CSCI 424/524: Computer Architecture
Spring 2008

Instructor:	Prof. Evgenia Smirni, `esmirni@cs.wm.edu` Office: M-S Hall 103, Phone: 1-3580
Time/Place:	TR 9:30–10:50, James Blair
Office hours:	TR 11:00-1:00, by appointment, or whenever you can find me
Textbook:	*Computer Organization and Design: The Hardware Software Interface, 3rd Edition* by and Patterson and Hennessy, Morgan-Kaufmann, 2007.
TA:	Eddy Zhang, `eddy@cs.wm.edu` Office: M-S Hall 108 Phone: 1-3484 Office hours: TBD

Synopsis/Purpose

CSCI 424/524 is the second Computer Architecture class that we offer at William and Mary. Following up on the material presented in CSCI 304, students will have the opportunity to learn more what's inside the "box", allowing them to make more effective use of computers, often achieving significant performance gains.

The focus will be on hardware technology that rapidly advances computer systems including the design of the CPU data path, control and pipelining, state-of-the-art architecture issues of memory hierarchy, I/O, and multiprocessor design. After completing the class, you will have a solid understanding of the following topics:

- **Evaluating Performance**: How to measure, report, and summarize performance, workloads and bencjmarks, new and old measures.
- **Datapath and Control**: We will focus on implementation techniques of ALU operations and the control mechanism for ALU, memory, I/O instructions and their corresponding operations.
- **Pipelining**: We will look into this very important design for overlapping computations and communications.
- **Memory Hierarchy**: With the rapid development of VLSI technology, the speed of processors has increased dramatically during the pas decade. Processor clock rates double every 2-3 years. Unfortunately, memory speed has been increasing at a much lower pace. In the '80s, processor speed increased approximately by a factor of 10, while memory access speed increased only by a factor of 2 to 3. Therefore, we have seen and will continue to see an increasing gap in speed between the processor and the memory. Building a memory hierarchy is an effective way to narrow this gap. Thus, the performance of computer systems relies more and more on the performance of caches, the first level and fast speed memory. We will emphasize on the cache design and virtual memory implementations.
- **I/O and interfaces**: The performance of data intensive applications, such as commercial database workloads, mainly rely on disks and high-performance graphics terminals, the two representative I/O devices. This type of applications has significantly increased in practice. We will overview the functions of I/O devices and their interfaces to computer systems.

- **Multiprocessors**: A computer system with multiple CPUs has become a standard for large scale computations. Low cost multiprocessor PCs and workstations are available in the market. We will introduce basic concepts of parallel processing and basic hardware configurations: bus-based multiprocessor systems, multi-core systems, and network of PCs/workstations.

Class Requirements

Prerequisite to the class is CSCI 304 or permission of the instructor. Your participation in the class will involve the following forms of activity: 1) attending the lectures, 2) doing homeworks/projects, 3) reading the book and supplemental material, and 4) taking the two exams (first scheduled on February 28, second scheduled early April) and final exam (scheduled on April 30, first period).

Class Policies

- No late homeworks/projects will be accepted.
- You are welcome to discuss with classmates class handouts, the textbook, even homeworks. You will not be allowed to:
  - take written notes while discussing homeworks/projects,
  - share code or electronic files, and
  - share written assignments.

Students with disabilities

If you have a disability that may affect your participation in this course and wish to discuss academic accommodations, please contact me as soon as possible.

Class Grading

Homeworks/projects will contribute 40% of the class grade. The two exams will contribute 30% of the class grade, and the final exam will contribute 30% of the class grade.