Proposal for CMSC 216 - Introduction to Computer Systems

1 CMSC 216 topics

1.1 Topics

- Intro - Unix memory model - statics, stack, heap, etc. (1 week) - includes memory hierarchy - registers → cache → main memory → virtual memory
- Moving from Java to C - to support systems programming - arrays, memory management, I/O, machine representation of types, etc. (3 weeks; not necessarily contiguous)
- C pointers and dynamic data structures (2 weeks)
- C I/O, standard libraries (1 week)
- Data representation and floating point arithmetic (.5 weeks)
- Testing (0.5 weeks)
- Assembly language programming (1 week) - especially mapping between C and assembly/machine code - includes how function calls are implemented by the compiler (runtime stack management)
- Process control (0.5 week) - includes fork() and exec()
- Systems programming (1 week) - includes other system calls, and pipes
- Program measurement and optimization (1 week) - includes software optimization, by compiler or by hand - loop optimizations, array organization, etc.
- Multithreaded programming with pthreads (1 week)
- Libraries and linking (1 week)
- Implementing dynamic memory management (0.5 weeks) - heap management
- Programming tools (spread through semester, as needed for other topics)
  - Basic programming tools - including gcc, make, gdb (ddd - gdb GUI), valgrind/memcheck - early in semester
  - Advanced programming tools - including gcov, gprof, shared libraries, debugging (sentinel) - later in semester
Additional topics (if time permits):

- Network programming - sockets
- Hardware design, to go fast - pipelining, branch prediction, etc.
- Advanced C literacy - unions, ternary assignment, etc.

2 CMSC 216 details

2.1 Pre-requisites and Credits

Prerequisite: CMSC 132 (C or better)

Co-requisite: CMSC 250

4 credits (3 hours lecture, 2 hours discussion section)

2.2 Textbook

Required


A 2nd edition is coming out January 2010.

Recommended


3 Transition plan

The plan to transition from 212 and 311 to 216 involves transition semesters in which 216 and 311 are offered concurrently (this semester and Spring 2010). After the transition semesters, only 216 would be offered.

Typical students either will have passed 212 and take the subsequent transition semester 311 immediately, or will not have taken 212 and will take 216 instead.

Students who failed 212, so have not attempted 311, will take 216 instead.
Students who failed 311 will have an opportunity to retake 311 during the transition semesters, which will allow them to avoid repeated content. (Should students fail 311 twice, or choose not to retake 311 immediately, perhaps it is better for them to take 216.)