

ACADEMIC-GRADUATE STUDIES AND RESEARCH DIVISION

FIRST SEMESTER 2023-2024

COURSE HANDOUT PART II

Date: August 11, 2023

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 the 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 subject-oriented textbooks, the students are advised to follow technical journal papers also. Skills like preparing and presenting technical reports, seminars, etc., will also be developed and evaluated.

3. Text Books

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

4. Reference Books

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

[R2] Liao, S. Y., Microwave Devices & Circuits PHI/ Pearson Edu., 3rd edition, 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 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 techniques	Class notes and TB1
9-11	S parameters and device characterization	To qualitatively describe various waveguide devices	Class notes and TB1
12-25	Microwave Amplifier and Power Amplifier design	To design, characterize and analyze microwave amplifiers and power amplifiers	Class notes and TB1
26-32	Microwave oscillator design	To design, characterize and analyze 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.**

***Class notes must be taken in notebooks. Tablets and electronic items are not allowed for note writing.**

Laboratory component: Two lab sessions per week.

6. Evaluation Scheme

Component	Duration	Weightage	Marks	Date & Time	Remarks
Mid sem Test	90 mins.	25%	50	09/10 2.00 - 3.30PM	Closed Book
Comprehensive Theory Exam	180 mins.	35%	70	7/12	Closed Book
Regular Lab	--	20%	40	During the lab session	Open Book
Assignment	--	20%	40	Will be announced	Open Book
Total		100%	200		

Note:

1. Open book signifies use of handwritten class notes and textbook (T1) only will be permitted.
2. Solution manuals/reference books/photocopy of books/print out of notes written on Tablets or other electronic devices are not permitted.

7. Consultation Hour: To be announced in class

8. Notices: All notices concerning the course will be put up on the CMS/equivalent 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-semester examination 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.

Harish V. Dixit
Instructor-in-Charge
EEE G581