

15-213

*“The Class That Gives CMU Its Zip!”*

## Introduction to Computer Systems

David R. O’Hallaron  
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### Topics:

- Staff, text, and policies
- Lecture topics and assignments
- Lab rationale and infrastructure

class01b.ppt

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## Teaching staff

- Instructors
  - Prof. Randal E. Bryant
  - Prof. David R. O’Hallaron
- TA’s
  - Ashwin Bharambe
  - Michael Brotzman
  - Tudor Dumitras
  - Donnie Kim
  - Amit Manjhi
- Course Admins
  - Cindy Chemsak (NSH 4303)
  - Barb Grandillo (WeH 8018)

Come talk to us anytime!  
(Or phone or send email)

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## Textbooks

Randal E. Bryant and David R. O’Hallaron,

- “Computer Systems: A Programmer’s Perspective”, Prentice Hall 2003.
- <http://csapp.cs.cmu.edu>

Brian Kernighan and Dennis Ritchie,

- “The C Programming Language, Second Edition”, Prentice Hall, 1988

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## Course Components

### Lectures

- Higher level concepts

### Recitations

- Applied concepts, important tools and skills for labs, clarification of lectures, exam coverage

### Labs

- The heart of the course
- 1 or 2 weeks
- Provide in-depth understanding of an aspect of systems
- Programming and measurement

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# Getting Help

## Class Web Page

- <http://www.cs.cmu.edu/~213>
- Copies of lectures, assignments, exams, solutions
- Clarifications to assignments

## Message Board

- <http://autolab.cs.cmu.edu>
- Clarifications to assignments, general discussion
- The only board your instructors will be monitoring (No blackboard or Andrew)

## Personal help

- Professors:
  - R. Bryant, office hour or appt.
  - D. O'Hallaron, office hour, appt, or when door is open.
- TAs: office hour, email, or appt.

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# Policies: Assignments

## Work groups

- You must work alone on all labs

## Handins

- Assignments due at 11:59pm on Wed or Fri evening
- Electronic handins using Autolab (no exceptions!).

## Makeup exams and assignments

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

## Appealing grades

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

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# Cheating

## What is cheating?

- Sharing code: either by copying, retyping, looking at, or supplying a copy of a file.
- Coaching: helping your friend to write a lab, line by line.

## What is NOT cheating?

- Helping others use systems or tools.
- Helping others with high-level design issues.
- Helping others debug their code.

## Penalty for cheating:

- Removal from course with failing grade.

## Detection of cheating:

- We do check and our tools for doing this are much better than you think!

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# Policies: Grading

## Exams (40%)

- Two in class exams (10% each)
- Final (20%)
- All exams are open book / open notes.

## Labs (60%)

- 7 labs (6-12% each)

## Grading Characteristics

- Lab scores tend to be high
  - Serious handicap if you don't hand a lab in
  - We offer generous redemption programs
- Tests typically have a wider range of scores

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## Facilities

### Labs will use the Intel Computer Systems Cluster (aka “the fish machines”)

- 15 Pentium Xeon servers donated by Intel for CS 213
- Dual 3.2 Ghz 64-bit (EM64T) Nocona Xeon processors
- 2 GB, 400 MHz DDR2 SDRAM memory
- Rack mounted in the 3rd floor Wean Hall machine room.
- Your accounts are ready.

### Getting help with the cluster machines:

- See course Web page for login directions
- Please direct questions to your TA’s first

## Logging into Fish Machines

**Read description on the course web-page carefully**

**Run checkin script (once only) to setup Kerberos credentials**

- `% /afs/cs/academic/class/15213-f06/bin/checkin`

**Login using your Andrew ID and password:**

- `% ssh -x -l bovik@ANDREW.CMU.EDU tuna.ics.cs.cmu.edu`

**Keep your code in your “213hw” directory on your *Andrew* account**

## Programs and Data (6)

### Topics

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

### Assignments

- L1 (datalab): Manipulating bits
- L2 (bomblab): Defusing a binary bomb
- L3 (buflab): Hacking a buffer bomb

## Performance (2)

### Topics

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

### Assignments

- L4 (perflab): Optimizing code performance

## The Memory Hierarchy (2)

### Topics

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

### Assignments

- L4 (perflab): 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 (tshlab): 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 (malloclab): 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 (proxylab): Writing your own Web proxy

## Lab Rationale

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

Doing a lab should result in new skills and concepts

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

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

## Autolab Web Service

Labs are provided by the Autolab system

- Autograding handin system developed in 2003 by Dave O'Hallaron
- Apache Web server + Perl CGI programs
- Beta tested Fall 2003, very stable by now

With Autolab you can use your Web browser to:

- Review lab notes, clarifications
- Download the lab materials
- Stream autoresults to a *class status Web page* as you work.
- Handin your code for autograding by the Autolab server.
- View the complete history of your code handins, autoresult submissions, autograding reports, and instructor evaluations.
- View the class status page

**Good Luck!**