COMPSCI 703 - Advanced Computer Architecture

Course information 2006

Overview. This course covers advanced techniques of computer design: Traditional and contemporary techniques for capturing parallelism at different levels. Pipelining and cache memory techniques. Speculative execution. Multiprocessing and synchronization. This offering will provide a special emphasis on shared-memory multiprocessing issues.

Lecture topics

- Computer design and Moore's Law
- Multithreading & Multiprocessors
  - Cache coherence
  - Memory ordering
  - Transactional memory
  - Multithreading
  - Multi-cores
- Memory systems
  - Bandwidth & Latency
  - Memory hierarchies, Cache memory
- Methods of evaluating performance
  - Simulation
  - Benchmarks
- Microprogramming
- Instruction Sets
- Instruction-Level Parallelism (ILP)
  - Out-of-order execution
  - Branch prediction
  - Precise interrupts
  - Speculation and checkpointing
- Dataflow
- I/O

Teaching staff

Lecturer	Office	E-mail
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Assessment. Final exam is worth 50%. Assignments, including a major project, are worth 40%. A test, to be given on (tentatively) the evening of Tuesday, May 2, is worth 10%

Timetable. The class nominally meets three times per week, though there are four assigned lecture periods per week: 9am Tuesday, Wednesday, Thursday, & Friday. There will be an average of 3 lectures per week. All lectures will be in the CS Seminar room, 303.279.

Textbook. This course will include a number of papers in their original context, with readings from three recommended books:

- Hennessy & Patterson, *Computer Architecture: A Quantitative Approach* (3rd Ed.), 2003, Morgan Kaufmann, San Francisco, CA, USA.
- Hill, Jouppi, & Sohi, *Readings in Computer Architecture*, 2000.
- Culler & Singh, *Parallel Computer Architecture*, 1999, Morgan Kaufmann, San Francisco, CA, USA.

If you are serious about computer architecture, you will want to purchase the Hennessy/Patterson book, which is widely referenced in computer architecture literature.

Project. A major part of the course is a project. This should include use of simulation tools or other techniques for evaluating architectural features, though an alternative is to write a survey paper.

This information will be available on the CS703 web page.