

## **EEE 598: 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 sub-system. This course covers the memory sub-system from the device cell structures to the array and architecture design with emphasis on the industry trend and cutting-edge technologies. The concept of memory hierarchy is used as an outline through the whole course. The first part of the course discusses 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, PCRAM, and RRAM. The second part of the course briefly discusses the memory architecture across different levels in the memory hierarchy, including the cache, main memory, and solid-state drive (SSD).

### **Prospective Students:**

Graduate students in electrical engineering program or computer engineering program, especially those majored in solid-state device, 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**

Circuit courses are required, e.g. EEE 425 - Digital Systems and Circuits, EEE 525 – VLSI Design

Courses related to solid state device and computer architecture are highly recommended, e.g. EEE 436 -Fund of Solid-State Devices, and CSE 420 - Computer Architecture.

### **Tentative Topics (subject to change)**

1. SRAM
2. DRAM
3. FLASH
4. Emerging memories: PCM, RRAM, STT-MRAM.
5. Memory array design including the peripheral circuitry
6. Architectural techniques for memory design
7. Cache/Main Memory/SSD organization.