

CS 485/ECE 440/CS 585 Computer Networks, Fall 2015

Instructor: Jed Crandall, crandall@cs.unm.edu

PGP info is on my website: <https://www.cs.unm.edu/~crandall>

Never hesitate to email me directly about anything. If you're emailing me something about a group assignment, always cc the members of your group unless there's some reason for privacy.

Office and office hours: FEC 335, Mondays and Tuesdays from 1:30pm to 3:00pm, or by appointment.

Class meeting time and place: MWF from 10am to 10:50am, in CEC B146 (the lab in the basement of the Centennial Engineering Center). Attendance will not be recorded and will not be explicitly part of your grade, but I strongly encourage you to attend class regularly because we're going to move at a fast pace.

Prerequisites: None formally, having taken CS 341 (Computer Organization and Design) or an equivalent class from your undergraduate institution before taking this class is recommended. We won't use any assembly or computer architecture material in this class, but when I discuss systems issues such as context switches or system calls I will generally be assuming that all students understand these things as they would coming out of CS 341 and entering CS 481. We will review these topics briefly at the beginning of the semester.

TA: Benjamin Mixon-Baca. For anything related to the class you should correspond directly with me (crandall@cs.unm.edu) and I can put you in touch with the TA as needed.

Mailing lists: There are two mailing lists, one required and one optional. See the course website for details.

Course website: <http://www.cs.unm.edu/~crandall/netsfall15/>

I'll post lots of important stuff here, like the lab assignments, links to the mailing lists, *etc.*

Required text: NONE. The only recommended text is *Computer Networking: A Top-Down Approach (6th Edition)* by Kurose and Ross, but you'll only use it as backup material and it shouldn't be necessary for any tests or anything. We'll use a lot of online resources such as Wikipedia, academic papers, and the RFCs. "The only laws on the Internet are assembly and RFCs" (see Phrack 65), so expect to do some digging for dirty little details.

Grading: The final grade will be calculated as 60% labs, 20% homeworks, 10% midterm, and 10% final. The points for each will be added up and divided into the total possible before weighting, so a 100-point lab does not *necessarily* contribute the same amount to your grade as a 100 point final. I reserve the right to curve the overall grades at the end of the semester (up, never down) if I don't feel that they reflect the amount of effort students put into the class. The overall grade will be out of 100, weighted as described above. For letter grade purposes, below 60 is an F, 60 and up is a D, 65 and up is a C-, 70 and up is a C, 75 and up is a C+, 80 and up is a B-, 82 and up is a B, 85 and up is a B+, 87 and up is an A-, and 90 and up is an A. I only give A+'s in extreme circumstances.

Note: The grading standards on the midterm and final are different for undergraduates (ECE 440 and CS 485) and graduates (CS 585). It's likely that there will be separate tests for undergraduate vs.

graduate. For the sixth and final lab, the grading standard will also be different for undergraduate vs. graduate.

Labs: There will be 6 labs, all weighted equally (*i.e.*, each is exactly 10% of your final grade). How each lab gets graded will be written on the lab assignment, but as a general rule “PCAP or it didn't happen.” Tentatively, the six labs are expected to be:

1. A lab where you build your own private little network of virtual machines, produce some PCAPs to prove that routing works, and write a paragraph or so explaining ARP based on your PCAP. A concept emphasized during this lab will be historical perspectives.
2. A lab where you work with a partner and network together your two individual networks. You'll make up a protocol and implement it through code that implements socket communications, then produce PCAPs of the two of you communicating via this protocol to be submitted along with your code. A concept emphasized for this lab will be teamwork.
3. A lab where the whole class will build one large network with dynamic routing. Each individual student will produce a PCAP proving that they were part of this network and able to reach the other students in the class who were connected to the network. A concept emphasized for this lab will be teamwork.
4. A lab where we collect some TCP traversing over our class network and then analyze it to compare two different TCP implementations (probably CUBIC and Tahoe). A concept emphasized for this lab will be experimental design.
5. A lab where we use Bro to better understand TCP, HTTP, and various vulnerabilities. A concept emphasized for this lab will be societal impact.
6. An individual project where you produce some data and analyze it, or download some existing data (*e.g.*, from the Tor project) and analyze it in some novel way. This should incorporate all of the above concepts (note that it's an individual project, but you should help others and seek help from your classmates proactively).

You will be using tools such as Wireshark and virtual machines. Programming is encouraged---C or Python are recommended. You may use other scripting languages (*e.g.*, Ruby), but keep in mind that the TAs and I won't be able to help you as well in languages we don't know as we can in languages we do.

Be sure to start early on the lab assignments and get the help you need to get them done.

Late assignments will be accepted only in special circumstances (medical, *etc.*).

For lab writeups, English spelling and grammar may affect your grade, since it's very difficult for me to read---and therefore also difficult for me to understand---English writing that has poor grammar. There are various University resources for helping students with English writing, contact me if you need help finding these resources.

Homeworks: There will be about eight to ten relatively light homework assignments throughout the semester. They will typically entail carrying out a basic task using Wireshark for packet capture analysis and then writing about what you found plus a little bit of material about societal impact and/or ethical issues.

Midterm: The midterm will be on Monday, 5 October at 10:00am in the normal class meeting place at the normal class meeting time. It may be curved.

Final: The final will be on Friday, 4 December at 10:00am in the normal class meeting place at the normal class meeting time. It may be curved.

UNM statement of compliance with ADA: “Qualified students with disabilities needing appropriate academic adjustments should contact the professor as soon as possible to ensure your needs are met in a timely manner. Students must inform the professor of the disability early in the class so appropriate accommodations can be met. Handouts are available in alternative accessible formats upon request.”

Cheating and collaboration, personal statements:

Every homework assignment and lab assignment, unless I specify otherwise, should be an individual effort where you do your own work and only discuss the assignment with your classmates at a high level.

Each lab will have a special section of the assignment writeup where I'll try to be as specific as possible about what is allowed or not allowed with respect to cheating and collaboration. In general, you are expected to do your own work, and for group work all group members are expected to contribute.

If you copy and paste any material (English text, figures, etc.) from any source you must clearly delineate it and attribute it properly to its source. Representing the work and materials of others as your own will not be tolerated in this class. Anything that is a full sentence or more that was not written originally by you has to be in quotes or indented in italics with a reference to clearly indicate where the material came from. Even if it was an accident, any kind of plagiarism in this class will result in an F in the class and possibly further actions pursuant to UNM policy.

Each test will state at the top what materials you're allowed to use (book, notes, etc.). Not noticing, for example, that the top of the test says that it's not open notes is not an excuse. Anything not specified as open is closed. In other words if the test instructions don't say “open-iPod” you should assume that the test is closed-iPod, and if the test instructions don't say “open-cheat-sheet-on-the-inside-of-your-water-bottle-label”, assume that the test is closed-cheat-sheet-on-the-inside-of-your-water-bottle-label.

All university policies regarding these matters will be strictly enforced. Typically I'll give the cheating parties an F in the class, but I may pursue further action in some cases.

Grades of “Incomplete” or “Withdrawal”, changes in grade mode, or any other special accommodations will only be considered in cases where circumstances arose that were outside the control of the student (such as a death in the family, medical issues, etc.). Losing a scholarship or visa status because of a low grade is a very serious issue, but it's up to you to do well in the classes you register for to make sure that doesn't happen, not up to the instructors of the classes you take.

Some lab assignments may be group efforts. I expect everybody to contribute, if some group members do all the work and others slack off, I consider that a fault of each and every member of the group individually. Doing all the work yourself is not an alternative to showing leadership.

My expectations of you as students

- **Be studious:** I'm fairly old-fashioned, I expect students to come to class, to come on time, to stay on task, to take the time to make sure they understand things well, etc.
- **Take responsibility for your own learning:** you're either registered for a 400-level class or for a graduate class, at a major research institution. If you find that coming to the regularly scheduled class time is a waste of time, then you're probably not taking responsibility for your own learning. Don't expect me to spoon-feed you information that is already well-known, you don't want to pay ~\$750 in tuition for me to tell you what's in a ~\$90 textbook that you could read yourself if you wanted to. My job is to teach you how to learn things that nobody knows

yet, which is why we'll focus on experimental methodology a lot in this class. A good philosophical approach for you to take in this class is to "teach the teacher."

- **Do only excellent work:** anything worth doing is worth doing well. In terms of your grade, you'll be much better off doing solid experiments that are very simple than to try to do complicated experiments with flawed methodologies. Keep your projects and writing simple and make sure everything you do is excellent and technically sound.
- **Show leadership and be a mentor:** don't think that this class is only about computer networks. If someone in your group is not as strong as you are in networking or programming, help them learn and motivate them to get things done instead of doing everything yourself.

Material to be covered:

We'll try to stick to the staples of networking protocols and abstractions that are typical to the Internet: ARP, TCP/IP, UDP, sockets, and routing algorithms (both link state and distance vector).

If you have a specific interest you'd like us to talk about in class, you don't understand the background material as well as you'd like to, or you have any other suggestions for lectures or class discussions, please let me know.

The class will also have a heavy focus on societal impact issues, which will be part of the labs and homeworks and will also be discussed regularly in class. These issues will include laws and regulations in the U.S. and overseas, University policy, Internet surveillance, Internet censorship, ethical disclosure of vulnerabilities, network neutrality, the history of the Internet, the impact of man-in-the-middle attacks, and many other topics. If any material or assignments make you uncomfortable (*e.g.*, because of possible repercussions for you in the country of your citizenship or at your job) please let me know.

Ethical scholarship and proper use of UNM resources

You're responsible for understanding the laws and UNM policies pertaining to everything we do in class. We'll cover this early in the semester, including University policies 2500 and 2520, and privacy laws relevant to the use of Wireshark.

Homework assignment #1:

This assignment is due by email (to crandall@cs.unm.edu) before 11:59pm on Wednesday, 19 August 2015.

First, you should join the class mailing list by following the link on the course web page. You should get a confirmation email. If you don't get a confirmation email within 24 hours of joining the mailing list send me an email and indicate with which email address you tried to join the mailing list.

Also make sure that you have a valid CS account so that you can log into the lab machines.

Lastly, read UNM University Policies 2500 and 2520, as well as Sergei Bratus' article about how hackers learn networking. Links to all three readings are available on the course website.

Then, you should send me an email with answers to the following questions, where your answers can range from a sentence to a paragraph (or more, if you like).

1. Did you join the nets mailing list and then confirm that you have a CS account to log into the lab machines? Did you also join the nets-chat mailing list?
2. Who are you? What is your major? Where are you from? What should I know about you? What's something interesting about you? Are you a troublemaker? If not, why not?
3. Why are you taking this class? What do you hope to learn this semester in this class?
4. What did you think about the three readings above?
5. Do you understand all of the course policies related to cheating and collaboration, University policy and legal issues, and grading?

If your answer to #5 is not yes or if you don't complete this assignment on time, I'll use the instructor drop feature of LoboWeb to drop you from the class. If you'd like to remain in the class but don't understand the policies, please ask me questions until you do understand.