

EEE 529: Semiconductor Memory Technologies and Systems

Course Description:

The functionality and performance of today's computing systems are increasingly dependent on the characteristics of the memory system. This course covers the memory device cell structures to the array design with emphasis on the industry trend and cutting-edge technologies. The concept of memory hierarchy is used as an outline throughout the course. The course starts by discussing the mainstream semiconductor memory device technologies that enable various levels in the memory hierarchy, including SRAM, DRAM, and FLASH technologies. Issues such as basic operation principles, device design considerations, and device scaling trend and peripheral circuitry will be addressed. In addition, emerging memory candidates that may have the potential to change the memory hierarchy are also introduced, e.g. STT-MRAM, FeFET, PCRAM, and RRAM.

Prospective Students:

Graduate students in electrical engineering or computer engineering programs, especially those majoring in semiconductor devices and circuit design are welcome to take the course. The course is a seminar and research-oriented course; thus, the students are expected to actively read the related literature as part of the learning process.

Prerequisites

Semiconductor device fundamentals and digital circuit courses, e.g. EEE 436 (Fund Solid State Devices) and EEE 425 (Digital Systems and Circuits) or an equivalent background are highly recommended.

Tentative Topics (subject to change)

1. SRAM
2. DRAM
3. FLASH
4. Emerging memories: PCM, RRAM, STT-MRAM, FeFET.
5. Memory array design including the peripheral circuitry