

BASIC VLSI DESIGN (ELECTIVE – 1)
(EC507)

Objective of the Course:

This course concerns theoretical and practical aspects of CMOS design, fabrication & Packaging issues.

UNIT - I

REVIEW OF MICROELECTRONICS AND INTRODUCTION TO MOS TECHNOLOGIES: (MOS,CMOS, Bi CMOS) Technology trends and projections.MOS device operation, I_{ds} - V_{ds} relationships,Threshold voltage V_t , G_m ,body effect, Pass Transistor, MOS,CMOS & Bi CMOS Inverters, Z_{pu}/Z_{pd} , MOSTransistor circuit model, spice models, Latch-up in CMOS circuits.

UNIT - II

VLSI FABrication Technology: An overview of wafer fabrication,wafer processing,oxidation, Photo Lithography, Diffusion,Ion implantation, Deposition, Silicon gate nMOS process, n well CMOS process, p well CMOS process, Twintub process, Silicon on isulator-Bi-Cmos process.

UNIT - III

VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling.

UNIT - IV

Basic circuit concepts, Sheet Resistance R_S and its concept to MOS, Area Capacitance Units, Calculations -?- Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out, Choice of layers, PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Design Approach. VHDL Synthesis, Simulation, Layout, Design capture tools, Design Verification Tools

UNIT - V

Packaging issues-structure, types, pad structure, Thermal, Mechanical, Electrical Considerations, Plastic , Ceramic packages.

TEXTBOOKS :

1. Kamran Eshraghian, Eshraghian Douglas and A. Pucknell, Essentials of VLSI circuits and systems, PHI, 2005 Edition.
2. Weste and Eshraghian, Principles of CMOS VLSI Design, Pearson Education, 1999.

REFERENCE BOOKS :

1. John P. Uyemura, "Chip Design for Submicron VLSI: CMOS Layout & Simulation",Thomson Learning.
2. John .P. Uyemura, JohnWiley, "Introduction to VLSI Circuits and Systems",2003.
3. John M. Rabaey, "Digital Integrated Circuits" PHI, EEE, 1997.
4. Wayne Wolf, "Modern VLSI Design" Pearson Education, 3rd ed., 1997.
5. S.M. SZE, VLSI Technology, 2nd ed., TMH, 2003.