E- and H- plane pattern,"
- Horn Antennas (Types of horn antennas, Design of E-plane sectoral horn, Directivity, Design of H-plane sectoral horns, Directivity, Design of pyramidal horn, Directivity)
- Horn Antennas
- Parabolic reflector (Introduction, Geometry of reflector, Effect the type of feeder, Analysis, Radiated field, Directivity)
- Loop antennas (Introduction, Calculation the far field, Radiation resistance, Directivity)
- Traveling wave antennas and rhombic antenna "Construction, Calculation the far field, The locations of nulls, The locations of peaks, Advantages, Rhombic antenna"

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 a_2
B	An ability to design and conduct experiments, analyze and interpret data.	b_2 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	c_1 c_3
D	An ability to function on multi-disciplinary teams.	
E	An ability to identify, formulate, and solve engineering problems	e_3
F	An understanding of professional and ethical responsibility	
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_3 h_4
I	A recognition of the need for, and an ability to engage in life-long learning.	i_2
J	A knowledge of contemporary issues within and outside the electrical engineering profession.	j_2
k	An ability to use the techniques, skills, and modern engineering tools necessary for electrical engineering practice.	k