NIRMA UNIVERSITY
School of Technology, Institute of Technology
B.Tech. Electronics & Communication Engineering
Semester - VII
Department Elective V

L	T	P	C
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Course Code	2ECDE63
Course Title	High Performance VLSI Design

Course Outcomes (COs):

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

1. evaluate the noise effects for integrated circuits.
2. modeling of devices using submicron technology.
3. design of VLSI interconnects for nanometer technology.
4. analyze and design on-chip clock generators and distribution.

Syllabus **Teaching Hours: 45**

UNIT I: Introduction / Overview of Integrated Circuits **03**

MOS Transistor, Integrated Circuits, IC Design Objectives Technology Scaling: Device Scaling, Small Geometry Effects, Device Enhancements, Interconnect

UNIT II: Scaling and Enhance Interconnect Networks **08**

Interconnect Design Criteria, Interconnect passive parameters/ Components (Resistance, Capacitance, and Inductance), Signal Propagation analysis, Interconnect coupling noise, Global signaling

UNIT III: Power Management **07**

Power Generation: Linear regulators, Switched capacitor converters, Switched DC-DC converters, on-chip converters, Power Distribution Networks

UNIT IV: CAD & Analysis **08**

Design flow for on-chip power networks, Model RLC Impedance, characterizing load circuits, On-chip Power/ Ground Noise analysis,

UNIT V: Synchronization **07**

Synchronous Systems, Characteristics, Fully Synchronized Circuits, Self-timed circuits, GALS Circuits

UNIT VI: On-chip Clock Generation and Distribution **06**

Ring Oscillators, Crystal Oscillators, Phases Locked Loop, and Delay Locked Loop, clock tree, reset circuit design and distribution

UNIT VII: New Logic, Transistor **06**

Models for High Speed and Low Power Design: FINFET, Carbon Nano Tubes (CNT), Techniques to reduce noise and power dissipation in VLSI Circuits

Self-Study:

The self-study contents will be declared at the commencement of the semester. Around 10% of the question 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. Emre Salman, Eby Friedman, High-Performance Integrated Circuit Design, MGH.

2. Neil Weste and David Harris, CMOS VLSI Design: A Circuits and Systems Perspective, Addison Wesley
3. H. B. Bakoglu, Circuits, Interconnections, and Packaging for VLSI, Addison-Wesley VLSI Systems Series

L = Lecture, T = Tutorial, P = Practical, C = Credit