



15-744: Graduate Computer Networks

Meeting Days, Times, Location: MWF 11:00-12:20 GHC 4303

Semester: Spring **Year:** 2023

Units: 12

Instructor

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Teaching Assistant

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Course Description

15-744 is a doctoral course in computer networking research. The goals are:

- To understand the state of the art in network protocols, network architecture, and networked systems.
- To engage with systems research at a scholarly level through written and oral argument.
- To investigate novel ideas and make new scholarly arguments through a semester-long research project in computer networking.

Prerequisites:

- Doctoral Students in ECE and SCS are admitted without prerequisites, although an undergraduate course in Operating Systems, Distributed Systems, or Networking is highly recommended.
- Master Students and Bachelor's Students in ECE, SCS, or INI may be admitted with instructor permission.
- No other students will be admitted.

UP TO DATE INFORMATION ABOUT THE COURSE IS AVAILABLE AT:
www.myheartisinthetnetwork.com

Learning Objectives

By the end of the semester, students will be able to:

- Evaluate a research paper on a computer system for performance, security, programmability, reliability, and other desirable properties
- Compare the designs of different systems and identify the trade-offs between deploying one or the other
- Read, write, and ask questions at a scholarly level about state of the art networking research
- Conduct original research in computer networking

These skills will help you in contributing to research at premier venues like SIGCOMM or NSDI or in developing next-generation systems at top tech companies. For those of you who are CSD PhD students, almost all of the assignments will additionally help you strengthen the skills you need to pass your Writing and Speaking Skills exams.

Non-Goals:

- Do a lot of problem sets
- Memorize a lot of facts about network protocols
- Write 50,000 lines of C++ code

Focus less about memorizing the details of each paper we read, and spend more time thinking about whether you think the proposed idea is a good one.

Learning Resources

- This class is writing and language-intensive. You will not be graded on the perfection of your English grammar, but you will be graded on the content, structure, clarity, and quality of your written arguments. The Student Academic Support Communication Center can help you with these skills: <https://www.cmu.edu/gcc/>
- As part of your class project, you may need additional resources like special hardware or AWS credits -- please talk to me about any special infrastructure you may need.

Assessments

The final course grade will be calculated using the following categories:

Assessment	Percentage of Final Grade
Paper Q&A (Homeworks)	15%
Presentation in Class	10%
Peer Presentation Feedback (Due 48 hours after presentation)	10%
Exams	20%
Course Project Paper	35%
Mock PC Reviews & Participation	10%

Students will be assigned the following final letter grades, based on calculations coming from the course assessment section.

Grade	Percentage Interval
A	90-100%
B	80-89.9%
C	70-79.9%
D	65-69.9%
R (F)	< 65%

I reserve the right to adjust these intervals to be more generous, but promise I will not adjust them to be less so.

Exception: If you submit your class project to SIGCOMM, NSDI, IMC, ANRW, SOSR, or CoNeXT before the end of 2022 and it is accepted, you **automatically get an A** in the class (I will retroactively change your grade if you did not get an A).

Reading, Homeworks, and Presentations

Over the course of the semester, you will read approximately 40 research papers from top networking venues such as SIGCOMM and NSDI. The readings are selected to help you engage with networking research. We will aim to understand the papers both for their technical contributions (“What are the trade-offs between centralized and distributed routing?”) and as exemplars of well-executed research papers (“Why did they choose to evaluate throughput in terms of packets per second rather than gigabits per second?”).

To explore these papers together:

- a) We will discuss these papers in class after a student-led presentation. You will lead 1-2 such discussions.
- b) You will listen to your peers presentation and provide feedback on your peers’ presentations.
- c) You will answer short questions about the papers we read each week. Feedback will be provided by me both on the technical contents of your responses as well on the quality of your writing.

You must provide feedback on at least 80% of your peer’s presentations for full credit.

Exams

There will be one midterm exam. It will primarily be based off of the readings and homework. It will be $\frac{2}{3}$ multiple-choice, and $\frac{1}{3}$ short essay questions.

There is one final exam, it is very short and primarily asks questions about your final project. You do not need to study for the final so long as you are an active participant in your class project.

Class Project

As a class project, you will conduct an original research project in the area of computer networking. The class project will prepare you to develop new systems designs and reason about your design choices. You will aim to prepare an 6-10 page

writeup on your research project, just like the research papers you have read in class. As a “stretch goal”, you might aim to continue your research project at the end of the semester and publish it. You will almost certainly fail to develop something SIGCOMM-worthy within only four months -- but aim to do so anyway!

This project is worth 35% of your final grade and is the most important assignment of the semester.

Your project write up is due on May 1.

At the end of the semester, we will hold our own “program committee” meeting for the exciting, top-tier research venue, *AndrewNets*. Your participation on this program committee will constitute 10% of your final grade and attendance is required at the mock PC meeting.

Grading Policies

- **Late-work policy:** I do not accept late work or make-up work, unless you are experiencing an emergency or crisis. In this case I will be happy to work with your advisor, student services, or disability services to develop an ad-hoc make-up plan.
- **Incomplete policy:** My incomplete policy is the same as my policy for late work: incompletes will only be permitted as part of a make-up plan in collaboration with your advisor, student services, or disability services in case of crisis or emergency.
- **Attendance policy:** Attendance is not part of your grade.

Other Course Policies

- **Academic Integrity & Collaboration:** Please talk with other people and share your thoughts and ideas! With the exception of the midterm and exams (which you will do alone, in class), everything in this course is collaborative.
 - For weekly write-ups: you need to write this yourself, and give credit to others where you cite their ideas. You might include in your discussion something like: “I discussed this paper with my friend Ahmed. Ahmed thinks the results in the evaluation are insufficient because they do not include empirical traffic matrices, only simulated ones. I think it was unreasonable to expect such empirical data since it is hard for academics to acquire.”
 - For class projects: you will work in teams. You and your teammates may use any open source code for your project, and should solicit feedback on your presentation and whitepaper from friends and classmates. The core of your code and the entirety of your writeup should be written by you and your teammates.
- **Accommodations for students with disabilities:** If you have a disability and require accommodations, please contact Catherine Getchell, Director of Disability Resources, 412-268-6121, getchell@cmu.edu. If you have an accommodation letter from the Disability Resources office, I encourage you to discuss your accommodations and needs with me as early in the semester as possible. I will work with you to ensure that accommodations are provided as appropriate.
- **Student wellness:** As a student, you may experience a range of challenges that can interfere with learning, such as strained relationships, increased anxiety, substance use, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may diminish your academic performance and/or reduce your ability to participate in daily activities. CMU services are available, and treatment does work. You can learn more about confidential mental health services available on campus at: <http://www.cmu.edu/counseling/>. Support is always available (24/7) from Counseling and Psychological Services: 412-268-2922.
- **Children in class** (adapted from [Dr. Melissa Cheyney](#)'s syllabus):
 - All exclusively breastfeeding babies are welcome in class as often as is necessary.
 - For older children and babies, I understand that unforeseen disruptions in childcare often put parents in the position of having to choose between missing class to stay home with a child and leaving him or her with

someone you or the child does not feel comfortable with. While this is not meant to be a long-term childcare solution, occasionally bringing a child to class in order to cover gaps in care is perfectly acceptable.

- In all cases where babies and children come to class, I ask that you sit close to the door so that if your little one needs special attention and is disrupting learning for other students, you may step outside until their need has been met.
- **In case of emergency:** If you, a family member, or a close friend are experiencing an emergency or crisis: absolutely do not worry about contacting me until you are out of the storm! In collaboration with your advisor, students services, or disability resources, we will take care of getting your coursework back on track after the crisis has passed.