



**Second Semester 2017-18**  
**Course handout Part II**

Date: 06-01-2018

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

**Course No.** : EEE G510  
**Course Title** : RF Microelectronics  
**Instructor-in-charge** : MAHESH ANGIRA  
**Instructor** : Chandra Shekhar

**1. Course Description:**

This course aims to develop the foundation for IC design for radio frequency applications, specific to CMOS integrated circuits. The course will cover low noise amplifiers, mixers, power amplifiers, frequency synthesizers and phase locked loops, besides reviewing concept in RF circuit design and concepts in communications.

**2. Scope and objective of the course:**

The objective of this course is to provide basic skills to analyze and design CMOS RF integrated circuits. This course will address all the aspects of various RF circuits in CMOS technology, which are used in communication applications including LNA, mixer, PLL, Power amplifier, oscillator and frequency synthesizers.

**3. Text Book:** Behzad Razavi, RF Microelectronics, Pearson Education India, 2<sup>nd</sup> edition, 2012.

**4. Reference Books:** Thomas H. Lee, The Design of CMOS Radio-Frequency Integrated Circuits, Cambridge University Press, 2<sup>nd</sup> edition, 2004.

**5. Course Plan:**

Module	Lecture No.	Reference	Learning Outcome
1. Introduction of RF and wireless technology	1-3	Chapter-1 (T.B)	Broad understanding of RF systems.
2. Basic concepts in RF communication technologies.	4-7	Chapter-2-3(T.B)	Strengthening of concepts from signal and systems and communication theory required for RF CMOS IC design.
3.Review of MOS device physics and distributed systems	8-9	Chapter-5-6- (R)	Strengthening of concepts from microwave theory and semiconductor device physics required for RF system design.
4.Passive RLC networks and passive IC components	10-13	Chapter-3-4-(R), Chapter-7 (T.B)	Ability to design integrated passive RF components.
5.High frequency amplifier design	14-16	Chapter-9 (R)	Ability to design a high frequency amplifier.
6. Noise	17-18	Chapter-11(R)	Understanding of noise sources and noise issues in RF IC design.
7. LNA design	19-21	Chapter-5(T.B), Chapter-12 (R)	Ability to design LNA for RF IC circuit.
8. Mixer design	22	Chapter-6 (T.B),	Ability to design mixer for RF IC circuit.





		Chapter-13 (R)	
9.RF power amplifier design	23-25	Chapter-12(T.B), Chapter-15 (R)	Ability to design power amplifier as a part of the RF IC circuit.
10. Oscillators	26-28	Chapter-8(T.B)	Ability to design oscillators as a part of the RF IC circuit.
11. Phase-locked loops	29-31	Chapter-9(T.B), Chapter-16 (R)	Ability to design PLL as a part of the RF IC circuit.
12.Frequency Synthesizers	32-34	Chapter-10,11 (T.B)	Ability to design frequency synthesizers as a part of the RF IC circuit.
13. Phase noise	35-36	Chapter-18 (R)	Understanding of phase noise concept
14. RF transceivers architecture and design	37-38	Chapter-2 (T.B)	Understanding of transceiver architectures and their design.
15. Introduction to RF-MEMS technology an emerging technology for RF passive devices.	39-40	Lecture slides/Notes.	Acquisition of the knowledge of next generation technology to design high performance passive components.

**6. Project Topics:** Specific topics will be selected and announced in the class as a project.

#### 7. Evaluation Scheme:

Component	Duration	Marks/Weightage Total Marks = 200	Date & Time	Remarks
Assignments/Projects/Seminars	-	40/20%	-	Open Book
Quizzes	-	20/10%		Closed Book
Midterm test	90 mins	50/25%	9/3 11:00 - 12:30 PM	Closed Book
Comprehensive exam	180 mins	90/45%	10/5 AN	Closed Book and Open Book

**8. Chamber Consultation Hour:** To be announced in the class.

**9. Notices:** Notices, if any, will be displayed on the EEE Notice Board// NALANDA (online portal).

**10. Make-up Policy:** Make-up will be given only to genuine cases. Prior applications should be sent for seeking the same. For quizzes and assignments make-up will not be permitted.

Instructor-in-charge  
EEE G510

