

VLSI DESIGN

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Objective: To cater the needs of students who want a comprehensive study of the principle and techniques of modern VLSI design and systems.

Module 1(12 hrs)

Process steps in IC fabrication: Silicon wafer preparation-Diffusion of impurities-physical mechanism-ion implantation- Annealing process- Oxidation process-lithography-Chemical Vapour Deposition -epitaxial growth -reactors- metallization-patterning-wire bonding -packaging

Module 2 (12 hrs)

Monolithic components: Isolation of components-junction isolation and dielectric isolation. Monolithic diodes- schottky diodes and transistors-buried layer-FET structures- JFET-MOSFET-PMOS and NMOS. Control of threshold voltage- silicon gate technology- monolithic resistors-resistor design-monolithic capacitors- design of capacitors- IC crossovers and vias.

Module 3 (12 hrs)

CMOS technology: CMOS structure-latch up in CMOS, CMOS circuits- combinational logic circuit-inverter- NAND-NOR-complex logic circuits, full adder circuit. CMOS transmission gate(TG)T-realization of Boolean functions using TG. Complementary Pass Transistor Logic (CPL)-CPL circuits: NAND, NOR-4 bit shifter. Basic principle of stick diagrams.

Module 4 (12hrs)

CMOS sequential logic circuits: SR flip flop, JK flip flop, D latch circuits. BiCMOS technology-structure-BiCMOS circuits: inverter, NAND, NOR-CMOS logic systems-scaling of MOS structures-scaling factors-effects of miniaturization. Gallium Arsenide Technology: Crystal structure-doping process-channeling effect-MESFET fabrication-Comparison between Silicon and GaAs technologies. Introduction to PLA and FPGA

References:

1. N Weste and Eshrangian, "Principles of CMOS VLSI Design: A system perspective", Addison Wesley
2. S M SZE, "VLSI Technology", Mc Graw Hill
3. Douglass Pucknell, "Basic VLSI design", Prentice Hall of India.
4. K R Botkar," Integrated circuits", Khanna Publishers
5. Jan M Rabaey, Anantha Chandrakasan and Borivoje Nikolic, "Digital Integrated Circuits- a Design perspective", Prentice Hall.
6. S M Kang & Y Leblebici, "CMOS digital integrated circuits", Mc Graw Hill.