CS 213
Introduction to Computer Systems

Course Organization

David O'Hallaron
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Topics:
- Staff, text, and policies
- Lecture topics and assignments
- Lab rationale

Teaching staff

Instructors
- Prof. Randy Bryant (Wed 10:00-11:00, WeH 4220)
- Prof. David O'Hallaron (Tue 10:30-11:30, WeH 8125)

TA's
- Balaji Sarpeshkar (TBD, Wean Cluster)
- Sanjit Sesha (TBD, WeH 4126)
- Cory Williams (TBD, Wean Cluster)
- Yinglian Xie (TBD, WeH 4112)

Course Admin
- Rosemary Battenfelder (WeH 4218)

These are the nominal office hours. Come talk to us anytime!
(Or send email)

Textbooks

Brian Kernighan and Dennis Ritchie,

- *The C Programming Language, Second Edition*
- Prentice Hall, 1988

Randy Bryant and David O'Hallaron,

- *Computer Systems: A Programmer's Perspective*
- To be published by Prentice Hall, Summer, 2002.
- We'll be using a preliminary version.

Course Components

Lectures

- **higher level concepts**

Recitations

- **applied concepts, important tools and skills for labs, clarification of lectures, exam coverage**
- **recitation problems (assigned in lecture the previous Thursday)**

Labs

- **the heart of the course**
- **1 or 2 weeks**
- **provide in-depth understanding of an aspect of systems**
- **programming and measurement**

Getting Help

Web

- www.cs.cmu.edu/afs/cs/academic/class/15213-f01/www
- Copies of lectures, assignments, exams, solutions
- Clarifications to assignments
- Summaries of performance on exams and assignments

Newsgroup

- cmu.cs.class.cs213
- Clarifications to assignments, general discussion

Personal help

- Professors: door open means come on in (no appt necessary)
- TAs: please mail or zephyr first.

Policies: Assignments

Work groups

- You may do all labs in groups of up to 2

Handins

- Assignments due at 11:59pm on specified due date.
- Either 11:59pm Monday evening or 11:59pm Wednesday evening.
- Electronic handins only.

Makeup exams and assignments

- OK, but must make PRIOR arrangements with either Prof. Bryant or O'Hallaron.

Appealing grades

- Within 7 days of due date or exam date.
- Assignments: Talk to the lead person on the assignment
- Exams: Talk to either Prof. Bryant or O'Hallaron.

Policies: Grading

Exams (50%)

- **Two in class exams (12.5% each)**
- **Final (25%)**
- **All exams are open book/open notes.**

La s (50%)

- **7 labs, 4-12% each)**

Grading Characteristics

- **Lab scores tend to be high**
  - Serious handicap if you don't hand a lab in
- **Tests have big bearing on letter grade**
  - Wider range of scores
  - Only chance for us to evaluate individual performance

Facilities

Assignments will use Intel Computer Systems Cluster (aka "the fish machines")

- 25 Pentium III Xeon servers donated by Intel for CS 213
- 550 MHz with 256 MB memory.
- Rack mounted in the 3rd floor Wean machine room.
- We'll be setting up your accounts this week.

Getting help with the cluster machines:

- See "Information about the Intel Cluster" on the 213 homepage.
- Please direct questions to the CS Help Desk (identify yourself as a CS 213 student),
  - help@cs.cmu.edu
  - x8-4231 (24x7)
  - WeH 3613 9-5pm

Programs and Data (8)

Topics

- Bits operations, arithmetic, assembly language programs, representation of C control and data structures
- Includes aspects of of architecture and compilers

Assignments

- L1: Manipulating bits
- L2: Defusing a binary bomb
- L3: Defusing a buffer bomb

Performance (3)

Topics

- **High level processor models, code optimization (control and data), measuring time on a computer**
- **Includes aspects of architecture, compilers, and OS**

Assignments

- **L4: Optimizing Code Performance**

The Memory Hierarchy (2)

Topics

- **Memory technology, memory hierarchy, caches, disks, locality**
- **Includes aspects of architecture and OS.**

Assignments

- **L4: Optimizing Code Performance**

Linking and Exceptional Control Flow (3)

Topics

- Object files, static and dynamic linking, libraries, loading
- Hardware exceptions, processes, process control, Unix signals, nonlocal jumps
- Includes aspects of compilers, OS, and architecture

Assignments

- L5: Writing your own shell with job control

Virtual memory (4)

Topics

- **Virtual memory, address translation, dynamic storage allocation**
- **Includes aspects of architecture and OS**

Assignments

- **L6: Writing your own malloc package**

I/O, Networking, and Concurrency (6)

Topics

- **High level and low-level I/O, network programming, Internet services, Web servers**
- **concurrency, concurrent server design, threads, I/O multiplexing with select.**
- **Includes aspects of networking, OS, and architecture.**

Assignments

- **L7: Writing a Web proxy**

Lab Rationale

Each lab should have a well-defined goal such as solving a puzzle or winning a contest.

- Defusing a binary bomb.
- Winning a performance contest.

Doing a lab should result in new skills and concepts

- Bit Manipulation: computer arithmetic, digital logic.
- Bombs: assembly language, using a debugger, understanding stack
- Perf: profiling, measurement, performance debugging.
- Shell: understanding Unix process control and signals
- Malloc: understanding pointers and nasty memory bugs.
- Proxy: network programming, server design

We try to use competition in a fun and healthy way.

- Set a threshhold for full credit.
- Post intermediate results (anonymized) on Web page for glory!