

Course Number and Name												
BEC010 - VLSI DESIGN												
Credits and Contact Hours												
3 and 45												
Course Coordinator's Name												
Ms M.Jasmin												
Text Books and References												
REFERENCES:												
1. Douglas A.Pucknell, K. Eshragian,—Basic VLSI Design , Third edition,PHI,2009												
2. Neil.H.E.Weste,KamranEshraghian,—PrinciplesofCMOSVLSIDesign ,Second Edition AddisoWesleyPublications,2002												
3. SamirPalnitkar,—VerilogHDL–GuidetoDigitaldesignandsynthesis ,SecondEdition Pearson Education,2009												
4. WayneWolf, —ModernVLSIDesign ,PearsonEducation , 2003												
5. https://en.wikipedia.org/wiki/Very-large-scale_integration												
Course Description												
<ul style="list-style-type: none"> • To learn basic CMOS Circuits. • To learn CMOS process technology. • To learn techniques of chip design using programmable devices. • To learn the concepts of designing VLSI Subsystems. 												
Prerequisites						Co-requisites						
Electronics Circuits & Principles of Digital Electronics						Nil						
required, elective, or selected elective (as per Table 5-1)												
Selected Elective												
Course Outcomes (COs)												
CO1: Identify the various IC fabrication methods.												
CO2 : Express the Layout of simple MOS circuit using Lambda based design rules.												
CO3 : Apply the Lambda based design rules for subsystem design												
CO4 : Differentiate various FPGA architectures.												
CO5: Design an application using Verilog HDL.												
CO6 : Concepts of modeling a digital system using Hardware Description Language.												
Student Outcomes (SOs) from Criterion 3 covered by this Course												
	COs/SOs	a	b	c	d	e	f	g	h	i	j	k
	CO1	H					M		H			
	CO2	M	L	H					M	L	H	
	CO3	M			H				M			H
	CO4	M				H		M	M			
	CO5		L							L		
	CO6						H					

List of Topics Covered

UNIT I MOS TRANSISTOR THEORY

9

MOSFET– Enhancement mode & Depletion mode – Fabrication – NMOS, PMOS – CMOS fabrication – P-well, N-well, Twin-Tub, SOI – BiCMOS Technology –Comparison with CMOS.

UNIT II MOS CIRCUITS AND DESIGN

9

Basic Electrical properties of MOS circuits – DC Equations, NMOS & CMOS inverter –Second Order Effects– Basic circuit concepts–Sheet resistance–Area Capacitances–Capacitance calculations–Inverter delays–Scaling of MOS Devices –Scaling Models and Scaling Factors–MOS layers – Stick diagram – NMOS Design Style – CMOS Design style – lambda based design rules– Simple Layout examples

UNIT III SUBSYSTEM DESIGN & LAYOUT

9

Switch Logic – Pass transistors and transmission gates – Two input NMOS, CMOS gates: NOT–NAND– NOR gates – Other forms of CMOS logic – Static CMOS logic–Dynamic CMOS logic – Clocked CMOS logic - Precharged domino CMOS logic – Structured design of simple Combinational logic design– Multiplexers – Clocked sequential circuits – Two phase clocking – D-Flip-flop–Charge storage - Dynamic register element –Dynamic shift register

UNIT IV PROGRAMMABLE LOGIC DEVICES

9

Programmable Logic Devices – PLA , PAL – Finite State Machine design using PLA – Introduction to FPGA – FPGA Design flow –Architecture – FPGA devices: Xilinx XC 4000 – Altera cyclone III

UNIT V VERILOG HDL DESIGN PROGRAMMING

9

Basic concepts: VLSI Design flow, Modeling, Syntax and Programming, Design Examples:Combinational Logic – Multiplexer, Decoder/Encoder, Comparator, Adders, Multipliers, Sequential logic- Flip Flops, Registers, and Counters, Memory- Introduction to back end tools.