Winter 2012

CEG 720: Computer Architecture I

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CEG 720 Computer Architecture I

Winter Quarter, 2012

Catalog Data: Review of sequential computer architecture and study of parallel computers. Topics include memory hierarchy, reduced instruction set computer, pipeline processing, multiprocessing, various parallel computers, and interconnection networks.

Prerequisite: CEG633, or CEG520 and CEG611
Prerequisite Topics: Process management, CPU scheduling, Memory management, Cache management. If not familiar with these topics, take CEG433/633 (Operating Systems) first.

Instructor: Dr. Soon M. Chung, 403 Russ Engineering Center (937-775-5119)
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Class: M. W. 6:05-7:20 pm at 002 Millet Hall.

Office hour: M. Tu. 4:30-5:30 pm at 403 Russ, or by appointment.
*use e-mail for short questions.

Text Book:
- J. L. Hennessy and D. A. Patterson, Computer Architecture, 5th edition, Morgan Kaufmann, 2011.

References:
- K. Hwang, Advanced Computer Architecture: Parallelism, Scalability, and Programmability, McGraw-Hill, 1993.
- A. Silberschatz, P. Galvin, and G. Gagne, Operating System Concepts.

Topics: Review of OS Concepts
Fundamentals of Quantitative Design and Analysis (Chap. 1)
Memory Hierarchy Design (Chap. 2)
Instruction Level Parallelism and Its Exploitation (Chap. 3)
Data Level Parallelism in Vectors, SIMD, and GPU Architectures (Chap. 4)

Grading: A:[85,100], B:[75,85), C:[65,75), D:[55,65), F:[0,55)
Midterm 30% (2/13, M.)
Final 40% (3/14, W., 8:00-10:00 pm)
Paper-review project 30% {papers referenced 7%, technical quality 8%, written presentation 6%, discussion 9%}

CEG 720 Project

1. Choose a topic and select at least 5 relevant technical papers. High-quality journal papers are preferred.
2. Summarize and compare the papers, and then add your own discussion.
3. Submit the working title and the list of candidate papers. (due 2/15)
4. Present in the class (?), and submit the report and the papers you studied. (due 3/14)
5. Size of the report is between 25 and 35 double-spaced pages.
6. This project can be done as an individual project or a team (of two) project.

Possible Topics

- Multiprocessor cache management
- Multicore processors
- SIMD, MIMD machines
- Fault tolerant computing
- Parallel algorithms
- Performance evaluation of parallel computers
- Interconnection networks
- Cluster computing
- GRID and Cloud computing
- RISC/CISC processors
- Reconfigurable array of processors
- Optical computing
- Application specific architectures
- Realtime computer systems
- Artificial neural network
- Other relevant topics

Reference Sources

- IEEE Transactions on Computer
- Computer (IEEE Computer Magazine)
- Communications of ACM
- IEEE Tutorials, such as Tutorial on computer architecture, on supercomputing, etc.
- Proceedings of Int'l Conf. on Parallel Processing
- Proceedings of Int'l Symposium on Computer Architecture: available in the volumes of Computer Architecture News
- Journal of Parallel and Distributed Computing
- ACM Transactions on Computer Systems
- IEEE Transactions on Parallel and Distributed Systems
- ACM Computing Surveys
- ACM/Springer Multimedia Systems
- IEEE Multimedia
- ACM Transactions on Modeling and Simulation
- IEEE Transactions on Knowledge and Data Engineering
- IEEE Transactions on VLSI
- IEEE Transactions on Neural Networks
- IEEE Micro
- Journal of Supercomputing

and others

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Prerequisite Test

Briefly answer the following questions.

1. What is the definition of a process?

2. List a couple of CPU scheduling algorithms and explain how they work.

3. Explain the *paging* memory management scheme and the role of a page table.

4. Explain a couple of cache block replacement algorithms.