Course Logistics

15-213 (15-513, 18-213): Introduction to Computer Systems
1st Lecture, May 19, 2015

Instructors:

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(With thanks to Greg Ganger, Dave O'Hallaron, and many others)

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
  - (3rd edition probably fine, if that's what you have)

- **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

Recitations

- **When? Possible options:**
  - Monday or Friday, same time as class
  - Later on Monday
  - T/W/R afternoon (I'll move office hours out of the way!)
  - Others?
- **Homeworks generally on Tues/Tues cycle, FYI.**

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 Piazza for the course
  - Blackboard just for video distribution

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**

- **My office hours (starting tomorrow):**
  - Usually TWR, 3:30-5:00pm, location TBA.
    - May move occasionally; will let you know if so!
  - These are deliberately scheduled so that you can look at material over lunch and **then** come find me. ☺

- **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
    - If you do not have Andrew credentials, **please let us know**.
  - 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
- **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, but**
  - Please be aware of their distracting potential
    - Please do not: IM, watch movies (!), browse the web, …
  - Failing to pay attention is not good grounds to ask me to repeat material

- **Presence in lectures, recitations: voluntary, recommended**

- **No recordings of ANY KIND without MY explicit permission**
  - If you feel that the existing recording is not working out for you, please come talk to me because it probably represents a broader need.

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

- **Everyone should 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 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)
- 18-213: Chelsea Mastilak (cmastila@andrew.cmu.edu)

- Please don't contact the instructors with waitlist questions.

Welcome
and Enjoy!