

# CSI 355: Computer Networks

Hamed Yaghoobian

Fall 2021

**Student hrs:**

**Class hrs:** MW 1:50-02:40 pm

**Class location:** 48 Trumbower

**Office:** Trumbower 125

**Course webpage:** [bit.ly/uga1100](http://bit.ly/uga1100)

**Lab webpage:** [bit.ly/uga1100lab](http://bit.ly/uga1100lab)

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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

- Basic Concepts
- 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, 8<sup>th</sup> 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.


### Email Policy

I try to be quick in responding to emails. However, please allow up to 24 hrs for a reply on workdays.

### 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.


## **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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