Lecture 1:
Course Introduction

CSE 123: Computer Networks
Aaron Schulman (aka Aaron Shalev)
Lecture 1 Overview

- Class overview
  - Expected outcomes
  - Structure of the course
  - Policies and procedures

- A brief overview of Computer Networking
  - High-level concepts
  - An end-to-end example
Personnel

- Instructor: **Aaron Schulman (aka Aaron Shalev)**
  - Office hours Tuesdays 1pm-2pm or by appointment
  - EBU3B 3120

- Project TAs:
  - **Alex Gamero-Garrido**
    - Office hours Thursdays 2-3pm
    - EBU3B B275
  - **Spoorti Joshi**
    - Office hours Tuesday 3-4pm
    - EBU3B B270A

- Project/Homework Tutor: **Sneh Shah**
  - Office hours Friday 12-1pm
  - EBU3B B275
Prereqs

- CSE30, CSE101, and CSE110 – *not* CSE120
  - Undergrads can’t enroll without them
  - We expect it (or equivalent) even for grad students

- Programming experience
  - We will be assigning programming projects in C/C++
  - This course will not teach you C. The TAs will help, but you need to learn it on your own if you don’t already know it.
Expected Outcomes

- This course *will* teach you the *fundamentals* of computer networks:
  - Layering, signaling, framing, MAC, switching, routing, naming, Internetworking, congestion control, router design, etc.
  - At the end of this course you should completely understand what’s actually happening when you view a Web page

- This course *will not* teach you signals and coding
  - Take an EE course to learn about modulation, encoding, etc. on different hardware technologies

- Similarly, we will not cover Internet apps/services
  - CSE124 covers application layer protocols, Web, etc.
  - You *will be able to* pick this up on your own with Google
CSE 123 Class Overview

- Course material taught through class lectures, textbook readings, and discussion sections

- Course assignments are
  - Homework questions (based on lecture)
  - Two substantial programming projects

- Discussion section: (Friday 3pm Mandeville Center 210)
  - Help you get started on the projects
  - Lecture material and homework
  - Additional networking topics

- Discussion board (Piazza.com)
  - The place to ask questions about lecture, hw, projects, etc.
Textbook


PDF, eBook, HTML, and source! available at:
Homeworks

- There will be 4 homeworks throughout the quarter
  - Reinforce lecture material…no better practice

- Collaboration vs. cheating
  - You *should* discuss homework problems with others
    - You can learn a lot from each other
  - But there is a distinction between collaboration and cheating
  - Rule of thumb: Discuss together in library, walk home, and write up answers independently
  - Cheating is copying from other student’s homeworks or solution sets, searching for answers on the Web, etc.
  - Suspicious homeworks will be flagged for review
Projects

- There will be two programming projects
  - You will have three/five weeks to complete each
  - The first will be assigned THIS WEEK

- The projects must be completed in C/C++
  - We will provide skeleton code for you to use
  - Your job is to fill in the interesting/hard parts
  - The TAs will be available to help with coding

- The projects are INDIVIDUAL assignments
  - All code must be your own (not copied from github!)
  - OK to discuss design ideas, NOT OK to share/look at code
  - Projects assigned AND SUBMITTED via private GitHub repo
Computer Labs

- You are welcome to use any Linux machine in the labs in the basement of the CSE/EBU3B building
  - Linux running on Intel machines

- You can also use your home machine
  - The project source will work on Windows/OS X (with caveats)
  - Graders will test on ieng6 machines
  - Be sure to test your projects there as well
Exams

- Midterm
  - Friday, May 3rd
  - Covers first third to half of class
- Final
  - Thursday, June 13\textsuperscript{th} (11:30am-2:30pm)
  - Covers second half of class + selected material from first part
    » I will be explicit about the material covered
- No makeup exams
  - Unless dire circumstances
- Closed book with crib sheet
  - You can bring one double-sided 8.5x11” page of notes to each exam to assist you in answering the questions
  - Not a substitute for thinking
Grading

- Homeworks: 12%
  - Think of these collectively as a take-home midterm

- Midterm: 21%

- Final: 25%

- Projects: 42%
  - Divided evenly among the projects
How Not To Pass CSE 123

- Do not come to lecture / discussion
  - It’s nice out, class is after lunch, and the material is in the book anyway…
  - Lecture material is the primary basis for exams and directly relates to the projects
  - Besides, the professor thinks he’s entertaining

- Do not do the homework
  - It’s only 12% of the grade
  - Excellent practice for the exams, and some homework problems are exercises for helping with the project
  - 12% is actually a significant fraction of your grade (easily the difference between an A and a C)
How Not To Pass (2)

- Do not ask questions in lecture, office hours, or email
  - Professor is scary, I don’t want to embarrass myself
  - Asking questions is the best way to clarify lecture material at the time it is being presented
  - Bring your concerns to the professor early (avoid snowball)
  - Office hours and email will help with homeworks, projects

- Wait until the last couple of days to start a project
  - We’ll have to do the crunch anyways, why do it early?
  - The projects cannot be done in the last couple of days
  - Repeat: The projects cannot be done in the last couple of days
Class Web Page

http://www.cs.ucsd.edu/classes/sp19/cse123-a/

- Serves many roles…
  - Course syllabus and schedule (updated as quarter progresses)
    » Lecture slides
  - Announcements
  - Homework handouts
  - Project information
Questions

● Before we start the material, any questions about the class structure, contents, etc.?
This Class in One Slide

- **Protocols & Layering**
  - Manage complexity by decomposing the tasks
  - Standardizing syntax and semantics to support interoperability

- **Naming**
  - Agreeing on how to describe a host, application, network, etc.

- **Switching & Routing**
  - Deciding how to get from here to there
  - Forwarding messages across multiple physical components

- **Resource Allocation**
  - Figuring out how to share finite bandwidth, memory, etc.
A “Simple” Task

- Send information from one computer to another
  - Endpoints are called **hosts**
    - Could be computer, iPhone, laptop, etc.
  - The plumbing is called a **link**
    - We don’t care what the physical technology is: Ethernet, wireless, cellular, etc.
ROUGHLY, what happens when I click on a Web page from UCSD?

My iPhone

www.muirskate.com

Internet
Web request (HTTP)

- Turn click into HTTP request

GET https://www.muirskate.com/ HTTP/1.1
Host: www.muirskate.com
Connection: keep-alive
...
Name resolution (DNS)

- Where is www.muirskate.com?

My computer
(132.239.9.64)

Local DNS server
(132.239.51.18)

Where is www.muirskate.com?

Many hosts have it, one is 104.20.86.126
Data transport (TCP)

- Break message into packets (TCP segments)
- Should be delivered reliably & in-order

GET http://www.muirskate.com HTTP/1.1
Host: www.muirskate.com
Connection: keep-alive
...

“and let me know when they got there”
Global Network Addressing

- Address each packet so it can traverse network and arrive at host

My computer
(132.239.9.64)

www.muirskate.com
(104.20.86.126)
Network Routing

- Each router forwards packet towards destination
Link management (WiFi)

- Break message into frames
- Media Access Control (MAC)
  - Can I send now? Can I send now?
- Send frame
**Physical layer**

- **802.11ac Wireless Access Point**
  - 5.8 Ghz Radio
  - OFDM/MIMO 4x4
  - 1 - 1,300 Mbps

- **Cat 6 Cable (4 pairs)**
  - NBase-T Ethernet
  - 10 Gbps

- **Ethernet switch/router**

- **To campus backbone**

- **100 Gbps Ethernet**

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CSE 123 – Lecture 1: Course Introduction
For Next Class...

- Browse the course web
  - http://www.cs.ucsd.edu/classes/sp19/cse123-a/

- Read Chapter 1.3 and 2.3

- Next class: Layers and Framing

- Drop now or plan to stick it out!