

Course Type	Course Code	Name of the Course	L	T	P	Credits
DE	NECD541	RF CMOS Transceiver Design	3	0	0	3

Course Objective

To develop basic understanding of various concepts and components of RF CMOS transceiver structure.

Learning Outcomes

Upon successful completion of the course, students will:

- be able to understand concepts of RF CMOS Transceiver
- be able to understand and design of various components of RF CMOS Transceiver

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Comparison of active devices such as BJT, MOSFET, MESFET, HEMT, and HBT; Circuit models for FETs and BJTs; Basic parameters of active devices such as f_t/f_{max} , transconductance, capacitance, resistance, etc.	6	Review of device physics
2	On-chip Inductor, capacitor, resistor, resonant circuit and its application in RF IC, Various impedance-matching techniques	6	Passive Components and Impedance Matching
3	Transistor Theory, Transistor S-parameters, gain & Stability, Unilateral and bilateral design	6	Design of Amplifier
4	Introduction, LNA topologies- power match vs. noise match, Power constrained noise optimization, Design examples, Linearity and large-signal performance, Spurious free dynamic range	7	Design of LNA
5	Introduction, class A, AB, B, and C power amplifiers, class D amplifiers, class E amplifiers, Class F amplifiers, summary of PA characteristics, RF PA design examples	7	Design of PA
6	Introductions, Mixer fundamentals, Nonlinear systems as linear mixers, Multiplier-based mixers, Sub-sampling mixers	4	Design of Mixer
7	Introduction, The problem with purely linear Oscillators, Resonators, A catalogue of tuned oscillators, Negative resistance oscillators, Frequency synthesizers	6	Design of Oscillators and Synthesizers
Total		42	

Text Books:

1. B. Razavi, "RF Microelectronics", 2nd Ed, Pearson, 2020.
2. Thomas H. Lee, "The Design of CMOS Radio-Frequency Integrated Circuits", Cambridge University Press, 2004.

Reference Books:

1. Robert Caverly, "CMOS RFIC Design Principles", Artech House, 2007.
2. Gonzalez, G., "Microwave Transistor Amplifiers Analysis and Design" 2nd Ed.", Prentice Hall, 1994.