BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI, HYDERABAD CAMPUS
FIRST SEMESTER 2020-2021
Course Handout (Part-II)

Course No. **: ECE F314**

Course Title **: Electromagnetic Fields and Microwave Engineering**

Instructor-in-charge **: Harish V. Dixit (hvdixit@hyderabad.bits-pilani.ac.in)**

Course Description:

Electromagnetic waves; Maxwell's equations; Poynting theorem and wave equations; propagation of EM waves; transmission lines; microstrip lines; wave guides; cavities and antennas; microwave generators, microwave amplifiers; measurement at microwave frequencies.

Scope and objective of the course:

Electromagnetics is one of the most fundamental topics in Electrical Engineering. Maxwell's four simple equations form the basis for almost all phenomena in Electrical and Communication Engineering. Thorough understanding of many areas such as VLSI, PCBs operating at GHz clocks, rotating machines, microwaves and antennas depends upon electromagnetics. The emphasis will be placed on both physical concepts and mathematical equations. An effort will be made to show that electromagnetic is not a dull and dry area with lot of mathematics but something beyond it. The objective of this course is to provide the students with the basic understanding of electromagnetic fields and microwaves. The material covered in this course is basic to the training of electrical engineers.

1. **Text Book :**
   1)TB1: David Pozar, "Microwave Engineering", 4th edition,John Wiley & Sons, 2012
   2)TB2: Samuel Y. Liao, "Microwave devices and circuits" 3rd ed.,PHI 2008.
2. **Reference Books :**
   i) RB1: Annapurna Das and Sisir Das, "Microwave Engineering", TMH 2009.
   ii) RB2: J.D Krauss et.al., "Antennas and Wave Propagation", 4th edition, TMH 2010.
   iii) RB3: Matthew N.O.Sadiku, "Principles of Electromagnetics" 4th ed. Oxford University Press, New Delhi, 2009.
   iv) RB4: David K.Cheng, "Field and Wave Electromagnetics" 2nd ed. Pearson Education, New Delhi, 2009.
   v) RB5: John D. Kraus and Daniel A. Fleisch, "Electromagnetics", 5th ed., McGraw-Hill, New York, 1999.

3. Course Plan:

Lec. No.	Topic to be covered	Learning Objective	Source*
1	Introduction to the course and its components	--	--
2-4	Transmission lines	To analyse the transmission line characteristics	Class notes and TB1

5-8	Graphical Evaluation of Transmission Lines	To analyse transmission lines and high frequency systems using graphical technique	Class notes and TB1
9	Review of Maxwell Equations	Review of basic EM concepts	Class notes and RB5
10-12	Maxwell's equations, Plane wave propagation in conducting and dielectric media	To qualitively and quantitatively describe propagation of EM waves	Class notes and RB5
13-15	Energy relations and Poynting Vector& Wave polarisation	To quantitatively analyse the power in EM wave	Class notes and RB5
16-17	Reflection & refraction of plane waves	To describe various wave phenomenon quantitatively	Class notes and RB5
18-23	Waveguides	To quantitatively analyse waveguide propagation	Class notes and TB1
24-28	Waveguide Devices and S parameters	To qualitatively describe various waveguide devices	Class notes and TB1
29-40	Microwave Generators and Amplifiers	To qualitatively and quantitatively analyse low and high power microwave generators and amplifiers	Class notes and TB2
40-42	Antennas	To quantitatively and qualitatively analyse RF and microwave antennas	Class notes and RB5

***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.**

4. Evaluation Scheme:

Component	Duration	Percentage	Marks	Date & Time	Evaluation type
Test 1	30 min	10%	30	September 10 –September 20 (During scheduled class hour)	Open book
Test 2	30 min	15%	45	October 09 –October 20 (During scheduled class hour)	Open book
Test 3	30 min	10%	30	November 10 – November 20 (During scheduled class hour)	Open book
Assignment/ Quiz/mini	-	30%	90	Continuous	Open Book

projects					
Comprehensive Exam	120 min	35%	105	As per time table	Open book
Total			**300**		

5. Consultation Hour: To be announced in class

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

7. Notices: All notices concerning with the course will be put up on the CMS or CANVAS or google classroom and/or would be announced during the class. The final portal will be announced during the first lecture and on the CMS.

8. The platform for test 1, 2 and 3 will be Canvas. Detailed instructions will be put up in due course of time.

9. Make-up Examination: Make up will be given for test 1/2/3 only in case of genuine reasons as deemed by the IC. Application for make-up should reach the IC via e-mail before the commencement of the exam. There is no make up for assignment/project.

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.

INSTRUCTOR-IN-CHARGE
ECE F314