BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI- HYDERABAD CAMPUS
FIRST SEMESTER 2020-2021
COURSE HANDOUT PART II

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Date: August 7, 2021

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:

Maxwell's equations, Boundary conditions, Wave propagation, Theorems; Transmission line theory, Smith chart; Waveguides, General solution of waves, Rectangular waveguide, Microwave guiding structures, Microwave networks, S-parameters; Impedance matching, Stub tuning; Transmission line resonators, Rectangular waveguide cavity resonator, Power dividers and directional couplers; Microwave antennas.

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 array design and analysis	To quantitatively and qualitatively analyse RF and microwave antennas	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/tutorials. Students are strongly advised to take class notes during the online lectures.**

Laboratory component: One lab session per week**.**

6. **Evaluation Scheme**

Component	Duration	Weightage	Date & Time	Remarks
Midsem Test	90 min	30%		Open Book
Comprehensive Theory Exam	2 Hrs	40%		Open Book
Regular Lab	--	15%	During the class session	Open Book
Term Project	--	15%	Will be announced	Open Book

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. 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.

Harish V. Dixit
Instructor-in-Charge