

GUJARAT TECHNOLOGICAL UNIVERSITY

ELECTRONICS & COMMUNICATION (WIRELESS COMMUNICATION TECHNOLOGY) (44)

VLSI IN WIRELESS COMMUNICATION SYSTEM

SUBJECT CODE: 2724407

M. E. Semester – II

Type of course: Design and simulation of VLSI based circuits used in Communication Engineering

Prerequisite: Fundamentals of VLSI

Rationale: The students need to learn fundamentals of VLSI based CMOS circuits. The students need to know basic concept of CMOS technology used for communication engineering. Lower level students need to know fundamental of CMOS circuits. Middle level students should know how CMOS circuits are used and designed for different applications of communication. The high level students should know how design can be developed using CMOS Technology for communication circuits. This is the first course by which students get exposure to VLSI for wireless Communication in detail with enhanced knowledge in various application areas of communication engineering.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	ESE (V)		PA (I)			
					ESE	OEP	PA	RP		
3	0	2	4	70	30	20	10	10	10	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Designer's perspective of communication system :Overview of Modulation Scheme, Classical Channel, Wireless Channel description, Path loss, Multi path Fading.	04	20%
2	Receiver Architecture :Receiver Front End, Filter Design, Rest of receiver Front end, Derivation of IIP3 of receiver front end.	08	20%
3	Low Noise Amplifier : Introduction, Wideband LNA Design, Narrowband LNA: Impedance Matching and Core Amplifier.	06	20%
4	Active and Passive Mixer :Balancing, Description Gilbert Mixer, Analysis of Gilbert Mixer, Noise, complete Active Mixer, Switching Mixer, Distortion, conversion gain and Noise in Unbalanced Switching mixer	08	20%

5	Analog to Digital Converters :Demodulators, A to D Converters used in receivers, Low pass Sigma delta modulators and its implementation.	06	10%
6	Frequency Synthesizer :PLL based Frequency Synthesizer, Phase Detector/Charge Pump, VCO, Ring oscillator	06	10%

Reference Books:

1. Bosco Leuing, VLSI for Wireless Communication, PE
2. T Lee, The Design of CMOS Radio Frequency integrated circuits, Cambridge University Press.
3. P Gray and R Meyer, Analysis and design analog integrated circuits, John Wiley & sons

Course Outcome:

After learning the course the students should be able to explain about CMOS based design for communication engineering. The student should be able to develop chip using CMOS Technology. Students should able to design CMOS circuits used in communication. At the end they should be able to develop a real time system on chip for different communication applications.

List of Experiments:

- (1) Design of Binary phase shift keying modulation scheme using MATLAB
- (2) Design of Binary frequency shift keying modulation scheme using MATLAB
- (3) Design of Low noise amplifier using 1um CMOS Technology
- (4) Design of Gilbert mixer using 1um CMOS Technology
- (5) Design of 1-bit DAC using switch capacitor integrator with use of CMOS Operational Amplifier.
- (6) Design of phase detector using EXOR gate with help of 1um CMOS Technology
- (7) Design of Ring oscillator using 1um CMOS Technology

Design based Problems (DP)/Open Ended Problem:

- (1) Design of 1-bit ADC using CMOS Operational amplifier

List of Open Source Software/learning website: (1) T-spice software

Review Presentation (RP): The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website.