

PEI7J004

VLSI DESIGN

3-0-0

80% University Level:

Module – I

2+2+4+3= 11 Hours

Introduction: Historical Perspective, VLSI Design Methodologies, VLSI Design Flow, Design Hierarchy, Concept of Regularity, Modularity and Locality, Fabrication of MOSFETs: Introduction, Fabrication Processes Flow – Basic Concepts, The CMOS n-Well Process, Layout Design Rules, Stick Diagrams, Full-Customs Mask Layout Design.

MOS Transistor: The Metal Oxide Semiconductor (MOS) Structure, The MOS System under External Bias, Structure and Operation of MOS Transistor (MOSFET), MOSFET Current- Voltage Characteristics, MOSFET Scaling and Small-Geometry Effects, MOSFET Capacitance. MOS Inverters – Static Characteristics: Introduction, Resistive-Load Inverters, Inverters with n-Type MOSFET Load, CMOS Inverter.

(Chapter 1 to 5 of Text Book 1 and for Stick Diagram Text Book 2)

Module – II

4+3+4= 11 Hours

MOS Inverters – Switching Characteristics and Interconnect Effects: Introduction, Delay- Time Definitions, Calculation of Delay-Times, Inverter Design with Delay Constraints, , Switching Power Dissipation of CMOS Inverters.

Combinational MOS Logic Circuits: Introduction, MOS Logic Circuits with Depletion NMOS Loads, CMOS Logic Circuits, Complex Logic Circuits, CMOS Transmission Gates (Pass Gates). Sequential MOS Logic Circuits: Introduction, Behaviour of Bistable Elements, SR Latch Circuits, Clocked Latch and Flip-Flop Circuits, CMOS D-Latch and Edge-Triggered Flip Flop. (Chapter 6 to 8 of Text Book 1)

Module – III

4+4+2= 10 Hours

Dynamic Logic Circuits: Introduction, Basic Principles of Pass Transistor Circuits, Voltage Bootstrapping, Synchronous Dynamic Circuit Techniques, Dynamic CMOS Circuit Techniques, High Performance Dynamic CMOS Circuits.

Semiconductor Memories: Introduction, Dynamic Random Access Memory (DRAM), Static Random Access Memory (SRAM), Non-volatile Memory, Flash Memory.

Design for Testability: Introduction, Fault Types and Models, Ad Hoc Testable. Design Techniques, Scan-Based Techniques, Built-In Self-Test (BIST) Techniques,

(Chapter ,9,10,11& 15 of Text Book

Text Books:

1. Sung-Mo Kang and Yusuf Leblebici, CMOS Digital Integrated Circuits: Analysis and Design, 3rd Edn., Tata McGraw-Hill Publishing Company Limited, 2003.
2. K. Eshraghian and N.H.E. Weste, Principles of CMOS VLSI Design – a Systems Perspective, 2nd Edn., Addison Wesley, 1993.
3. Debaprasad Das, VLSI Design, Oxford University Press, New Delhi, 2010.

Reference Books:

1. Wayne Wolf, Modern VLSI Design System – on – Chip Design, 3rd Edn., PHI.
2. Jan M. Rabaey, AnanthaChandrakasan, Borivoje Nikolic, Digital Integrated Circuits – A Design Perspective, 2nd Edn., PHI.
3. John P. Uyemura, CMOS Logic Circuit Design, Springer (Kluwer Academic Publishers), 2001.
4. Ken Martin, Digital Integrated Circuit Design, Oxford University Press, 2000.

TENTATIVE
Likely to be Modified