

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	6EC167ME22
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