

CSI 355: Computer Networks

Hamed Yaghoobian

Fall 2021

Class hrs: MW 12:30 pm - 1:45 pm

Student hrs: W 2:30-3:30 pm

Course webpage: kutt.it/cs355

Class location: Trumbower 48

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Course Description

There is nothing probably more intensely connected, more distant, compulsory, and more strategically organized than a computer network. This course serves as an introduction to fundamental concepts of computer networks and widely used networking technologies. Topics include application protocol design, principles of congestion and error control protocols, network routing, local, wireless, and access networks, network security, and networking programming. We will utilize programming and written assignments toward maximizing engagement with networking concepts.

Learning Objectives

Upon successful completion of CSI 355, you will be able to:

- make sense of how the Internet and computer networks work.
- translate your insights into sustained intellectual discussion and lucid analytical prose,
- think critically about technology by comparing ethical frameworks and social criticism
- examine how technology interferes with diversity and the power dynamics of race, class, gender, health status and etc.

Topics

- A Bit of History and Basic Concepts of Networks
- Networking Fundamentals
- Application Protocol Design and Implementation
- Network Security
- Principles of Reliable Transport - Transport Layer
- Routing and the Network Layer
- Link and Physical Layers

Textbook

- Kurose, J., Ross, K., Computer networking: A top-down approach featuring the internet, 8th Ed. Pearson Education, 2021.

Grading Breakdown

- **Five Bi-weekly projects:** 55%
- **Two midterms:** 20%
- **Participation:** 10%
- **Final exam:** 15%

Course Policies

Attendance Policy

Showing up is 80 percent of life — Woody Allen, via [Marshall Brickman](#)

Attendance is not directly recorded. However, it is counted toward your grade for participation. Missing discussions may affect your projects' quality, papers, and thus your total grade indirectly. I assume you are enrolled because you are interested in the topic and wish to learn. Therefore, I assume you will not skip class frivolously. I will work with you to address conflicts and emergencies on a case-by-case basis but expect you to attend class. Participation hinges on engaging thoughtfully with the readings and your peers' analysis of them. Please notify me before the scheduled class time if you must miss a class, and I will consider ways in which you may compensate for your absence.

Submission and Late Work Policy

! Projects are assigned on **Wednesdays** of each week. The submission deadline is the **midnight of the second Wednesday** after the project is assigned.

! Late submissions lose 20% of the allocated credit for each day of delay.

! There is a **five-day extension** to use at your discretion over the semester (excluding the final project).

Group Work Policy

You are encouraged to work in groups of **two**. Each group submits an individual *Teamwork Effectiveness Survey* through Google Forms by the end of each project. You submit an individual copy of your work regardless of work being collaborative or individual. Collaborative assignments should be bearing both the names of both members.


Email Policy

I try to respond to email as promptly as possible. However, please allow up to 24 hrs for a reply on work-days.

Academic Honesty Policy

We are required to abide by [Muhlenberg's Academic Integrity Code](#). The general rule of thumb is **if you use other material to support your own, make sure to cite the source properly**. If you are unsure as to what constitutes plagiarism, please contact me before submitting your assignment.


Laptop & Technology Statement

You will need a computer to do the assignments. We will be using e-devices in different capacities in class. Please make sure to silence  your e-devices during the meetings.

Disabilities Policy

If you are a student with a disability or health-related issue who needs class accommodation, please make sure to complete a multi-faceted determination process through the [Office of Disability Services](#) prior to the development and implementation of accommodations, auxiliary aids, and services. Each Accommodation Plan is individually and collaboratively developed between the student and the Office of Disability Services. If you have not already done so, please contact them.

Financial Hardship

If you are experiencing financial hardship, have difficulty affording groceries or accessing sufficient food to eat every day or do not have a safe and stable place to live, I would urge you to contact the [CARE Team](#)  through the Dean of Students Office for support. You can also discuss your concerns with me if you are comfortable doing so.

Student Bill of Rights

You deserve:

- To be addressed according to the name and pronouns you choose.
- To be accepted and celebrated for who you are.
- To be treated fairly, inclusively, and respectfully.
- To be free from discrimination, harassment, and violence.
- To receive support overcoming barriers to learning.
- To learn in a community that upholds academic integrity.


Syllabus Policy

This course syllabus is a general plan for the course; deviations announced to the class by the instructor may be necessary.

Tentative Schedule

Week 01, 08/30 - 09/03 Personal Introductions, syllabus, and course overview

 Reading assignments: KR § 1

 Project 1

Week 02, 09/06 - 09/10

 Reading assignments: KR § 4.3.1, § 4.4.3, § 6.4.1, § 6.7.2

- Network Layer Fundamentals (II): IP prefix and subnet mask, DHCP, Network Layer Routing
- Network Layer Fundamentals (III): Longest Prefix Match, Bridging, Special Use IPv4 Addresses

Week 03, 09/13 - 09/17

 Reading assignments: KR § 4.3.3, § 6.4

- Network Layer Fundamentals (II): IP prefix and subnet mask, DHCP, Network Layer Routing
- Network Layer Fundamentals (III): Longest Prefix Match, Bridging, Special Use IPv4 Addresses

Week 04, 09/20 - 09/24

 Reading assignments: KR § 2.1, § 2.4, § 2.7

 Project 2

- Network Layer Fundamentals (IV): Spanning Tree Protocol
- Application Layer (I): Client-and-Server, P2P, Point-to-Point Connection, NetCat
- Application Layer (II): Socket API, Domain Name Services (sample socket programming code is in this note)

Week 05, 09/27 - 10/01

 Reading assignments: KR § 2.2, § 2.3

- Application Layer (III): A DNS Example; Electronic Mail – SMTP, ESMTP/TLS, POP3/IMAP, MIME; HTTP, GET Method (SMTP and HTTP demonstrations are in the note)


Week 06, 10/04 - 10/08

 Reading assignments: KR § 8

- Application Layer (IV): HTTP POST Method; Build a Server Using NodeJS; AJAX (NodeJS sample code is in this note)
- Network Security (I): Objectives, Encryption Categories, RSA

Week 07, 10/11 - 10/15

 Reading assignments: KR § 8

 Project 3

 Midterm exam 1

- Network Security (II): RSA (cont.), Authentication, Replay Attack, Message Integrity

Week 08, 10/18 - 10/22**📖 Reading assignments: KR § 3.1, § 3.4, § 3.6**

- Network Security (III): Certificates
- Transport Layer (I): Overview, Functions of Transport Layer, Error-control Method – ARQ
- Transport Layer (II): Error-control Method – ARQ (cont.), Stop and Wait, Sliding Window

Week 09, 10/25 - 10/29**📖 Reading assignments: KR § 3.2, § 3.4, § 3.5, § 3.6, § 3.7****⚙️ Project 4**

- Transport Layer (III): Error-control Method (cont.) – Utilization, Flow control, Two Types of Congestions
- Transport Layer (IV): TCP: header, 3-way handshake, closing

Week 10, 11/01 - 11/05**📖 Reading assignments: KR § 3.3, § 3.7, § 4.1.1**

- Transport Layer (V): TCP: Congestion Control, UDP
- Network Layer (I): Data Plane and Control Plane, General Functions, ICMP, Ping

Week 11, 11/08 - 11/12**📖 Reading assignments: KR § 4.3, § 5.2, § 5.3**

- Network Layer (II): IPv4, Fragmentation, IPv6, Neighbor Discovery Protocol
- Network Layer (III): Routing, Weights, Link State Routing

Week 12, 11/15 - 11/19**📖 Reading assignments: KR § 5.2, § 5.4****⚙️ Project 5****✍️ Midterm exam 2**

- Network Layer (IV): Distance Vector Routing, BGP

Week 13, 11/22 - 11/26**📖 Reading assignments: KR § 6.1, § 6.3**

- Link Layer (I): Overview, Multiple Access Protocols, Three Broad Classes, Channel Partitioning – TDMA, FDMA, CDMA
- Link Layer (II): Random Access Protocol – ALOHA, CSMA, CSMA/CD, CSMA/CA

Week 14, 11/29 - 12/03**📖 Reading assignments: KR § 6.3****✍️ Final exam**

- Link Layer (III): “Taking turns” protocols

Week 15, 12/06 - 12/10

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