

VLSI TECHNOLOGY AND APPLICATIONS

(Core Subject)

Course Code:	10B11EC612	Semester:	6 th Semester, B. Tech (ECE)
Credits:	4	Contact Hours:	L-3, T-1, P-0

Course Objectives

The objectives are to study

1. To bring both Circuits and System views on design together.
2. It offers a profound understanding of the design of complex digital VLSI circuits, computer aided simulation and synthesis tool for hardware design.

Course Outcomes

After studying this course the students would gain enough knowledge

1. Understand the static and dynamic behavior of MOSFETs (Metal Oxide Semiconductor Field Effect Transistors) and the secondary effects of the MOS transistor model.
2. To be aware about the trends in semiconductor technology, and how it impacts scaling and its effect on device density, speed and power consumption.
3. To understand MOS transistor as a switch and its capacitance.
4. Student will be able to design digital systems using MOS circuits (Static and Switching characteristics of inverters)
5. Able to learn Layout, Stick diagrams, Fabrication steps.
6. Understand the concept behind ASIC (Application Specific Integrated Circuits) design and the different implementation approaches used in industry.

Course Contents

Unit	Topics	References (chapter number, page no. etc)	Lectures
1.	Introduction to VLSI technology, VLSI design flow, Digital Design Cycle, Physical Design Cycle.	Kang : Chapter 1	3
2.	MOS fundamentals, Device Structure and Physical Operation, Current-Voltage Characteristics, channel length modulation, body effect, biasing of MOSFETs, capacitances in MOS, VLSI circuit and system representation.	Kang : Chapter 3	12
3	Logic gate characteristics, Design of MOS inverter with different loads, Determination of pull up and pull down ratio for an nMOS inverter driven by another n MOS inverter, Design of W/L, power dissipation, propagation delay, and noise margin analysis.	Kang : Chapter 5 Pucknell : Chapter 2	12

4	CMOS inverter, static and dynamic characteristics of CMOS inverter, DC Characteristics: NAND and NOR Gates, NAND and NOR transient response, System design using HDL.	Kang : Chapter 7 Uymera : Chapter 10	11
5	Stick diagram, Layout, Fabrication.	Pucknell : Chapter 3 Kang : Chapter 2 (Fabrication)	6
Total Number of Lectures			44

Evaluation Scheme

1. Test 1 :15 marks
2. Test 2 : 25 marks
3. Test 3 : 35 marks
4. **Internal Assessment** : 25 marks
 - 10 Marks : Class performance, Tutorials & Assignments
 - 10 Marks : Quizzes
 - 5 marks : Attendance

Text Books

1. Sung-Mo Kang, Yusuf Leblebici : CMOS Digital Integrated Circuits Analysis and Design”,Tata McGraw-Hill Edition 2003
2. Adel S. Sedra, Kenneth C. Smith : Microelectronics Circuits, 5th Ed., Oxford University Press, 2004
3. John P. Uyemura : Introduction to VLSI Circuits and Systems, John Wiley & Sons, , Inc, 2002

Reference Books

1. Neil Weste and David Harris, “CMOS VLSI Design”, 4th Ed., Addison Wesley, 2011.
2. Douglas A Pucknell et al, “Basic VLSI Design”, 3rd Ed., Prentice Hall, 2004