

Advanced VLSI Design

B.E. Sem. VIII [ETRX]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical & Oral	–	–
Oral Exam	–	25
Term Work	–	25

SYLLABUS

- **Objective** : To introduce advance design concepts, develop basic understanding of analog VLSI field and relate to issues occurring at chip level
- **Pre-requisite** : VLSI Design, DSD I and II, BEC

1. Wire interconnect for circuit simulation

Interconnect parameters (Capacitance, Resistance and Inductance) their effect on circuit performance. Electrical wire models (ideal, lumped, lumped rc, distributed rc and transmission line), switching characteristics, transistor sizing, sizing routing conductors, charge sharing and reliability issues. (Numericals on each subtopic expected)

2. Sequential logic circuits design

Clocked systems (Single phase, Two phase and four phase clocking), recommended clocking approaches – clocked CMOS – Dynamic CMOS circuits – solutions for charge sharing - Implementation of general VLSI sequential system components such as Flip Flops, static as well as dynamic latches and Registers. Pipelining concepts

3. Arithmetic Circuits in CMOS VLSI

Dynamic adders, Fast adders, Wide adders: Carry look ahead, Block generate and propagate, carry save, carry skip, carry save

4. Design of memories & programmable logic

CMOS Memory structures – SRAM and DRAM design –Sense amplifier design - Low power design techniques. ROM Arrays and Logic Arrays. EPROM, EEPROM, Flash cell working . Design of basic 6T SRAM Cell with read and write stability criteria

5. Timing issues & System Level Physical Design

Timing classification, Synchronous timing basics, clock skew, propagation delay estimation, clock jitter, combined clock skew and clock jitter estimation, synchronous and asynchronous design timing estimations. Clock generation and distribution

Crosstalk, Interconnect Scaling, Floor planning & Routing, I/P & O/P Circuit, Power dissipation and consumption, Low power Design considerations.

6. Introduction to Analog and Mixed signal design

Building blocks for CMOS amplifiers, CMOS operational transconductance amplifiers. Frequency compensation schemes. Design of fully differential amplifiers, common mode feedback circuits, switched capacitor circuits. Design of sample and hold and comparator circuits.

Reference Books:

1. Introduction to VLSI Circuits and systems (*John P. Uyemura*) John Wiley & sons.
2. CMOS Digital Integrated Circuits - Analysis & Design (*Sung-Mo Kang & Yusuf Leblebici*) Second Ed., MGH
3. Digital Integrated Circuits - A Design Perspective (*Jan M Rabaey*) Prentice Hall
4. Design of Analog CMOS circuits (*D.Razavi*) McGraw Hill
5. Principles of CMOS VLSI Design : A system perspective (*Neil H.E. Weste, Kamran Eshraghian*) Addison Wesley publication.
6. Introduction to VLSI Design (*Fabricius, Eugene D*) TMH
7. Analysis and design of analog integrated circuits (*P.R. Gray & R.G. Meyer*) John Wiley

