

Brooklyn College
Department of Computer & Information Sciences

CISC 7302 [742.1X] Computer Architecture

37½ hours plus conference and independent work; 3 credits

Digital circuits and logic design. Gates, registers, counters, bus transfer. The arithmetic unit and machine algorithms for high-speed arithmetic. The control unit. Memory design and the analysis of hierarchical memory systems and their management. Input-output and communication techniques. Microprogramming. Comparison of advanced systems including multiprocessors, stack machines, parallel and pipeline processors, associative computers.

Textbook

"Computer Organization and Design: The Hardware/Software Interface, (4e)", Patterson and Hennessy, Morgan Kaufman, 2008

Syllabus

1. Digital design (2 weeks)

- Gates, truth tables and logic equations
- Combinatorial logic
- Memory
- Sequential logic
- Finite state machines

2. Computer Arithmetic (2 weeks)

- Integer arithmetic, addition/subtraction, multiplication, division
- Floating point arithmetic, addition, multiplication, division
- Optimization techniques

2. Computer performance (1 week)

- Underlying technology and technology trends
- Performance and cost
- Measuring performance and cost

3. Computer Instruction sets (1 week)

- Classifying instruction set architectures

- Memory addressing and operands
- Instruction set encoding
- Compilers

4. Pipelining (2 weeks)

- Pipeline basics
- Hazards, data hazards, control hazards, structural hazards
- Interrupts, exceptions, and pipelining
- Instruction set design and pipelining

5. Memory hierarchy (3 weeks)

- Caches, cache organizations
- Main memory, memory organizations
- Virtual memory

6. Mass storage and I/O (2 weeks)

- Buses
- I/O categories, polled, interrupt driven, DMA
- Types of storage devices
- Reliability and RAID

7. Multiprocessors (1 week)

- Application domains
- Centralized architectures
- Distributed architectures
- Synchronization
- Consistency

8. Final exam