MEMORY TECHNOLOGIES

(Elective-III)

Course Code: 19EC2258

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Prerequisites: Digital Logic Design, VLSI Design

Course Outcomes: At the end of the course, the student will be able to:
CO1: Summarize Static Random Access Memory Technologies.
CO2: Outline the concepts of dynamic random access memory technologies.
CO3: Demonstrate various nonvolatile memories
CO4: Illustrate Memory Reliability and Radiation Effects
CO5: Describe advanced memory technologies

UNIT-I — 10 Lectures

Static RAM Technologies

Static Random Access Memories (SRAMs), SRAM Cell Structures, MOS SRAM Architecture, MOS SRAM Cell and Peripheral Circuit, Bipolar SRAM, Advanced SRAM Architectures, Application Specific SRAMs.

Learning outcomes: At the end of this unit, the student will be able to

1. Describe the operation of SRAMs (L2)
2. Analyze the working of SRAM Cell and peripheral circuit (L4)
3. Illustrate Advanced SRAM architectures (L3)

UNIT-II — 10 Lectures

Dynamic RAM Technologies

DRAMs, MOS DRAM Cell, Bi-CMOS DRAM, Error Failures in DRAM, Advanced DRAM Design and Architecture, Application Specific DRAMs. SRAM and DRAM Memory controllers.

Learning outcomes: At the end of this unit, the student will be able to

1. Discuss the operation of DRAMs (L2)
2. Demonstrate the working of BiCMOS DRAM (L3)
3. Develop DRAM Memory controllers (L6)

UNIT-III 10 Lectures

Non-Volatile Memories

Masked ROMs, PROMs, Bipolar & CMOS PROM, EEPROMs, Floating Gate EPROM Cell, OTP EPROM, EEPROMs, Non-volatile SRAM, Flash Memories.

Learning outcomes: At the end of this unit, the student will be able to

1. Describe the operation of Non-Volatile Memories (L2)
2. Evaluate the working of Floating Gate EPROM Cell (L5)
3. Develop Non-volatile SRAM and Flash RAMs (L6)

UNIT-IV 10 Lectures

Memory Reliability and Radiation Effects

General Reliability Issues, RAM Failure Modes and Mechanism, Nonvolatile Memory, Radiation Effects, SEP, Radiation Hardening Techniques. Process and Design Issues, Radiation Hardened Memory Characteristics, Radiation Hardness Assurance and Testing.

Learning outcomes: At the end of this unit, the student will be able to

1. Describe the importance of Memory Reliability and Radiation Effects (L2)
2. Summarize RAM Failure Modes and Mechanism (L2)
3. Demonstrate Radiation Hardness Assurance and Testing (L3)

UNIT-V 10 Lectures

Advanced Memory Technologies

Introduction to memory technologies, High-density Memory Packing Technologies, Ferroelectric Random Access Memories (FRAMs), Gallium Arsenide (GaAs) FRAMs, AnalogMemories, Magneto Resistive Random Access Memories (MRAMs), Experimental Memory Devices.

Learning outcomes: At the end of this unit, the student will be able to

1. Describe advanced memory technologies (L2)
2. Identify Analog Memories (L2)
3. Demonstrate Experimental Memory Devices (L3)

Text Books

Ashok K Sharma, *Advanced Semiconductor Memories: Architectures, Designs and Applications*", Wiley.

References

1. Kiyoo Itoh, *VLSI memory chip design*, Springer International Edition
2. Ashok K Sharma, *Semiconductor Memories: Technology, Testing and Reliability*, PHI.

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