

Course Code	Course Title	L	T	P	C
1152EC106	VLSI FOR WIRELESS COMMUNICATION	3	0	0	3

a) Course Category

Program elective

b) Preamble

The purpose of this course is to understand the knowledge of VLSI for Wireless Communication and also emphasis on the fundamentals design of wireless systems as well as Transmitter, Receiver, mixers, frequency synthesizers and Power Amplifier.

c) Prerequisite

VLSI Design, Linear Integrated Circuits, Digital Communication and Communication Systems

d) Related Courses

Wireless Communication Networks and Wireless technologies

e) Course educational objectives

- i) To Gain the basic Knowledge of Low noise Amplifier and Power Amplifier.
- ii) To Study the Transmitter and receiver architectures of VLSI for wireless Communication.
- iii) To understand the various types of mixers designed for wireless communication.
- iv) To introduce the application of frequency synthesizers.

f) Course Outcomes

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Knowledge Level (Based on Revised Bloom's Taxonomy)
CO1	Discuss the Low Noise Amplifier which includes wideband, narrow band for impedance matching and Core Amplifier	K2
CO2	Illustrate the Transmitter Architectures and Power Amplifier	K3
CO3	Describe the types of mixer and its parameters	K2
CO4	Explain the application of frequency synthesizers	K2
CO5	Illustrate the Receiver Architectures	K3

g)Correlation of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H	H	M	M	M	L	-	-	L	L	-	L	-	-
CO2	M	M	L	L	M	L	L	-	L	L	-	L	-	-
CO3	M	L	L	L	M	-	-	-	-	-	-	-	-	-
CO4	M	L	L	L	M	-	-	-	-	-	-	L	-	-
CO5	M	L	L	L	M	L	L	-	L	L	-	L	L	-

h) Course Content

UNIT I OVERVIEW OF WIRELESS COMMUNICATION SYSTEMS 9

Introduction of wireless system, Low Noise Amplifier – Matching Network, Wideband LNA –DC Bias-Gain and frequency Response-Noise Figure, Narrowband LNA - Impedance Matching-Matching of Imaginary and real Part-Interpretation of Power Matching, Core Amplifiers-Noise Figure-Power Dissipation, Trade-Off and Noise contribution from Other Sources

UNIT II TRANSMITTER ARCHITECTURE AND POWER AMPLIFIER 9

Transmitter Back End, Quadrature LO generator-Single ended RC and LC, R-C with Differential stages-Polyphase IQ generator-Divider based generator, Power Amplifier Design.

UNIT III MIXERS 9

Active Mixer: Balancing Mixer - Qualitative Description of the Gilbert Mixer - Conversion Gain – Distortion - Analysis of Gilbert Mixer of Low Frequency Case and High-Frequency Case -Noise.

Passive Mixer: Switching Mixer – Distortion, Conversion Gain and Noise in Unbalanced Switching, Conversion Gain, Sampling Mixture,Gain,Distortion and noise in Single Ended Sampling Mixer.

UNIT IV FREQUENCY SYNTHESIZER 9

Phase Locked Loops - Phase Detector - VCO - Dividers - LC Oscillators - Ring Oscillators - Phase Noise – Loop Filter-First order filter-Second order filter, High Order filter , Digital Enhanced Cordless Telecommunication.

UNIT V RECEIVER ARCHITECTURE 9

Receiver Front end-Filter Design-Band selection Filter, Image Rejection Filter, Channel Filter, Rest of receiver front end- non idealities and design parameters, Derivation of Noise Figure(NF) and input third order Intercept points(IIP3) of receiver front end, Partitioning of required NF and IIP3 of receiver front end

into individual NF and IIP3

Total 45 Hrs

i) Learning Resources

Text Books

1. Bosco H Leung "VLSI for Wireless Communication", Pearson Education, 2nd edition, 2002.
2. Carols and M. Stewart, "CMOS Wireless Transceiver Design," Boston, Kluwer Academic Publication, 1997

Reference Books

1. Thomas H.Lee, "The Design of CMOS Radio –Frequency Integrated Circuits', Cambridge University Press ,2003.
2. Emad N Farag and Mohamed I Elmasry, "Mixed Signal VLSI Wireless Design - Circuits and Systems", Kluwer Academic Publishers, 2000.
3. BehzadRazavi, "Design of Analog CMOS Integrated Circuits" McGraw-Hill, 1999.

Online Resource

1. www.nptelvideos.in/2012/12/wireless-communication.html
2. www.springer.com/us/book/9781461409854/.