

CSC 256 Machine Structures

Prerequisites: *a grade of C or better in CSC230 or CSC330*

Catalog Description: Digital logic circuits. Data representation. Assembly language programming. Subroutine linkage. Machine language encoding. Interrupt/exception handling. Memory system concepts. CPU organization and performance.

Objective: Introduce students to various topics in computer architecture and machine language. The student who completes this course will encounter and understand differing computer architectures, become familiar with multiple computer instruction sets, understand the basics data representation and gain assembly language proficiency.

Course Topics:

- Introduction to Digital Logic
- Integer and floating point representations
- Instruction set architecture and assembly language translation
- Input/output and interrupts
- Memory system architecture
- Functional organization
- Multiprocessing and advanced topics

Expanded Description:

- AR/DigitalLogicandDataRepresentation
Digital logic and circuits (3 hours)
Integer and floating point representation and arithmetic (3 hours)
Representation of non-numeric data, compression (1 hour)
- AR/ComputerArchitecture
History and system overview (1 hour)
Instruction set architecture and basic translation (4 hours)
Arrays and functions (7 hours)
- AR/InterfacingIO
Basic input/output concepts and technologies (1 hour)
Interrupts/signals (2 hours)
- AR/MemoryArchitecture
Storage systems and technologies (1 hour)
Memory hierarchy concepts (2 hours)
Cache memory operation (2 hours)

- AR/Functional Organization
 - Machine language representation (2 hours)
 - Introduction to register transfer language and microarchitecture (4 hours)
 - Basic concepts of pipelining and instruction-level parallelism (2 hours)
 - Performance concepts and power consumption (1 hour)
- AR/Multiprocessing
 - Amdahl's Law (1 hour)
 - Vector and multimedia operations (1 hour)
 - Multicore and multithreaded processors (1 hour)
 - Introduction to multiprocessor systems (2 hours)
 - GPUs and special purpose processors (1 hour)

Learning Outcomes:

At the end of this course students will be able to

- Translate C/C++ code into assembly language
- Perform simple optimizations by hand
- Trace and debug at the assembly level
- Understand and extend simple CPU implementations
- Understand basic interrupt/exception handling
- Make simple performance estimates for assembly code

Method of Evaluation:

Student learning will be evaluated on the basis of

- Completeness and quality of programming assignments
- Grade on two quizzes
- Grade on two midterm examinations
- Grade on final examination

The weight assigned to each element of evaluation will be determined by the instructor of the course on the first day of the class.

Missed Exams:

Generally, there will be no make-up exams and no incomplete grades given. If you miss an exam, you must notify me before the exam or, if physically impossible, soon after. If any of the scheduled exam dates are in conflict with your religious observances, you must notify me, in writing, at least two weeks in advance of the exam. If you have an acceptable, documented excuse, you may be given a make-up exam or be given the average score of other exam(s) at the discretion of the instructor. Note that a make-up exam will consist of questions/exercises that might have a degree of difficulty that does not match those on the original exam.

Students with disabilities:

Students with disabilities who need reasonable accommodations are encouraged to contact the instructor. The Disability Programs and Resource Center (DPRC) is available to facilitate the reasonable accommodations process. The DPRC is located in the Student Service Building and can be reached by telephone (voice/TTY 415-338-2472) or by email (dprc@sfsu.edu).

Attendance:

“Students are expected to attend classes regularly because classroom work is one of the necessary and important means of learning and of attaining the educational objectives of the institution.” (SFSU Bulletin) To this end, attendance will be taken at different times through the term. Students missing class on a day of attendance will lose attendance points.

Required Textbooks

Computer Organization, Patterson, D. and Hennessy, J. Morgan-Kaufmann, 2004

Created and approved: November 2009