



University of Tehran
School of Electrical and Computer Engineering

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|-------------------------------|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|----------------|
| Course:* | 8101... – Memory Technologies, Circuits, and Systems | | | | | | | | | |
| Course type:* | EE* | | | | | | CE* | | | Credit: ... |
| | Com | E | P | B | Con | D | SW | HW | IT | |
| | Required | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| | Elective | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| Level: | Undergraduate <input type="checkbox"/> Graduate <input type="checkbox"/> | | | | | | | | | |
| Co-requisite(s): | None. | | | | | | | | | |
| Prerequisite(s): | Advanced VLSI (8101...) | | | | | | | | | |
| Prerequisite by topic: | | | | | | | | | | |
| Textbook(s):* | <p>[1] A. Pavlov, and M. Sachdev, CMOS SRAM Circuit Design and Parametric Test in Nano-Scaled Technologies, Springer, 2008.</p> <p>[2] B. Jacob, S. Ng, and D. Wang, Memory Systems: Cache, DRAM, Disk, Morgan Kaufmann, 2007.</p> <p>[3] M. K. Qureshi, S. Gurumurthi, and B. Rajendran, Phase Change Memory: From Devices to Systems, Morgan & Clypool, 2011.</p> <p>[4] J. E. Brewer, and M. Gill, Nonvolatile Memory Technologies with Emphasis on Flash, Wiley, 2007.</p> <p>[5] H. Li, and Y. Chen, Nonvolatile Memory Design: Magnetic, Resistive, and Phase Change, CRC, 2011.</p> <p>[6] M. Verma, and P. Marwedel, Advanced Memory Optimization Techniques for Low-Power Embedded Processors, Springer, 2007.</p> | | | | | | | | | |
| Coordinator: |,, School of ECE | | | | | | | | | |
| Goals: | | | | | | | | | | |
| Outcome: | <p>Upon successful completion of the course, students will be able</p> <ol style="list-style-type: none"> 1. operation concepts of the transistor-based SRAM memory 2. different circuits of transistor-based SRAM 3. operation concepts of the transistor-based DRAM memory 4. operation concepts of the phase change memory devices and their circuits 5. operation concepts of the resistive memory devices and their circuits | | | | | | | | | |

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| | 6. operation concepts of the Flash memories and their circuits 7. important design parameters/characteristics of the memory cells |
| Topics: | <ol style="list-style-type: none"> 1) Basic operation of transistor devices 2) Transistor based memory devices <ol style="list-style-type: none"> a. SRAM circuit and operation b. SRAM cell stability c. DRAM circuit ad operation d. DRAM memory system organization e. DRAM access protocol & DRAM controller basics 3) Flash memories <ol style="list-style-type: none"> a. Basic operations of NAND Flash memory technology b. Basic operations of NOR Flash memory technology c. Multi-level cells of flash memory devices 4) Basic operation of phase change materials <ol style="list-style-type: none"> a. Operating principles of phase change memory devices 5) Basic operations of resistive memory (memristor) devices 6) 3D memory device technology 7) Memory Fault and Error Correction |
| Computer usage: | |
| Assignments: | to homework assignments |
| Projects: | |
| Grading: | Assignments: ... % Projects: ... % Quizzes: ... % Midterm exams: ...% Final exam: ... % |
| Further readings: | [1] |
| Prepared by: | |
| Date: | |

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|------------------------------------|----------------|---------------------------------|------------------------|
| *EE: Electrical Engineering | | CE: Computer Engineering | |
| Com | Communications | SW | Software |
| E | Electronics | HW | Hardware |
| P | Power | IT | Information Technology |
| B | Bioelectronics | | |
| Con | Control | | |
| D | Digital System | | |