

CS 485/ECE 440/CS 585 Computer Networks, Fall 2013

Instructor: Jed Crandall, jedcrandall@gmail.com

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. Homework and lab submissions should always be submitted to unmnetworkingclass@gmail.com.

Office and office hours: FEC 335, Tuesdays and Thursdays from 9:30am to 11:00am.

Reasons to drop this class right now:

- ***The class is at 8:00am.***
- ***The class is in a lab format.*** That means that more often than not I will show up to class and rather than giving a lecture, I'll say, "Work on your lab assignment."
- ***You won't finish any of the lab assignments.*** Few things make me more unhappy than hearing, "But I'm done with the lab so I don't have anything to do." When a student says that, I hear, "I only care about getting a good grade and I'm unwilling to take pride in my work and keep improving my lab because I know it's already good enough for an A." There's always more to be done, you might think about adding a compelling visualization, having someone read a draft and suggest improvements to you, or running some additional experiments to tie up loose ends. If you really care about learning about networks then your work is never done (but you do still need to submit it before the deadline).
- ***The class is taught by me.*** I don't do traditional networking research and I've never published a paper in INFOCOM, MOBICOM, SIGCOMM, or IMC. My research in the area of network security is about network protocol implementations and measuring network anomalies via side channels. The anomalies I'm interested in typically don't conform to the RFCs and aren't in any textbooks. For this reason this class will focus heavily on the low-level implementation basics of network protocols, and not on the high-level, theoretical, performance-centric research that typically makes up a networking textbook. If you prefer a more traditional networking class that covers traffic shaping, different physical layer technologies, ATM networks, *etc.* (*e.g.*, because you want to work at one of the national labs on supercomputers or you want to work for a company like Cisco) then the ECE department offers this same class in the spring.

Prerequisites: None formally, having taken CS 341 (Computer Organization and Design) or an equivalent class from your undergraduate institution before taking this class is strongly 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.

TAs: The TAs and their office hours and office numbers will be announced on the course website.

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/netsfall13/>

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

Required text: The only required text is *Computer Networking: A Top-Down Approach (6th Edition)* by Kurose and Ross. We'll also 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.

Class meeting time and place: Tue/Thur 8:00am to 9:15am, in CEC B146 (the lab in the basement of the Centennial Engineering Center).

Grading: The final grade will be calculated as 50% labs, 15% homeworks, 15% midterm, and 20% 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 third and final lab, the grading standard will also be different for undergraduate vs. graduate.

Labs: There will be 3 labs, with the third being a final project and worth twice as much as either of the first two.

You will be using tools such as Wireshark and virtual machines. Programming is encouraged---C, Perl, and 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. Silly fairy tail languages such as LOLCODE or Java are strongly discouraged and will not be supported in the lab environment.

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. The lab writeups I ask for will typically be one or two pages including figures, so that you can focus on doing an excellent job of presenting new information to me and not lots and lots of pages of things I already know.

Each lab will have a societal impact component to it that will also be part of your writeup. More details will be in the lab assignment handout.

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 Thursday, 26 September in class at the regular time. It may be curved.

Final: The final will be on Thursday, 12 December at 7:30am in the normal class meeting place. 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, 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.

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 a 0 on the assignment or exam, but I may pursue further action in some cases.

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. For group assignments, every group member will attach a personal statement to the final submitted lab writeup stating their contributions. All members of the group must be given a chance to see the personal statements of the other group members before submitting. If another group member claims a contribution that they didn't actually make, your two options are (1) ask them to change their personal statement, or (2) tell me about it privately. Personal statements should answer the following questions:

1. What tangible contributions did you make (source code, writing, implementation, experimental testing, etc.)? “Tangible” means that if I ask you to show it to me you can show it to me.
2. What ideas did you contribute to the experimental design?
3. In what instances did you show leadership for the group (motivating people to work, helping them learn something, organizing meetings, etc.)?

If your personal statement is misleading in any way, that can be considered cheating, so make sure your personal statement is truthful. I reserve the right to call any student into my office and ask them questions about their personal statement and technical questions about the lab itself before giving a grade for the personal statement.

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). We'll be applying this knowledge to try to learn new things that aren't in the book and that nobody knows yet. For the first lab we'll be doing experiments with different TCP/IP socket options and testing performance and other characteristics. The second lab will be about evading Intrusion Detection Systems (IDSes) at the IP and TCP layers. The third lab will require you to do some simple Internet measurements (traceroute, etc.) and teach the rest of the class something about some other part of the Internet.

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.

Homework assignment #1:

This assignment is due by email (unmnetworkingclass@gmail.com) before 11:59pm on Friday, 23 August 2013.

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? 你最喜欢的中国菜是什么? 你是不是捣蛋鬼?
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?

If you're willing to attach a picture to the email, please attach a picture of yourself to help me learn everybody's name (so I know by name who to punish if I see you do something bad ;-).