

GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. SEMESTER : VIII

ELECTRICAL & ELECTRONICS ENGINEERING

Subject Name: **VLSI TECHNOLOGIES**

Sr. No.	Course Contents	Total Hrs
1.	INTRODUCTION:: Overview of VLSI design methodology, VLSI design flow, Design hierarchy, Concept of regularity, Modularity, and Locality, VLSI design style, Design quality, package technology, ,computer aided design technology.	4
2.	Fabrication of MOSFET: Introduction, Fabrication Process flow: Basic steps, C-MOS n-Well Process, Layout Design rules, full custom mask layout design.	5
3.	MOS Transistor: The Metal Oxide Semiconductor (MOS) structure, The MOS System under external bias, Structure and Operation of MOS transistor, MOSFET Current Voltage characteristics, MOSFET scaling and small-geometry effects, MOSFET capacitances	8
4.	MOS Inverters Introduction, Resistive load Inverter, Inverter with n-type MOSFET load(Enhancement and Depletion type MOSFET load), CMOS Inverter, Delay-time definitions, Calculation of Delay times	7
5.	Combinational MOS Logic Circuits Introduction, MOS logic circuits with Depletion nMOS Loads, CMOS logic circuits, Complex logic circuits, CMOS Transmission Gates (TGs)	6
6.	Dynamic Logic Circuits Introduction, Basic Principles of pass transistor circuits, Voltage Bootstrapping, Synchronous Dynamic Circuit Techniques, CMOS Dynamic Circuit Techniques, High-performance Dynamic CMOS circuits	7
7.	Design for testability Introduction, Fault types and models, Controllability and observability, Ad Hoc Testable design techniques, Scan –based techniques, Built-in Self Test (BIST) techniques, current monitoring IDDQ test	4
8.	Introduction to Programmable Logic Devices: FPGA and CPLD	4

Suggested Laboratory experiments & Assignments:

- Introduction to VHDL/verilog.
- Implementation of basic logic gates and its testing
- Implementation of adder circuits and its testing.
- Implementation 4 to 1 multiplexer and its testing.
- Implementation of 3 to 8 decoder and its testing.
- Implementation of BCD to seven segments Decoder and its testing.
- Implementation of 4 bit Magnitude comparator and its testing.
- Implementation of RS, D, T, JK flip flop and its testing.
- Implementation of 4 bit Shift register using and its testing
- Implementation of 8 bit down counter using and its testing
- Implementation of all logic 8 bit UP counter and its testing

Text Books:

1. Sung-Mo Kang, Yusuf Leblebici, "CMOS Digital Integrated circuits – Analysis and Design" Tata McGraw-Hill Education, 2003.
2. Jayaram Bhasker, "VHDL Primer", Prentice Hall PTR, 1999.
3. Douglas L. Perry, "VHDL", McGraw-Hill, 1991.

Reference Books:

1. Mohan Ned, Undeland Tore, M. and Robbins William, P., "Power Electronics: Converter, Applications and Design", John Wiley & Sons, 1994.
2. Douglas A. Pucknell, Kamran Eshraghian, "Basic VLSI Design", Prentice Hall, 1994.
3. Carver Mead, Lynn Conway, "Introduction to VLSI Systems", Addison-Wesley, 1980.
4. Smith, "Application Specific Integrated Circuits", Pearson Education India, 1997.
5. Uyemura, "Introduction to VLSI Circuits & Systems", Wiley-India, 2006.
6. Stephen Brown, Zvonko Vranesic, "Fundamentals of Digital Logic with VHDL Design", McGraw-Hill Higher Education, 2009.