CPSC 317: Introduction to Computer Networking

Summer Term 1, 2024

Course Staff

Instructors and Office Hours

Instructor	In-person office hour	Online office hour
Maryam R. Aliabadi	Wed, 10am-12pm	Thu, 3:30-4:30pm (Zoom)

Teaching Assistants

- Seraj Abo Sabbah (ubcsabo@student.ubc.ca)
- Ken Li (junxua01@student.ubc.ca)
- Ali Mehrabian (alimehrabian619@student.ubc.ca)
- Alireza Rafiei (alireza.rafiei@student.ubc.ca)
- William Shen (wshen05@student.ubc.ca)
- Arman Moztarzadeh (arman88@student.ubc.ca)

Course Coordinators

- Gale Chen
- Irene Yuan

Emails

- cpsc317-admin@cs.ubc.ca: For requesting academic concessions due to, for example, illness or regrading requests
- cpsc317-staff@cs.ubc.ca: For contacting the course teaching staff

Lectures

Days, Time and Place

Tue/Thu, 11:00 AM – 2:30 PM, FSC 1005

Course Calendar

Session#	Date	Topic	Reading	In-class work	Tutorial	Quiz	Assignment
1	May 14th, 2024	Introduction			Playing with the Internet		
		Design of the Internet	Ch 1 Intro, 1.1, 1.2, 1.3, 1.5, 1.7	Circuit vs Packet Switching			
		Switching Protocols		Protocol Layers			
2	May 16th 2024	Network Performance	1.4.4	Network Performance Metrics	TCP sockets in Java		
		Network Delay	1.4	Network Delay			
		Application Layer Protocols	2.1, 2.7	Application Architecture and Transport Protocols			
3	May 21st 2024	Application Layer Protocols: The Web	2.2	HTTP	Understanding DICT and DNS RFCs		
		Application Layer Protocols: DNS	2.4	DNS			
		Application Layer Protocols: E-mail	2.3	Email and its protocols			
4	May 23rd 2024	Application Layer Protocols: peer-to-peer	2.5	Peer to Peer Applications	DNS	Quiz 1 (sessions 1-3) May 24	A1 Release: May 21st Due: May 30th at 11:59pm
		Transport: Introduction and UDP	3.1, 3.2, 3.3	Transport			
		Transport: State Machines and Reliability	3.4.1	Finite State Machines			
5	May 28th 2024	Transport: Lost Segments and Timeouts	3.4.1, 3.5.3	Timeouts and Reliable Data Transfer	Writing tests for DNS		
		Transport: Windowing Protocols	3.4.2, 3.4.3, 3.4.4	Go-Back-N			
		Transport: Selective Repeat	3.4.4	Selective Repeat			

6	May 30th 2024	Transport: Flow and Congestion Control.	3.5.2, 3.5.4, 3.5.5	TCP	Sockets in C	Quiz 2 (sessions 4,5) May 31	
		Transport: TCP-1	3.5.4, 3.7 before 3.7.1	TCP Congestion Management			
		Transport: TCP-2	3.5.6	TCP Congestion Management			
7	Jun 4th 2024	Transport: Alternate Protocols	Search Google: QUIC SIGCOMM		Debugging with GDB		A2 Release: Jun 3rd Due: Jun 10th at 11:59pm
		Network Layer: History and ASes	Ch 5 Intro, 5.3, 5.4	Networks and Autonomous Systems			
		Network Layer: IP and Address Forwarding	4.3, 4.3.1, 4.3.3 (Before obtaining a Host Address: DHCP), 4.3.5	IP addresses			
8	Jun 6th 2024	Network Layer: IP Address Ranges	4.3 (upto 4.3.2)	IP address segregation, splitting, and forwarding	TCP review	Quiz 3 (sessions 6,7) Jun 7	A3 Release: Jun 13rd Due: Jun 20th at 11:59pm
		Network Layer: Routing	5.1, 5.2, 5.2.1, 5.2.2	Link State Routing			
		Network Layer: Distance Vector Routing	5.1, 5.2, 5.2.1, 5.2.2	Distance Vector Routing			
9	Jun 11th 2024	Network Layer: Inter-domain routing	5.4 (5.4.2)		Getting started with PA4		
		Network Address Translation (NAT)	4.3.4	Network Address Translation			
		Link Layer: Introduction, Error Detection	6.1, 6.2	MAC addresses, and error detection and correction			
10	Jun 13th 2024	Link Layer: Access control and ARP	6.3 Intro, 6.3.2, 6.3.3, 6.4 Intro, 6.4.1	Switches and ARP		Quiz 4 (sessions 8,9) Jun 14	
		Link Layer: DHCP	4.3.3 (obtaining a host address)	DHCP			

		Link Layer: Physical and Link Layer Issues	1.2.1, 1.2.2, 6.4.4, 6.6				
11	Jun 18th 2024	Security: Introduction	8.1, 8.2	Breaking encryption			
		Security: Encryption	8.3	Advanced encryption			
12	Jun 20th 2024	Security: Asymmetric Encryption	8.4	Asymmetric encryption	Security		
		Security: Authentication and TLS	8.6	Protocol security			
		Security: IPSec, VPN, Firewall and IDS Security: Availability	8.7	VPNs and Secure Protocols			
	Jun 28th 2024		**Final Exam**				

Prerequisites

CPSC 213, CPSC 221

Instructors cannot waive these prerequisites, if you do not have them please see the Rules for Appeals about Prerequisites.

Waiting List

Do not contact the instructor or course staff about the waiting list or about admission into the class. Waitlists are processed in priority order by the department. Instructors have no knowledge or control over the class composition, waitlists, and who gets into the course. We cannot sign course registration forms. If you have any questions about registration, please contact the CS advisors.

If you are on the waiting list and expect to enroll, you are required to keep up with all the course work. If you are on the waiting list, attend any lecture section and tutorial that works for you until you are able to get in the course.

Grading Scheme

The final grade will consist of:

- Assignments (3): 30%
- Formal Quizzes (4): 30%
- Class participation: 5%
- Final exam: 35%

In order to pass you must:

- Get >= 50% in the weighted average of the formal quizzes and the final exam
- Get >= 50% in the overall average of the assignments.
- The lower of the computed grade or 45% will be assigned if the above conditions are not met.

(Last year, the class average was in the mid 70's.)

Class participation: In each lecture class, there will be **iClicker questions** worth a small number of points. We will drop roughly 10-20% of these components for the final grading.

Quizzes: There will be 4 quizzes roughly at two weeks intervals.

If you are going to miss a quiz, write to cpsc317-admin@cs.ubc.ca as soon as you are aware of the situation. If you miss one quiz, the remaining 4 quizzes will be considered for your final grade. If you miss more than one quiz, we will move the weights to other quizzes.

Assignments: All assignments will be available starting Monday of a week and will span two or three weeks. The assignment submission deadlines will be on Sunday 23:59:59h in the last week. For example, PA1 will start on January 15, 2024 and the deadline will be January 28, 2024 at 23:59:59h.

You can submit your assignments multiple times on PrairieLearn. The latest submission on PrairieLearn within the deadline will be considered for evaluation.

Assignments must be submitted within one week of the specified due date. Extensions beyond this period are granted only until the release of the subsequent assignments. The final assignment submission deadline coincides with the final exam date. Late submissions incur a penalty of 30% if submitted after the main due date and 50% if submitted after the extended due date, unless a valid reason such as illness or another extreme condition is provided by the student. If you cannot finish any assignment even with the extra hours, write to cpsc317-admin@cs.ubc.ca along with the reasons. We will exempt you from the assignment and shift the weight to the other submitted assignments.

The instructors reserve the right to make minor modifications to the rules above.

Computer Based Test Facility (CBTF)

CBTF portal: https://ca.prairietest.com/

Quizzes

The quizzes will be conducted in the Computer Based Test Facility, which allows you the flexibility of taking the quizzes at your convenient date and time.

Each of the four quizzes will be run for three days in the week they are scheduled. You will be able to register for a 1-hour slot on the CBTF portal one week before the week of a quiz. Students must ensure timely completion within this window, as the deadline cannot be extended except for valid reasons such as illness or university-related activities, which require prompt notification to the instructor or course coordinator with supporting documentation. In cases where a student misses a quiz due to a valid reason and provides timely notification with supporting documentation, the weight of the missed quiz will be redistributed to other quizzes or the final exam, as determined by the course grading policy.

Inside the CBTF, you will be giving the test on a computer via PrairieLearn. The CBTF only supports exams that are closed book and closed notes; our quizzes will comply with this requirement. No electronic devices, such as laptops and tablets will be allowed.

Final exam

Our plan is to use the CBTF for the final exam as well, although this might change. The exam format will be announced well ahead of time.

Overview of Course Content

Computer networks are pervasive and we use them daily yet we often do not give a lot of thought to how they are put together, how they work, how applications use them, and what the underlying fundamental principles are that allow us to build and design applications using computer networks. In this course you should:

- Become comfortable with writing and working with different programs that use computer networks.
- Learn the terminology associated with networking.
- Learn the key paradigms and strategies used in developing applications that use computer networks.
- Be able to apply the key paradigms and strategies to write programs and/or explain the operation of the Internet.

- Become familiar with the basic concepts of how the Internet is put together and operates and basic protocols that are used.

The material will be framed by looking at the key strategies and models for addressing:

- Design strategies for scalability and reliability in distributed systems.
- The use of layers and abstractions to understand and simplify designs.
- Routing, naming and addressing
- Isolation, data loss and performance
- Privacy and Security

Textbook and References

There will be assigned reading from the textbook along with pointers to relevant practice problems in the text.

Textbook

The course textbook is:

Title: *Computer Networking: A Top-Down Approach – seventh edition* (get 8th edition if buying new or if you plan on taking 417)
Authors: James Kurose and Keith Ross
ISBN-13: 978-0-13-359414-0

We are officially using the 7th/8th edition, and all references to assigned readings and problems will be based on those editions. If you have the 6th edition, you are welcome to use it, but you are responsible for any material that is in the 7th edition but not in the 6th.

If you need to purchase a copy of the text don't forget to check sites like Amazon and Chapters/Indigo as they are sometimes cheaper. If you just want an online version Vital Source offers textbook rental as well as a Lifetime Access option. (Please note that I am **NOT** endorsing Vital Source but simply pointing out the option; should you choose to use this service it is your responsibility to ensure that the various access methods and restrictions meet your needs and that you are comfortable with their privacy commitments and tracking of you.)

References

These books are not required, but may provide additional support or study material.

- Larry Peterson and Bruce Davie, *Computer Networks: A Systems Approach*, – this is the open sourced version of one of the standard networking textbooks. (https://book.systemsapproach.org/)
- Brian W. Kernighan and Dennis Ritchie, *The C programming language*, 2nd edition, Prentice Hall, 1988. (ICCS/Computer Science Reading Room link and UBC Libary Link)

- Delores M. Etter, *Engineering Problem Solving with C*, 4th edition, Prentice Hall, 2013. (ICCS/Computer Science Reading Room link)

Online Learning Tools

- **PrairieLearn:** for practice questions
  - CPSC 317 PrairieLearn link: 2023S1
- **iClicker Cloud** (for in-class participation questions):
  - CPSC 317 Section 201: https://join.iclicker.com/
- **Piazza** (for class discussions): Sign up link

- **Canvas:** for lecture slides and the other resources

Weather Contingency Plan for Class, Quizzes, and Exams

If in-person activities in our course are cancelled due to weather conditions (e.g., snow), please monitor https://www.cs.ubc.ca for information, the pinned posts section on Piazza for announcements on our course, and your UBC-registered e-mail. Specifically, in the event of such cancellations, we will:

- Make up missed lectures and tutorials via posted recordings or alternate exercises; follow Piazza for details.
- Adjust the deadline of quizzes, assignments, and in-class exercises during the affected period.
- Add scheduling dates to exams during the affected period and post instructions on how to re-register. (For the final exam, in the unlikely event that we run out of days available in the exam period, we will work with scheduling services and announce an alternate solution similar to normal exam rescheduling. Follow Piazza and your UBC-registered e-mail for more information.)

If rescheduling causes problems for you that require academic concession, please reach out as usual to cpsc317-admin@cs.ubc.ca with details.

Statement on Academic Integrity

The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work. Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise and harsh sanctions are imposed. For example, incidences of

plagiarism or cheating may result in a mark of zero on the assignment or exam and more serious consequences may apply if the matter is referred to the President's Advisory Committee on Student Discipline. Careful records are kept in order to monitor and prevent recurrences.

University Policies and Values to Support Student Success

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious, spiritual and cultural observances. UBC values academic honesty and students ae expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available here.

Course Policies

- Academic Conduct
- Sickness
- Academic Concessions
- Lab Usage
- Marking Concerns