BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI,
HYDERABAD CAMPUS
Second Semester 2020 – 2021

Course Handout (Part - II)

Date: Jan 16, 2021

Course Number : EEE F474
Course Title : Antenna Theory and Design
Instructor-in-Charge : Harish V. Dixit

Course Description:

Introduction of Antenna theory; Antenna parameters: Radiation pattern, power density, radiation intensity, beamwidth, Directivity, Antenna Efficiency and Gain etc; Antenna Polarization, Antenna Equivalent circuit, Friis transmission and Radar range equation; Radiation integrals and auxiliary potential functions; Basic radiator; short dipoles, half wave dipoles, Monopole antenna, loop antennas; Antenna Arrays; linear arrays, planar arrays. N-Element Linear Array; Antenna Synthesis: Schelkunoff Polynomial Method, Fourier Transform Method; Traveling wave and Broadband Antennas (Helical and Yagi-Uda antennas); Frequency Independent Antennas (FIA): Spiral antennas and Log-periodic antenna Fractal antennas; Aperture antennas: Huygen's principle, rectangular apertures; Horn Antennas: E-Plane, H-Plane, Pyramidal and conical horn; Microstrip antennas analysis and design; general characteristics, radiation mechanism feeding techniques, rectangular patch.; Q-factor, bandwidth and Efficiency. Input impedance & circular polarization techniques. Patch Antenna arrays; Parabolic Reflector antennas.

Scope and Objective of the Course:

To provide the fundamental knowledge about the antenna design which is the key subject of radar, wireless communication and mobile communication. The main objective of this course is to introduce theory, analysis, design and measurements of antennas. First, the electromagnetic theory is introduced and the fundamental antenna parameters are explained. Classical radiating elements; dipoles/monopoles, loops, apertures, horns, reflectors and modern antennas like microstrip patch antennas (MPAs) and fractal antennas are included to meet the cutting-edge requirement of this field. Considerable special attention is also planned to antennas popular in mobile telecommunications. Antenna simulations through professional software will be taken through seminars.

1. Text Books:

TB 1 C.A. Balanis, Antenna Theory, Analysis and Design, 3rd ed., John Wiley and Sons 2005.

2. Reference Books:

a) J. D. Kraus and R. J. Marhefka, Antennas, 3rd ed. McGraw-Hill, 2002.

4. Course Plan:

Lec. No.	Topic	Learning Objective	Chapter in the Text Book
1 –10	Introduction to antenna and antenna parameters	To recall the basics of EM theory to useful to discuss antenna theory	TB 1 and class notes
11-18	Dipole and monopole antennas	To explain the analysis and parameters of basic radiators	TB1 and class notes
19-25	Antenna arrays-linear, planar etc. and their synthesis	To discuss antenna synthesis process	TB 1 and class notes
26-30	Broadband antennas and frequency independent antenna	To discuss important broadband antennas	TB1 and class notes
30-35	Waveguide and microstrip antenna	To analyze the performances of horn antennas	TB1 and class notes

		To explain the theory and radiation mechanism of patch antennas	
35-42	Advanced antenna topics	Advanced topics in antenna design and analysis	TB1 and class notes
		Total no. of classes planned	42

The primary reference for the coverage (breadth and depth)/nomenclature/notations for a particular topic would be as per the lectures/tutorials. Students are strongly advised to take class notes during the online lectures.

5. Evaluation Scheme:

Component	Duration	Weightage	Date & Time	Nature of Component
Mid Term Test	90 mts.	30%	05/03 9.00 -10.3AM	Open Book
Lab/Assignment	Continuous	25%	Ongoing	Open book
Classroom interaction	continious	5%		--
Comprehensive	120 Hrs	40%	12/05 FN	Open Book

6. Chamber Consultation Hour: To be announced in Class

7. Make-up Policy: Make-up will be given on extremely genuine grounds only. Prior application should be made for seeking the make-up examination.

8. Notices: Notices, if any, concerning the course will be put up on CMS only.

9. It is presumed that students have access to reliable broadband internet connection and a desktop pc/laptop.

10. Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Harish V. Dixit
Instructor-in-Charge
EEE F474