

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

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Course Code	3EC12D206
Course Title	Memory Technology

Course Learning Outcomes (CLOs):

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

1. Comprehend the architecture of RAM and non-volatile memory.
2. Apply reliability modelling and failure modes to memory design.
3. Design the memory cell using advanced technology.

Syllabus:

Teaching Hours:45

UNIT I: Static Random Access Memory Technologies	10
MOS RAM technologies, SRAMs, architecture, SRAM cell and peripheral, Circuit operation, SRAM Technologies, SOI Technology, advanced SRAM architectures and technologies, DRAM technology development, CMOS DRAMs cell, theory and advanced cell structures	
UNIT II: Embedded Memory Designs	08
Nonvolatile memories, MOS ROMs, PROMs, EPROMs, One-Time Programmable EPROMS, EEPROM technology and architecture, Nonvolatile SRAM-Flash Memories, advanced Flash Memory architecture	
UNIT III: Failure Memory Directions	09
Memory failure modes, reliability modelling, Prediction design for reliability, reliability test structures, reliability screening and qualification, radiation effects, radiation hardening, process and techniques, Radiation hardened memory characteristics, soft errors	
UNIT IV: Advanced Memory Designs	08
Ferroelectric random access memories (FRAMs), Gallium arsenide FRAMs, Analog memories, Magneto resistive RAMs, Experimental memory devices, Memory hybrids and MCMs (2D), Memory stacks and MCMs(3D), memory cards, high density memory packaging	
UNIT V Memory Testing	10
RAM Fault Modeling, Memory Testing Algorithms, Electrical Testing, Pseudo Random Testing-Megabit DRAM Testing-Nonvolatile Memory Modeling and Testing, IDDQ Fault Modeling and Testing-Application Specific Memory Testing	

Self-Study:

The self-study contents will be declared at the commencement of Semester. Around 10% of the questions will be asked from self-study contents.

Suggested Readings:

1. Ashok K. Sharma, Advanced Semiconductor Memories: Architectures, Designs, and Applications, John Wiley
2. Ashok K. Sharma, Semiconductor Memories Technology, Testing and Reliability, IEEE Press
3. Kiyoo Itoh, VLSI Memory Chip Design, Springer International Edition
4. Santosh K. Kurinec, Krzysztof Iniewski, Nanoscale Semiconductor Memories: Technology and Applications, CRC Press