

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI- HYDERABAD CAMPUS
FIRST SEMESTER 2022-2023
COURSE HANDOUT PART II

Date: August 16, 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. : **EEE G581**
Course Title : **RF and Microwave Engineering**
Instructor-in-charge : **Harish V. Dixit**

1. Course description:

Introduction to radio frequency engineering; advantages; various frequency bands; propagation; transmission lines; microwave waveguides and components; their characterizations; s-parameters and their use; microwave transistor; FETs, Gunn diode, IMPATT diodes; microwave tubes; Klystron; two cavity Klystron amplifier analysis; reflex Klystron; TWTs; high power tubes; cross field tubes; microstrip lines MICs; microwave measurements; microwave antennas and microwave communication system; microwave applications; ISM applications; introduction to EMI and EMC; microwave hazards.

2. Scope & Objective:

This course deals with radio frequency and microwave engineering, which in other words is the physical realization of electromagnetic theory. The basic knowledge of the student in the field of engineering electromagnetics will be developed to advanced levels. Low frequency systems can be analyzed using *circuit theory*, where concepts like *voltage*, *current* and *impedance* are valid. At intermediate frequencies, the analysis needs inclusion of an additional effect called *reflection* into circuit theory, which now becomes the *transmission line theory*. But at high frequencies, the circuit / transmission line theory has to be replaced with *field theory*, in order to address the new effect of *radiation*. Practical uses of certain theorems based on *field theory* will be described. Commercial electromagnetic simulators will be introduced and the underlying electromagnetic principles will be revisited. Students are supposed to approach the course from a research point of view also. In addition to relying on the subject oriented textbooks, the students are advised to follow technical journal papers also. Skills like preparing and presenting technical report, seminar, etc., will also be developed and evaluated.

3. Text Books

[T1] Pozar, David M, Microwave Engg. WSE , 4th ed , 2012.

[T2] Balanis, Constantine A., Antenna Theory: Analysis and Design, WSE, 3rd ed, 2005.

4. Reference Books

[R1] Rizzi, Peter A., Microwave Engineering: Passive Circuits, PHI, 1988

[R2] Liao, S. Y., Microwave Devices & Circuits PHI/ Pearson Edu., 3rd ed, 2003

5. 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
9-11	S parameters and device characterisation	To qualitatively describe various waveguide devices	Class notes and TB1
12-25	Microwave Amplifier and Power Amplifier design	To design, characterise and analyse microwave amplifiers and power amplifiers	Class notes and TB1
26-32	Microwave oscillator design	To design, characterise and analyse RF oscillators and DROs	Class notes and TB1
33-40	Antenna and microwave communication systems	--	Class notes and TB2

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

Laboratory component: Two lab session per week.

6. Evaluation Scheme

Component	Duration	Weightage	Date & Time	Remarks
Mid sem Test	90 min	25%	05/11 11.00 - 12.30PM	Open Book
Comprehensive Theory Exam	3 Hrs	35%	29/12 FN	Open Book
Regular Lab	--	20%	During the class session	Open Book
Assignment/ Project	--	20%	Will be announced	Open Book

- 7. Consultation Hour:** To be announced in class
- 8. Notices:** All notices concerning with the course will be put up on the CMS or CANVAS and/or would be announced during the class. The final portal will be announced during the first lecture and on the CMS.
- 9. 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.
- 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

Dr. Harish V. Dixit
Instructor-in-Charge
EEE G581