

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI, HYDERABAD CAMPUS  
**FIRST SEMESTER 2022-23**  
**Course Handout (Part-II)**

Date: August 29, 2022

In addition to Part-I (General Handout for all courses appended to the timetable), this portion gives further specific details regarding the course.

**Course No. : ECE F314**  
**Course Title : Electromagnetic Fields and Microwave Engineering**  
**Instructor-in-charge : Harish V. Dixit**

**Course Description:**

Electromagnetic waves; Maxwell's equations; Poynting theorem and wave equations; propagation of EM waves; transmission lines; microstrip lines; waveguides; 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. A 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", 4<sup>th</sup> edition, John Wiley & Sons, 2012
- 2)TB2: Samuel Y. Liao, "Microwave devices and circuits" 3<sup>rd</sup> 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", 4<sup>th</sup> edition, TMH 2010.
- iii) RB3: Matthew N.O.Sadiku, "Principles of Electromagnetics" 4<sup>th</sup> ed. Oxford University Press, New Delhi, 2009.
- iv) RB4: David K.Cheng, "Field and Wave Electromagnetics" 2<sup>nd</sup> ed. Pearson Education, New Delhi, 2009.
- v) RB5: John D. Kraus and Daniel A. Fleisch, "Electromagnetics", 5<sup>th</sup> ed., McGraw-Hill, New York, 1999.

**3. Course Plan:**

Lec. No.	Topic to be covered	Learning Objective	Chapter in the Text Book *
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1	Introduction to the course and its components	--	--
2-4	Transmission lines	To analyze the transmission line characteristics	Class notes and TB1
5-8	Graphical Evaluation of Transmission Lines	To analyze 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 qualitatively and quantitatively describe the propagation of EM waves	Class notes and RB5
13-15	Energy relations and Poynting Vector & Wave polarization	To quantitatively analyze 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 analyze 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 analyze low and high-power microwave generators and amplifiers	Class notes and TB2
40-42	Antennas	To quantitatively and qualitatively analyze 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 advised to take class notes during the lectures.**

#### **4. Evaluation Scheme:**

<b>Component</b>	<b>Duration</b>	<b>Percentage</b>	<b>Marks</b>	<b>Date &amp; Time</b>	<b>Nature of Component</b>
Mid-sem Test	90 min	25 %	75	04/11 11.00 - 12.30PM	Closed Book
Quizzes	---	20 %	60	To be Announced in class	Quiz-Closed Book
Project/Assignment	==	20 %	60	To be Announced in class	Course Project-Open Book/Take Home

Comprehensive. Exam.	180 minutes	35 %	105	27/12 AN	Closed Book
<b>Total</b>			<b>300</b>		

**5. Chamber Consultation Hour:** To be announced in class

**6. Notices:** All notices concerning the course will be put up on the CMS and/or would be announced in the class.

**7. Make-up Examination:**

No make-up will be given for Assignments and Quizzes in any case. Makeup for mid-sem and Comprehensive Examination will be as per ID rules only in **extremely genuine cases (as per the view of the IC)** for which **prior** permission of the instructor-in-charge is required.

**8. 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.

**Dr. Harish V. Dixit**  
**INSTRUCTOR-IN-CHARGE**  
**ECE F314**