CSEE 4119 - Computer Networks

Fall 2017
Instructor: Ethan Katz-Bassett
Tuesdays/Thursdays 1:10pm-2:25pm
301 Pupin Laboratories

Updates to this Document

See Piazza for the newest version of this document.

List of updates:
2017-09-04: nothing to date.
2017-09-05: added links to Piazza and CourseWorks.

Description

This course provides an introduction to computer networks and the technical foundations of the Internet, including applications, protocols, algorithms for routing and transport/congestion control, and local area networks. The course assumes students have background in computer science and/or electrical engineering, but it does not assume background in networks.

The course will cover key network "layers" and how they operate together to provide services, with an emphasis on:

- Application, transport, network, and link layers.
- A "top-down" approach, starting from applications we all use every day in order to derive the requirements they place on the network, moving to how the layers below the applications provide these requirements.
- How these layers manifest in the Internet, and how the Internet's design has facilitated its tremendous growth.
- The emerging *software-defined networking (SDN)* separation of the network control plane from the network data plane.

Logistics

Location

Instructors and Office Hours

- Professor: Ethan Katz-Bassett <ebk2141@columbia.edu>. Office hour: 3-4pm Thursdays in CEPSR 712, or by appointment.
- TAs
  - Yuhao Zhang <yz3044@columbia.edu>. Office hour TBD.
  - Benjamin Low <bkl2115@columbia.edu>. Office hour Tue 10am-12pm.
  - Jiajun Zhang <jz2793@columbia.edu>. Office hour TBD.
  - Garrett Kaighn <grk2114@columbia.edu>. Office hour TBD.

Book

We will use the 7th edition of the book "Computer Networking: a top-down approach" by James F. Kurose and Keith W. Ross. (Unfortunately, I have to recommend against using earlier editions for this class, as they are missing important material and are organized differently in places). We will cover chapters 1-6. If time remains, we will cover one of chapters 7-9. We may also occasionally cover supplemental material, which will be indicated on the detailed syllabus.

The detailed Syllabus describes which chapters we will cover on which days. Subsection-level details will be added as we see how quickly we progress through the material. below It is strongly recommended that you read the material before class.

Course Structure and Grading

In addition to reading the book and participating in class, you will complete homework assignments, an in-class midterm, and a final exam at the university-designated time during the finals period. The grading breakdown is as follows (percentages may be adjusted):

- **50%: Homework assignments:**
  - ~3 purely written and ~3 programming plus written answers about the program, assigned roughly every other week.
  - The programming assignments will likely include one each on Application Layer, Transport Layer, and Network Layer.
  - Each programming assignment will contribute twice as much to your final grade as a written assignment.
- **15%: Midterm:**
  - The midterm is one class period, closed book, closed notes. The midterm will cover all material discussed in the course up to the week before the exam.
- **35%: Final:**
  - The final exam is scheduled at the normal final exam time for this class period. The final is closed book, closed notes. The final is cumulative and will cover all material discussed in the course.
- **0%:**
  - No "extra credit" work.

Homework Submission and Late Policy

The due date and time of an assignment will be specified in the assignment (usually one or two weeks after it is issued). Please submit your homework electronically, through CourseWorks. Each assignment will include complete submission instructions.

You can submit your assignment multiple times, but the last submission is what counts. Each submission will be time stamped. Proper submission is your responsibility; we strongly urge you to make sure you understand the submission process and submit early. You can always submit again up until the deadline, so we strongly urge you to submit well before the deadline and then submit again if you have a more updated assignment to submit later.

Each day (24-hour period) or partial day late incurs a 20% penalty on the assignment. However, you are allowed a total of 3 *slip days*, to be used as you wish throughout the semester. That means you can be three days (24 hour periods) late for Homework 2 (for example), or one day late for each of the first three homework assignments, with no point penalty. Each slip day entitles you to 24 hours beyond the submission deadline. To use a slip day, you must send a message to all instructors (professor/TAs/CAs) on Piazza, indicating how many slip days you want to use for which assignment. You must send the message no later than 12 hours after submitting the assignment (and you may send it before submitting if you wish). We will not accept slip day requests via any other means. No other extensions will be given, except for medical emergencies certified by University Health Services or a family emergency. Naturally, you may hand in incomplete assignments for partial credit by the deadline.

Academic Integrity

The rules for [Columbia University](#), the [CS Department](#), and the EE Department (via SEAS: [1](#) and [2](#)) apply. It is your responsibility to carefully read these policies and ask the professor (via Piazza) if you have any questions about academic integrity for the course. Please ask the professor before submitting the assignment, with enough time to resolve the issue before the deadline. A misunderstanding of university or class policies is not an excuse for violating a policy.

Please note that this class requires closely obeying the policy on academic integrity, and has zero tolerance on plagiarism for all assignments, including both programming assignments and written assignments. By zero tolerance, we mean that the minimum punishment for plagiarism/cheating is a 0 for the assignment, and all cases will be referred to the Dean of Students.

Unless explicitly stated otherwise on the assignment itself, assignments must be completed individually. For programming assignments, in particular, you must write all the code you hand in, except for code that we give you as part of the assignments. You are not allowed to look at anyone else's solution (including solutions on the Internet, if there are any), and you are not allowed to look at code from previous years. You may discuss the assignments with other students at the conceptual level, but you may not write pseudocode together, or look at or copy each other's code. Please do not publish your code or make it available to future students -- for example, please do not make your code visible on Github. You may look at documentation from the tools' websites. However, you may not use external libraries unless granted explicit permission by the professor or TA. If you copy material from textbooks, journal articles, manuals, etc., you **must** include a citation that gives proper credit to the source to avoid suspicion of plagiarism. If you are unsure how to properly cite, you can use the web to find references on scientific citations, or ask fellow students and TAs on Piazza.

For each programming assignment, we will use software to check for plagiarized code.

Note: You *must* set permissions on any homework assignments so that they are readable only by you. You may get reprimanded for facilitating cheating if you do not follow this rule.

Course Announcements, Submissions, and Questions

Please be sure you are signed up for the class's [Courseworks](#) and [Piazza](#) pages, and please monitor emails from them about class. The course is listed as "CSEEW 4119_001_2017_3: COMPUTER NETWORKS" for both. Homework assignments are submitted via Courseworks (Canvas). The Piazza mailing list (and occasionally the Courseworks list) will be used for announcements. We are using the Piazza Discussion Forum for class discussions.

Please submit questions about the class (assignments, logistics, clarifications about things that came up in lecture, etc) via Piazza:
- Unless the topic is sensitive, please address your question to the professor and all TAs. This will help you get an answer sooner and help us all stay on the same page.
- Unless the topic is sensitive, please make the question visible to your classmates, so that others can benefit. You are welcome to submit the question anonymously if you prefer.
- If you email us a question, we will ask you to instead post it on Piazza.

Feedback

We would like the course to run smoothly, and we'd like you to enjoy the course and learn from it. Feel free to let us know what you find good and interesting about the course. Let us know sooner about the reverse. See us during office hours or send us a message via Piazza.

Statement for Students with Disabilities

We will make reasonable accommodations for persons with documented disabilities. In order to receive disability-related academic accommodations, students must first be registered with Disability Services (DS). More information on the DS registration process is available online at www.health.columbia.edu/ods. Faculty must be notified (via appropriate documentation) of registered students' accommodations before exam or other accommodations will be provided. Students who have, or think they may have, a disability are invited to contact Disability Services for a confidential discussion at (212) 854-2388 (Voice/TTY) or by email at disability@columbia.edu. As your instructor, I am happy to discuss specific needs with you as well.

Syllabus

Course Overview and Intro

1. Tues. Sept. 5. Course Intro and Overview (1): What is the Internet?
2. Thurs. Sept. 7. Course Intro and Overview (2): Edge and Core
3. Tues. Sept. 12. Overview (3): Performance, Protocol Layering
4. Thurs. Sept. 14. Overview (4): Protocol Layering

Application Layer

5. Tues. Sept. 19. Application (1): Principles of Network Applications
6. Thurs. Sept. 21. Application (2): The World Wide Web, HTTP, and Email
7. Tues. Sept. 26. Application (3): Email (cont), DNS
8. Thurs. Sept. 28. Application (4): P2P, Video Streaming, CDNs
9. Tues. Oct. 3. Application (5): Socket Programming

Transport Layer

10. Thurs. Oct. 5. Transport (1):
11. Tues. Oct. 10. Transport (2):
12. Thurs. Oct. 12. Transport (3):
13. Tues. Oct. 17. Transport (4):
14. Thurs. Oct. 19. Transport (5):
15. **MIDTERM** Tues. Oct. 24. **MIDTERM.**

IMPORTANT NOTE: The exact date of the midterm may change depending on how quickly we progress through material. It will be in class and will cover up through as much of the transport layer material as we can finish.

Network Layer Part 1: The Data Plane

16. Thurs. Oct. 26. Network Data Plane (1):
17. Tues. Oct. 31. Network Data Plane (2):
18. Thurs. Nov. 2. Network Data Plane (3):

No Class Tues. Nov. 7. **Election Day - University Holiday.**

Network Layer Part 2: The Control Plane

19. Thurs. Nov. 9. Network Control Plane (1):
20. Tues. Nov. 14. Network Control Plane (2):
21. Thurs. Nov. 16. Network Control Plane (3):

Link Layer and LANs

22. Tues. Nov. 21. Link (1):

No Class Thurs. Nov. 23. **Thanksgiving - University Holiday.**

23. Tues. Nov. 28. Link (2):
24. Thurs. Nov. 30. Link (3):
25. Tues. Dec. 5. Link (4):
26. Thurs. Dec. 7. Wrap up and review.

No Class Tues. Dec. 12. **Study Days**

No Class Thurs. Dec. 14. **Study Days**

Final Tues. Dec. 19. 1:10-4:00pm **Projected Final Exam Schedule**

IMPORTANT NOTE: The final exam will be at the university-designated time. This time is the projected time, but it is subject to change. The registrar's office and website specify the schedule and its status.