NIRMA UNIVERSITY
SCHOOL OF TECHNOLOGY, INSTITUTE OF TECHNOLOGY
M. Tech. in Electronics & Communication Engineering (VLSI Design)
M.Tech Semester - I

L	T	Practical component				C
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Course Code	**6EC101**
Course Title	**Digital VLSI Design**

Course Learning Outcomes (CLOs):

At the end of the course, the students will be able to -

1. Comprehend the various VLSI design styles, approaches, and IC fabrication process from the designers' viewpoint.
2. Design the static and dynamic digital VLSI circuits.
3. Develop small digital design including layout preparation
4. Analyze the speed, power, and area for CMOS-based design

Syllabus: **Teaching Hours: 45**

UNIT I: Introduction **05**
Overview of VLSI Design Methodology, Integrated Circuit Design Flow, Design Hierarchy, Design Styles, Design Quality

UNIT II: Fabrication of MOSFET (Designer's View-Point) **03**
Introduction, Fabrication Process Flow: Basic Steps, The CMOS n-well Process, Layout Design Rules, Full Custom Mask Layout Design

UNIT III: MOS Inverter **07**
Generalized MOS Inverter, MOS Inverter with Various Loads, CMOS Inverter

UNIT IV: MOS Inverter: Switching Characteristics and Interconnect Effect **06**
Delay Time Definition, Calculation of Delay Times, Inverter Design with Delay Constraints, Estimation of Interconnect Parasitic, Calculation of Interconnect Delay, Switching Power Dissipation

UNIT V: Combinational and Sequential CMOS Logic Circuits **09**
Primitive Logic Gates; Complex Logic Circuits, Stick Diagram, Pass Transistors/Transmission Gates Sequential MOS Logic Circuits: Latches and Flip-flops

UNIT VI: Dynamic Logic Circuits **07**
Basic Principle of Pass Transistor, Voltage Bootstrapping, Synchronous Dynamic Circuit Techniques, High Performance Dynamic Circuit Design

UNIT VII: Semiconductor Memory **08**
DRAM, SRAM, Non-Volatile Memory, Flash Memory

Self-Study: The self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from self-study contents

Laboratory Work:
Laboratory work will be based on the above syllabus with a minimum of 10 experiments to be incorporated.

Suggested Readings:

1. Sung Mo Kang and Yusuf Leblebici CMOS Digital Integrated Circuits Analysis and Design, McGraw-Hill
2. Gary K.Yeap, Practical Low Power Digital VLSI Design,Kluwer Academic Publishers
3. Etienne Sicard, Sonia Delmas Bendhia, Basics of CMOS Cell Design, Tata McGraw-Hill