Diploma, Anna Univ UG & PG Courses

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EC8095 VLSI DESIGN

DETAILED SYLLABUS

OBJECTIVES:

- Study the fundamentals of CMOS circuits and its characteristics.
- Learn the design and realization of combinational & sequential digital circuits.
- Architectural choices and performance tradeoffs involved in designing and realizing the circuits in CMOS technology are discussed
- Learn the different FPGA architectures and testability of VLSI circuits.

UNIT I INTRODUCTION TO MOS TRANSISTOR

MOS Transistor, CMOS logic, Inverter, Pass Transistor, Transmission gate, Layout Design Rules, Gate Layouts, Stick Diagrams, Long-Channel I-V Charters tics, C-V Charters tics, Nonideal I-V Effects, DC Transfer characteristics, RC Delay Model, Elmore Delay, Linear Delay Model, Logical effort, Parasitic Delay, Delay in Logic Gate, Scaling.

UNIT II COMBINATIONAL MOS LOGIC CIRCUITS

Circuit Families: Static CMOS, Ratioed Circuits, Cascode Voltage Switch Logic, Dynamic Circuits, Pass Transistor Logic, Transmission Gates, Domino, Dual Rail Domino, CPL, DCVSPG, DPL, Circuit Pitfalls. Power: Dynamic Power, Static Power, Low Power Architecture.

UNIT III SEQUENTIAL CIRCUIT DESIGN

Static latches and Registers, Dynamic latches and Registers, Pulse Registers, Sense Amplifier Based Register, Pipelining, Schmmit Trigger, Mono stability Sequential Circuits, Astability Sequential Circuits. Timing Issues: Timing Classification of Digital System, Synchronous Design.

UNIT IV DESIGN OF ARITHMETIC BUILDING BLOCKS AND SUBSYSTEM

Arithmetic Building Blocks: Data Paths, Adders, Multipliers, Shifters, ALUs, power and speed tradeoffs, Case Study: Design as a tradeoff. Designing Memory and Array structures: Memory Architectures and Building Blocks, Memory Core, Memory Peripheral Circuitry.

UNIT V IMPLEMENTATION STRATEGIES AND TESTING

FPGA Building Block Architectures, FPGA Interconnect Routing Procedures. Design for Testability: Ad Hoc Testing, Scan Design, BIST, IDDQ Testing, Design for Manufacturability, Boundary Scan.

TEXT BOOKS:

1. Neil H.E. Weste, David Money Harris "CMOS VLSI Design: A Circuits and Systems Perspective", 4th Edition, Pearson, 2017. (UNIT I,II,V)

2. Jan M. Rabaey, Anantha Chandrakasan, Borivoje. Nikolic, "Digital Integrated Circuits: A Design perspective", Second Edition, Pearson, 2016. (UNIT III,IV)

REFERENCES

1. M.J. Smith, "Application Specific Integrated Circuits", Addisson Wesley, 1997

2. Sung-Mo kang, Yusuf leblebici, Chulwoo Kim "CMOS Digital Integrated Circuits: Analysis & Design",4th edition McGraw Hill Education,2013

3. Wayne Wolf, "Modern VLSI Design: System on Chip", Pearson Education, 2007

4. R. Jacob Baker, Harry W.LI., David E. Boyee, "CMOS Circuit Design, Layout and Simulation", Prentice Hall of India 2005.