

# Course Logistics

15-213 (18-213): Introduction to Computer Systems

1<sup>st</sup> Lecture, Aug. 26, 2014

## Instructors:

Greg Ganger, Greg Kesden, and Dave O'Hallaron

The course that gives CMU its “Zip”!

# Textbooks

- Randal E. Bryant and David R. O'Hallaron,
  - *Computer Systems: A Programmer's Perspective*, Second Edition (CS:APP2e), Prentice Hall, 2011
  - <http://csapp.cs.cmu.edu>
  - This book really matters for the course!
    - How to solve labs
    - Practice problems typical of exam problems
  
- Brian Kernighan and Dennis Ritchie,
  - *The C Programming Language*, Second Edition, Prentice Hall, 1988
  - Still the best book about C, from the originators

# Course Components

## ■ Lectures

- Higher level concepts

## ■ Recitations

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

## ■ Labs (7)

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

## ■ Exams (midterm + final)

- Test your understanding of concepts & mathematical principles

# Getting Help

- Class Web page: <http://www.cs.cmu.edu/~213>
  - Complete schedule of lectures, exams, and assignments
  - Copies of lectures, assignments, exams, solutions
  - Clarifications to assignments
- Blackboard and Piazza
  - We won't be using Blackboard or Piazza for the course

# Getting Help

- Staff mailing list: **15-213-staff@cs.cmu.edu**
  - Use this for all communication with the teaching staff
  - Always CC staff mailing list during email exchanges
  - Send email to individual instructors only to schedule appointments
  
- Office hours (starting Tue Sept 2):
  - SMTWR, 5:30-8:30pm, WeH 5207
  
- 1:1 Appointments
  - You can schedule 1:1 appointments with any of the teaching staff

# Policies: Labs And Exams

- Work groups
  - You must work alone on all lab assignments
- Handins
  - Labs due at 11:59pm on Tues or Thurs
  - Electronic handins using **Autolab** (no exceptions!)
- Exams
  - Exams will be online in network-isolated clusters
  - Held over multiple days. Sign up for a slot
- Appealing grades
  - In **writing** to Prof O'Hallaron within 7 days of completion of grading
  - Follow formal procedure described in syllabus

# Facilities

- Labs will use the Intel Linux Computer Systems Cluster
  - AKA the “shark machines”
  - Login to the any shark machine:
    - `linux> ssh -X shark.ics.cs.cmu.edu`
  - Login to a particular machine:
    - `linux> ssh -X angelshark.ics.cs.cmu.edu`
  - Login using your Andrew credentials
  
- List of machines at
  - `http://www.cs.cmu.edu/~213/labmachines.html`

# Shark Machines

- 21 servers donated by Intel for 213
  - 10 student machines (for student logins)
  - 1 head node (for Autolab server and instructor logins)
  - 10 grading machines (for autograding)
- Each server:
  - Core i7 system with 8 Nehalem cores, 32 GB DRAM, Linux
  - Rack mounted in Gates machine room
- Getting help with the cluster machines:
  - Please direct questions to staff mailing list

# Timeliness

## ■ Grace days

- **5 grace days** for the semester
- Limit of **2 grace days** per lab used **automatically**
- Covers scheduling crunch, out-of-town trips, illnesses, minor setbacks
- Save them until late in the term!

## ■ Lateness penalties

- Once grace day(s) used up, get penalized **15% per day**
- No handins later than **3 days after due date**

## ■ Catastrophic events

- Major illness, death in family, ...
- Formulate a plan (with your academic advisor) to get back on track

## ■ Advice

- Once you start running late, it's really hard to catch up

# Cheating: Description

- Please pay close attention, especially if this is your first semester at CMU
  
- What is cheating?
  - Sharing code: by copying, retyping, **looking at**, or supplying a file
  - Describing: Verbal description of code from one person to another.
  - Coaching: helping your friend to write a lab, line by line
  - Copying code from a previous course or online solution
    - Only allowed to use code we supply, or from CS:APP website
  
- What is NOT cheating?
  - Explaining how to use systems or tools
  - Helping others with high-level design issues
  
- See the course syllabus for details.

# Cheating: Consequences

- Penalty for cheating:
  - Removal from course with failing grade (no exceptions!)
  - Permanent mark on your record
  - Your instructors' contempt
- Detection of cheating:
  - Last Fall, 17 students were caught cheating and failed the course.
- Don't do it!
  - Start early
  - Ask the staff for help when you get stuck

# Other Rules of the Lecture Hall

- Laptops: permitted
  
- Electronic communications: **forbidden**
  - No email, instant messaging, cell phone calls, etc
  
- Presence in lectures, recitations: voluntary, recommended
  
- No recordings of ANY KIND

# Policies: Grading

- Exams (50%): midterm (20%), final (30%)
- Labs (50%): weighted according to effort
- Final grades based on a combination of straight scale and possibly a tiny amount of curving.

# Programs and Data

## ■ 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

# The Memory Hierarchy

## ■ Topics

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

## ■ Assignments

- L4 (cachelab): Building a cache simulator and optimizing for locality.
  - Learn how to exploit locality in your programs.

# Exceptional Control Flow

## ■ Topics

- Hardware exceptions, processes, process control, Unix signals, nonlocal jumps
- Includes aspects of compilers, OS, and architecture

## ■ Assignments

- L5 (tshlab): Writing your own Unix shell.
  - A first introduction to concurrency

# Virtual Memory

## ■ Topics

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

## ■ Assignments

- L6 (malloclab): Writing your own malloc package
  - Get a real feel for systems-level programming

# Networking, and Concurrency

## ■ 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
  - Learn network programming and more about concurrency and synchronization.

# Lab Rationale

- Each lab has a well-defined goal such as solving a puzzle or winning a contest
- Doing the 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 Autolab scoreboard for glory!

# Autolab (<https://autolab.cs.cmu.edu>)

- Labs are provided by the CMU Autolab system
  - Project page: <http://autolab.cs.cmu.edu>
  - Developed by CMU faculty and students
  - Key ideas: Autograding and Scoreboards
    - **Autograding:** Using VMs on-demand to evaluate untrusted code.
    - **Scoreboards:** Real-time, rank-ordered, and anonymous summary.
  - Used by over 2,500 CMU students each semester, since Fall, 2010
- With Autolab you can use your Web browser to:
  - Download the lab materials
  - Handin your code for autograding by the Autolab server
  - View the class scoreboard
  - View the complete history of your code handins, autograded results, instructor's evaluations, and gradebook.
  - View the TA annotations of your code for Style points.

# Autolab accounts

- Students enrolled 10am on Mon, Aug 25 have Autolab accounts
- You must be enrolled to get an account
  - Autolab is not tied in to the Hub's rosters
  - If you add in, contact [15-213-staff@cs.cmu.edu](mailto:15-213-staff@cs.cmu.edu) for an account
- For those who are waiting to add in, the first lab (datalab) will be available on the Schedule page of the course Web site.

# Waitlist or enrollment questions

- 15-213: Catherine Fichtner ([cathyf@cs.cmu.edu](mailto:cathyf@cs.cmu.edu))
- 18-213: Chelsea Mastilak ([cmastila@andrew.cmu.edu](mailto:cmastila@andrew.cmu.edu))
- Please don't contact the instructors with waitlist questions.

Welcome  
and Enjoy!