GUJARAT TECHNOLOGICAL UNIVERSITY

ELECTRONICS & COMMUNICATION (VLSI SYSTEM DESIGN) (42)

SILICON ON INSULATOR

SUBJECT CODE: 2744201

M.E. 4TH SEMESTER

Type of course: CMOS Circuit Design using Silicon on Insulator**.**

Prerequisite: Basics knowledge of CMOS Circuit Design

Rationale: Useful to understand the concepts and designing steps of Circuit Design using Silicon on Insulator Technology.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks		Practical Marks				
L	T	P	C	ESE (E)	PA (M)	ESE (V)		PA (I)		
						ESE	OEP	PA	RP	
3	2#	0	4	70	30	30	0	10	10	50

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**Introduction:** Evolution of CMOS VLSI, SOI versus bulk, Low-Voltage SOI VLSI.	4	10
2	**Basic SOI Technology:** Introduction, Back gate bias effect, Short channel effect, Narrow channel effect, Floating body effects, Sub threshold behavior, History effect.	7	15
3	**SOI CMOS Devices:** Hot carrier, Accumulation-Mode Devices, Double Gate, DTMOS, Scaling Trends, Single Electron Transistor (SET), Electrostatic Discharge (ESD).	8	20
4	**Fundamentals of SOI CMOS Circuits:** Basic Issues, Low-Voltage circuit techniques, MTCMOS Circuits, Noise, Self heating, System-on-Chip (SOC) Techniques.	7	15
5	**SOI CMOS Digital Circuits:** Static Logic Circuit, Dynamic Logic Circuit, DRAM, SRAM, Gate Array.	8	20
6	**SOI CMOS Analog Circuits:** SOI Op Amps, Filters, ADC and DAC, Low voltage amplifier (LNA), Voltage controlled oscillator (VCO).	8	20

Reference Books:

1. James B. Kuo, Shih-Chia Lin , Low-voltage SOI CMOS VLSI Devices and Circuits, Wiley Publisher, ISBN: 978-0-471-41777-4.
2. Jean-Pierre Colinge, Silicon-on-Insulator Technology: Materials to VLSI, Kluwer Academic Publisher, ISBN 978-1-4020-7773-9.
3. Kerry Bernstein, Norman J. Rohrer, SOI-Circuit Design Concepts, Kluwer Academic Publisher, ISBN 978-0-7923-7762-7.

4. Andrew Marshall, Sreedhar Natarajan , SOI-Design: Analog, Memory and Digital Techniques, Kluwer Academic Publisher, ISBN 978-0-7923-7640-8.

Course Outcome:

After learning the course the students should be able to:

1. Understand the basic concept of Silicon on Insulator Technology.
2. Understand the concept of different constrain, and optimization techniques of CMOS IC Design using Silicon on Insulator Technology.
3. To understand various effects observed by the device when design using Silicon on Insulator Technology.
4. Understand the basic issues involve in design of analog and digital circuits.
5. Should able to design different analog and digital circuits using Silicon on Insulator Technology.

List of Open Source Software/learning website:

Ng-spice
www.nptel.com
www.nptel.ac.in

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.