

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE PIANI, Goa Campus
INSTRUCTION DIVISION
FIRST SEMESTER 2021-22
(Course Handout (Part II))

02 August 2021

In addition to Part I (General Handout for all courses appended to the time table, this portion gives further specific details of the course

Course No.: **EEE G510**

Course Title: **RF Microelectronics**

Instructor-in-Charge: **Chembiyan T**

1. Course Description

The course presents a broad overview of the Radio frequency wireless transceivers at a circuit and system level. Wireless standards from the inception of cordless phones, mobile phones to the recent multimedia devices will be covered at the physical layer level. Parameters to characterize the physical layer of a wireless system will then be covered in detail. Several popular transceiver architectures will be discussed and analyzed based on the performance metrics like Implementation complexity, IIP3, Noise figure, sensitivity and bandwidth. Circuit level description of individual blocks like RF amplifiers, Power Amplifiers and Oscillators will be discussed.

2. Scope and Objective

To understand the design of wireless systems at a circuit and system level. After doing this course, the students should be able to understand and design RF circuits and systems and be able to arrive at suitable RF transceiver architectures from basic specifications.

3. Book

Text Book

- i. Behzard Razavi, "RF Microelectronics , second edition", Tata McGraw Hill, 2011

Reference Books

- i. Thomas Lee , "CMOS RF Integrated circuit Design", McGraw Hill International Edition, 3rd Edition 2003.

4. Course Plan

Lecture No.	Learning Objective	Topics to be Covered	Reference
1-6	Introducing wireless technologies	RF and wireless technologies. Basics of AM,FM and wireless modulation schemes	Lecture Notes/ Slides
7-12	Understanding of RF system specifications	Specifications of RF systems. Non-linearity IIP3, noise (NF), Sensitivity	Lecture Notes/ Slides,
13-17	Survey of RF transceiver architecture	Standard RF transmitter and receiver architectures. Heterodyne, sliding IF, Zero-IF	Lecture Notes/ Slides
18-22	Understanding problems in RF system design	Problems in RF systems like LO leakage, blocker, Interferers	Lecture Notes/ Slides
23-25	To understand the design of RF amplifiers	Design of tuned amplifiers. Noise figure and IIP3 of amplifier circuits	Lecture Notes/ Slides
25-30	Understanding RF oscillators	Oscillators. LC and ring oscillator basics. Phase noise and LTV systems	Lecture Notes/ Slides
30-33	Phase locked loops	Design of phase locked loops- History, design procedure and PLL architectures	Lecture Notes/ Slides
33-38	Frequency synthesizers	Problem of frequency synthesis. Integer-N and Fractional-N PLLs, Fractional-N dividers.	Lecture Notes/ Slides
39-40	Learning the design of RF Power Amplifiers	Power Amplifiers. Class A,B,C and E amplifier topologies and design constraints	Lecture Notes/ Slides

5. Presentation Topics:

There will be continuous evaluated lab throughout the semester forming 20 % of the total weightage. A project (of 25 % weightage) to be submitted toward the end of the semester.

6. Evaluation Scheme:

Component	Duration	Weightage	Date, Time and Venue of Examination	Remarks
Quizzes/ class participation	Through the semester (Weekly Evaluation)	15%	IC to announce	Open book
Project	Two months	20%	IC to announce	Open book
Mid Sem Examination	90 minutes	30%	Instr. Div. to announce	Open book
Comprehensive Examination	180 minutes	35%	Instr. Div. to announce	Open book

7. Chamber Consultation Hour:

To be announced in class.

8. Notices:

Moodle/ email (in selected cases)

9. Make-up Policy:

As per the Institute-norms, only in genuine cases.

Instructor-in-Charge
EEE G510