



EE 450: Foundations of Computer Networks

Units: 4

Fall 2026—8:00–9:50 AM

Location and Modality

In-Person: OHE 122, Online: DEN

Discussion: F, 1:00-1:50PM

Quiz: F, 7:00-9:15PM

Instructor Information

Professor: [Corey E. Baker, PhD](#)

Office: EEB 342

Office Hours: TR, 1:00 –2:00 PM

Contact Info: coreybak@usc.edu

Teaching Assistant Information

Names: Rodrigo, Ibukunoluwa, Yulin

Office: See Brightspace (Content->Staff Information)

Office Hours: See Brightspace (Content->Staff Information)

Contact Info: aguilarb@usc.edu, isoyebo@usc.edu, yulinxu@usc.edu

Course Description

EE 450 takes a top-down approach to explore how networks operate and how network applications are written, following the layered architecture of the Internet from the applications down to the wires. We begin at the application layer, where we study how the distributed systems you use every day actually work: the Web and HTTP through its modern HTTP/2 and HTTP/3 incarnations, DNS, electronic mail, video streaming, the content distribution networks (CDNs) behind services like Netflix and YouTube, and cloud computing systems. We then explore how these applications transfer data between their components and end users over the Internet using transport layer protocols, including the classic TCP and UDP as well as QUIC, the transport underlying HTTP/3. Along the way we examine the principles that make these protocols work: reliable data transfer, flow control, and congestion control. We go deeper to understand what keeps the transport layer running; specifically, we look at how packets are addressed and routed and how routers work in both the data plane and the control plane. Finally, we dive one more layer down to understand how

the link layer transfers packets using Ethernet and local area networks. In addition to cutting through the layers and covering the basics, we learn about state-of-the-art topics in networking such as datacenter networks and software-defined networking (SDN). Because none of these layers were designed with adversaries in mind, we also investigate security in computer networks, to study the principles of cryptography, message integrity, and end-point authentication, and to see how protocols like TLS secure the traffic flowing through every layer we cover.

From a practical point of view, we learn what sockets are and how to use them. And we write code. We write code to implement various protocols, to build client-server applications, HTTP proxies, and video distribution applications, and reliable transport. My goal is for you to connect the abstractions we study in lecture to the software that runs the Internet.

Catalog Description

Network architectures; layered protocols, network service interface; local, wide area, wireless networks; Internet protocols; link protocols; addressing; routing; flow control; software defined network; multimedia networks. Cross-listed as CSCI 353.

Learning Objectives

Students will learn fundamentals of computer networks, main protocols and applications of the Internet, design and analysis of networks, and use of software tools for understanding workings of the Internet. Writing socket programming to learn about protocols and applications and use simulation and emulation for performance evaluation.

Prerequisite(s): Students who have not completed the pre-requisites should contact the Professor immediately in order to receive clearance to take the course or else the student will be removed from the course.

Concurrent Enrollment: N/A

Recommended Preparation: Open only to junior standing and above.

Technological Proficiency and Hardware/Software Required

Students are required to have basic familiarity of programming and elementary probability theory.

Readings and Supplementary Materials

Required: [Computer Networking: A Top-Down Approach by James Kurose and Keith Ross, 9th Ed., Pearson Publishers \(main textbook\)](#). Supplementary materials are tutorial notes on Unix, C, C++, and Mininet user guides.

Optional: [Slides](#), [Interactive End-of-Chapter Exercises](#), and [Interactive Animations - 8th Edition](#).

Assessments and Assignments

Assignments, Submissions, and Additional Material

Assignments will be posted and submitted through [Brightspace](#), the course GitHub Organization (TBD), and GitHub Classroom (TBD). Discussions will occur on [Piazza](#)

Homeworks

This course is based on established materials from a widely used textbook. There will be weekly homework with problems on materials covered in class.

Projects

The objective of the projects are to familiarize students with networking concepts in-vivo. These projects will consist of subjects such as: UNIX socket programming, UDP/TCP clients, and web servers using network simulations platforms like OPNET and NS-3, and Wireshark.

Participation

Please post all questions in the Brightspace/Piazza discussion board first as other students may have a similar question. Posting in Brightspace/Piazza allows all questions/answers to be centralized and easily viewed by all classmates. Other students enrolled in the course are encouraged to answer questions and provide suggestions.

With regard to questions directly related to code, provide inline comments and post the repo on the course GitHub. The question should still be posted in the Brightspace/Piazza with links to your GitHub repository. These type of questions should point out the problem, the line number where the problem occurs, and different steps taken to attempt to remedy the problem.

If your question is not answered in Brightspace/Piazza, please contact the instructor via email or office hours. **Note that private questions to the TAs or the professor can be posted in Brightspace/Piazza if needed. If for some reason you need to email the professor or TAs, always include "EE 450:" in the subject line.**

Grading Breakdown and Scale

Table 1 Grading Breakdown

Assessment Tool (assignments)	Points	% of Grade
Homework & Programming Projects		20%
Quizzes		10%
Participation		10%
Midterm Exam		30%
Final Exam		30%
TOTAL		100%

Table 2 Example of a Course Grading Scale

Letter grade	Corresponding numerical point range
A	95-100
A-	90-94
B+	87-89
B	83-86
B-	80-82
C+	77-79

Letter grade	Corresponding numerical point range
C	73-76
C-	70-72
D+	67-69
D	63-66
D-	60-62
F	59 and below

Grading Timeline

Assignment grades are expected to be given to students within 1.5 weeks of assignment due date unless otherwise specified by the professor.

Course Policies

Assignment Submission Policy: All assignments and project submissions will be submitted by 7:30 am (or a designated time by the Professor) of the deadline through Brightspace or GitHub Classroom. Late homework will not be accepted under any conditions.

Attendance and Quizzes

Students are responsible for knowing the material provided in the lectures as well as being able to apply the concepts to develop the project. Quizzes will be given randomly during the first 10 minutes of class via Brightspace, paper, or other means. Students must complete quizzes in their respective sessions. If a student is late for class, they will have the remaining time up until 8:10 to complete the quiz. If a student arrives after 8:10, or is absent for class, the student will receive a zero (0) on the quiz. The lowest three (3) quiz scores will be dropped at the end of the semester (assuming 10+ quizzes given, or else 20% of quizzes given) and the remaining scores will be counted as the final quiz grade. Quiz grades cannot be made up if a student is absent, but the dropping of the lowest three (3) scores are intended to help with missed classes.

Learning Community Expectations

Active class participation will count towards a student's participation grade. Discussion sessions will be used to assist students with understanding key concepts. Attending discussions is mandatory.

The units within the tracks are arranged so new information is presented via brief lectures and reinforced through learning activities like labs and mini projects. A lecture and either a lab or other learning activity make up a single unit within a track. To mimic work flows students are likely to experience in the industry, a mix of individual and group-based work is utilized within each track.

Academic Integrity

The University of Southern California is foremost a learning community committed to fostering successful scholars and researchers dedicated to the pursuit of knowledge and the transmission of ideas. Academic misconduct is contrary to this fundamental mission and includes any act of dishonesty in the submission of academic work (either in draft or final form), as well as cheating, plagiarism, fabrication (e.g., falsifying data), knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain

an unfair academic advantage. Students are expected to uphold the highest standards of academic integrity in all coursework. This course follows the expectations for academic integrity as stated in the [USC Student Handbook](#). All students are expected to submit assignments that are original work and prepared specifically for the course/section in this academic term. Students may not submit work written by others or “recycle” work prepared for other courses without obtaining written permission from the instructor(s). Students suspected of academic misconduct will be reported to the Office of Academic Integrity.

Academic dishonesty has a far-reaching impact and is considered a serious offense against the university. Violations will result in a grade penalty, such as a failing grade on the assignment or in the course, and disciplinary action from the university, such as suspension or expulsion. For more information about academic integrity see the [Student Handbook](#), the [Office of Academic Integrity’s website](#), and university policies on [Research and Scholarship Misconduct](#). Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment or what information requires citation and/or attribution.

Instructors determine whether and how generative AI tools (such as ChatGPT, Copilot, Claude, Gemini, and similar applications) and other external resources (such as English-language translation tools) may be used in this course. Expectations may vary from assignment to assignment. This includes AI tools that record, transcribe, or summarize class sessions, which may require express instructor permission. Review the AI use guidance provided below carefully, and direct any questions to your instructor before submitting work.

Students seeking general guidance may consult the following resources:

- [USC Student Handbook](#)
- [Generative AI General Policy](#)
- [Practical Tips for Using AI in Academic Work](#)
- [Office of Academic Integrity](#)

Permitted Use of Artificial Intelligence (AI) Tools

AI tools are not permitted in this course

This course is designed to help students develop and demonstrate their own knowledge, skills, and abilities in relation to the course learning objectives. Unless explicitly authorized by the instructor, all assignments and assessments must be completed by the student or assigned group members without the use of generative artificial intelligence (AI) tools. The use of AI-generated text, code, images, analyses, or other content is not permitted in this course. Students are expected to submit work that reflects their own understanding and effort. AI tools used in a manner that is inconsistent with this policy may constitute unauthorized assistance under the USC Student Handbook and be referred to the Office of Academic Integrity. Students who are uncertain whether a particular use of AI is permitted should consult with the instructor before submitting their work.

Using Stack Overflow, Open Source, or Code Found Online

All assignments should be prepared by the student working individually or in groups (if allowed on respective assignment). Students may not have another person or entity complete any substantive portion of the assignment. Small snippets of code may be used to assist with solving small parts of the assignments, but this code **MUST** be documented with the original link and author in the comments directly above the respective code. The respective code will be evaluated by the TAs and the Professor to determine if the documented code is feasible to not impact the students grade.

Student Handbook Policies

This course follows the policies stated in the current [USC Student Handbook](#). Handbook policies particularly relevant to this course concern course content distribution and recordings of class sessions:

Recording a university class without the express permission of the instructor and announcement to the class is prohibited, unless conducted pursuant to an Office of Student Accessibility Services (OSAS) accommodation. Recording can inhibit free discussion in the future, and thus infringe on the academic freedom of other students as well as the instructor. (Living our Unifying Values: The USC Student Handbook, page 13).

Distribution or use of notes, recordings, exams, or other intellectual property, based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study is prohibited. This includes but is not limited to providing materials for distribution by services publishing course materials. This restriction on unauthorized use also applies to all information, which had been distributed to students or in any way had been displayed for use in relation to the class, whether obtained in class, via email, on the internet, or via any other media. Distributing course material without the instructor's permission will be presumed to be an intentional act to facilitate or enable academic dishonesty and is strictly prohibited. (Living our Unifying Values: The USC Student Handbook, page 13).

Learning Experience Evaluations

Course evaluation occurs at the end of the semester university-wide. It is an important review of students' experience in the class. In addition, a mid-semester evaluation may be provided for early course correction.

Course Schedule

The course schedule outlines weekly topics, readings, and assignment due dates. The schedule is subject to change; any revisions will be announced in class and posted on Brightspace. For the date and time of the final exam for this class, consult the [USC Schedule of Classes](#).

Table 3 Course Schedule

Week	Topic	Readings	Assignments
1	Introduction	Chap 1.1-1.4	Intro to Github
2	Introduction	Chap 1.5-1.7	
3	HTTP, SMTP, DNS	Chap 2.1-2.4	HW 1
4	Video Streaming and Content Distribution Networks, Socket Programming	Chap 2.5-2.7	HW 2
5	UDP and Reliable Data Transfer	Chap 3.1 - 3.4	Project 1
6	TCP and Congestion Control	Chap 3.5 - 3.8	HW 3
7	Router and IP	Chap 4.1 - 4.3	HW 4
8	Forwarding and Architectural Principles Midterm Review (Discussion)	Chap 4.4 - 4.5	Project 2
9	Routing Algorithms SDN's - Control Plane Midterm (During Quiz)	Chap 5.1 - 5.7	HW 5
10	Error-detection and Multiple Access	Chap 6.1 - 6.3	HW 6
11	ARP and Virtual Networks	Chap 6.4 - 6.7	HW 7
12	WiFi	Chap 7.1 - 7.3	Project 3

13	Wireless Core Network & IoT	Chap 7.4 - 7.6	HW 8
14	Break		
15	Network Security (If time permits) and Final Review	Chapter 8.1 - 8.3, 8.5, 8.6, 8.8	HW 9, Proj 4
Final			Date: Tuesday, December 15, 4:30-6:30PM

Statement on University Academic and Support Systems

Students and Disability Accommodations

USC welcomes students with disabilities into all of the University's educational programs. [The Office of Student Accessibility Services](#) (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Student Financial Aid and Satisfactory Academic Progress

To be eligible for certain kinds of financial aid, students are required to maintain Satisfactory Academic Progress (SAP) toward their degree objectives. Visit the [Financial Aid Office webpage](#) for undergraduate- and graduate-level SAP eligibility requirements and the appeals process.

Support Systems

[Counseling and Mental Health](#) - (213) 740-9355 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

[988 Suicide and Crisis Lifeline](#) - 988 for both calls and text messages – 24/7 on call

The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline consists of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

[CARE-SC: Confidential Advocacy, Resources, and Education Support Center](#) - (213) 740-9355(WELL) – 24/7/365 on call.

Confidential advocates, prevention educators, and professional counseling teams work to promote a universal culture of consent, and prevent and respond to gender- and power-based harm. Services available to all USC students at no cost.

[Office of Civil Rights Compliance](#) - (213) 740-5086

Information about how to get help or help someone affected by harassment, discrimination, retaliation on the basis of a protected characteristic, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

[USC Campus Support and Intervention](#) - (213) 740-0411, uscsupport@usc.edu

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

[USC Emergency Information](#)

Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

[USC Department of Public Safety](#)

For 24 hour emergency assistance or to report a crime: UPC: (213) 740-4321, HSC: (323)-442-1000.

For 24 hour non-emergency assistance or information: UPC: (213) 740-6000, HSC: 323-442-1200.

[Office of the Ombuds](#) - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

[Occupational Therapy Faculty Practice](#) - (323) 442-2850 or otfp@med.usc.edu

Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.

[The Office of Sustainability](#) promotes numerous ways for all Trojans to study, work, and live sustainably at USC. Students can access tools, resources, and opportunities on their website and in the Sustainability Hub in the Student Union Building, Suite 101.

[USC Report & Response](#) provides a front door to reporting concerns, including an ability to report anonymously, which violate university policies or go against our Unifying Values and helps connect you with the support you need. The website provides a list of confidential resources, supporting offices, and policies that are available to our university community. The [Resources page](#) includes information regarding the university's response in the event of immigration enforcement activity on campus or involving a student or employee. Additional questions may be directed to the Office of Professionalism and Ethics (OPE) and ope@usc.edu or in reviewing the [Office of Professionalism and Ethics](#) website.