CS 456/656, [Computer Networks](#) provides an introduction to the fundamentals of network architectures and protocols. Emphasis is placed on protocols used in the Internet.

When: TTh 10:00AM-11:20AM (LEC001), 11:30AM - 12:50PM (LEC002)

Where: MC 2038 (LEC001 & LEC002)

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Office Hours: Monday 9:00AM - 10:00AM on MS Teams ([CS 456/CS 656 Spring 2023](#)), or by appointment (email)

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Required Text:
Computer Networking: A Top-Down Approach, James Kurose & Keith Ross, Pearson, 8th Edition (7th Edition will also be fine)

Course Objectives
This course provides an overview of computer networks featuring the Internet, covering aspects ranging from transmitting frames on a comm. link and routing packets in a network to the design of network applications.

Course Topics
We will take a 'top-down' approach to networking to explain how networking principles are put into practice in support of widely-used networked applications and systems.

I. Overall Picture of Computer Networking

Circuit Switching vs. Packet Switching, Access Networks, Physical Media, Network Delays, Protocol Layering, Internet architecture.

II. Application layer protocols
World Wide Web (HTTP), File Transfer (FTP), Electronic Mail (SMTP), Domain Name System (DNS), Socket Programming.

III. Transport layer protocols
Design Issues, Connectionless UDP, Principles of Reliable Data Transfer, Connection-oriented Transport TCP, Flow Control, Congestion Control.

IV. & V. Network layer and routing
Routing approaches, routing in the Internet, Internet Protocol, IPv6, tunnelling, router design, control/data plane, SDN.

VI. Data link layer
Multiple access protocols and LAN's, address resolution protocol, Ethernet.

Course Requirements
It is expected that students complete the required assignments and take all quizzes and exams. Any material presented in lectures will be examinable unless specifically noted.

Course Resources
Primary electronic material for the course is available on **Waterloo Learn**.

Course Discussion Forum
We will use Piazza for course-related discussions. The system is highly catered to getting you fast and efficient help from classmates, the TAs, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza.

You can sign up at: https://piazza.com/uwaterloo.ca/spring2023/cs456656

Course Prerequisites
CS 350 or 354; Computer Science students only
Antirequisites: CS 436, ECE 358, ECE 428

Grading Policy
CS 456
Assignments: 3 programming assignments of 10% each (check your calendar for tentative dates)
Midterm Exam: 25% (tentatively on June 16, 2023. Check your calendar)
Final Exam: 35% (date/time to be announced by Registrar's office)
Quizzes: 10% (4 out of 5 in total, in-class, at the end of each chapter)

CS 656
Assignments: 3 programming assignments, a total of 10% (check your calendar for tentative dates)
Midterm Exam: 25% (tentatively on June 16, 2023. Check your calendar)
Final Exam: 35% (date/time to be announced by Registrar's office)
Project (Research Paper): 20% (check your calendar for out/due date)
Quizzes: 10% (4 out of 5 in total, all in-class, at the end of each chapter)

Assignments are to be returned by the provided due dates. **In the case of illness or extraordinary circumstances, a VIF has to be submitted and a 10% penalty will apply for each 24 hours late submission up to a maximum of 72 hours of assignment deadline. No further extension will be granted.**

Midterm and final have to be passed, in the aggregate, in order to pass the course; i.e.,:
[(Midterm*25) + (Final*35)] / 60 >= 50%

All examinations are closed books.

In the case of a **missed** exam, a medical certificate or doctor's note must be uploaded to the **university's online portal**. The certificate or doctor's note MUST include the statement "This Student is unable to write the test on (date) for (medical reasons)". Documentation MUST show that the physician was consulted before or on the day of the exam. Only ORIGINAL copies can be accepted. A statement merely confirming a report of illness made by the student is NOT acceptable.

Doctor's note will not be accepted for a missed quiz. A missed quiz cannot be retaken.

Continuity of Education Plan
Reduced weights for Midterm and Final exams if they are to be conducted online:

Midterm Exam: 20%
Final Exam: 25%

Note that if any exam has to be scheduled online, the remaining portion of the grade for the online exam will be proportionally spread across the remaining components (i.e., assignments, quizzes, and projects, where applicable).

FALSE STATEMENTS AND/OR DOCUMENTATION WILL BE TREATED AS ACADEMIC OFFENCES AND HANDLED ACCORDINGLY.

Plagiarism

A programming assignment is an individual creative process. Individuals must reach their own understanding of the problem and discover a path to its solution. During this time, discussions with friends are encouraged. However, when the time comes to write the code that solves the problem, such discussions are no longer appropriate; the program must be your own work.

Do not, under any circumstances, copy another person's program. This includes relevant web sources. Writing code for use by another or using another's code in any form is academic fraud and will be dealt with harshly. You are also responsible for ensuring that the code you write for the assignments is not readable by others.

Appeals

Assignment appeals should be directed to the TA who marked the assignment. Exam appeals need to be submitted in writing to the instructor. The whole exam will be remarked.

Academic Integrity

In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. All members of the UW community are expected to hold to the highest standard of academic integrity in their studies, teaching, and research. The Office of Academic Integrity's website contains detailed information on UW policy for students and faculty. This site explains why academic integrity is important and how students can avoid academic misconduct. It also identifies resources available on campus for students and faculty to help achieve academic integrity in — and out — of the classroom.

Grievance
A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70 - Student Petitions and Grievances, Section 4.

Discipline
A student is expected to know what constitutes academic integrity, to avoid committing academic offenses, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offense, or who needs help in learning how to avoid offenses (e.g., plagiarism, cheating) or

about "rules" for group work/collaboration should seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean. When misconduct has been found to have occurred, disciplinary penalties will be imposed under Policy 71 – Student Discipline. For information on categories of offenses and types of penalties, students should refer to [Policy 71 - Student Discipline](#).

Avoiding Academic Offenses
Most students are unaware of the line between acceptable and unacceptable academic behaviour, especially when discussing assignments with classmates and using the work of other students. For information on commonly misunderstood academic offenses and how to avoid them, students should refer to the [Faculty of Mathematics Cheating and Student Academic Discipline Policy](#).

Appeals
A student may appeal the finding and/or penalty in a decision made under Policy 70 - Student Petitions and Grievances (other than regarding a petition) or Policy 71 - Student Discipline if a ground for an appeal can be established. Read [Policy 72 - Student Appeals](#).

Intellectual Property
Students should be aware that this course contains material that is the intellectual property of their instructor, TA, and/or the University of Waterloo. Intellectual property includes items such as:
- Lecture content, spoken and written (and any audio/video recording thereof);
- Lecture handouts, presentations, and other materials prepared for the course (e.g., PowerPoint slides);
- Questions or solution sets from various types of assessments (e.g., assignments, quizzes, midterm and final exams); and
- Work protected by copyright (e.g., any work authored by the instructor or TA or used by the instructor or TA with permission of the copyright owner).

Course materials and the intellectual property contained therein, are used to enhance a student's educational experience. However, sharing this intellectual property without the intellectual property owner's permission is a violation of intellectual property rights. For this reason, it is necessary to ask the instructor, TA and/or the University of Waterloo for permission before uploading and sharing the intellectual property of others online (e.g., to an online repository).

Permission from an instructor, TA or the University is also necessary before sharing the intellectual property of others from completed courses with

students taking the same/similar courses in subsequent terms/years. In many cases, instructors might be happy to allow distribution of certain materials. However, doing so without expressed permission is considered a violation of intellectual property rights.

Please alert the instructor if you become aware of intellectual property belonging to others (past or present) circulating, either through the student body or online. The intellectual property rights owner deserves to know (and may have already given their consent). Read Policy 73 - Intellectual Property Rights.

Diversity

It is our intent that students from all diverse backgrounds and perspectives be well served by this course, and that students' learning needs be addressed both in and out of class. We recognize the immense value of the diversity in identities, perspectives, and contributions that students bring, and the benefit it has on our educational environment. Your suggestions are encouraged and appreciated. Please let us know ways to improve the effectiveness of the course for you personally or for other students or student groups. In particular:

- We will gladly honour your request to address you by an alternate/preferred name or gender pronoun. Please advise us of this preference early in the term so we may make appropriate changes to our records.
- We will honour your religious holidays and celebrations. Please inform us of these at the start of the course.
- We will follow AccessAbility Services guidelines and protocols on how to best support students with different learning needs.

Note for students with disabilities

AccessAbility Services, located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.

Mental Health Support

The Faculty of Math encourages students to seek out mental health support, if needed.

On-campus Resources:

- Campus Wellness https://uwaterloo.ca/campus-wellness/
- Counselling services: counselling.services@uwaterloo.ca, 519-888-4567 ext. 32655

- [MATES](#): one-to-one peer support program offered by Waterloo Undergraduate Student Association (WUSA) and Counselling Services: mates@wusa.ca
- [Health Services](#): located across the creek from the Student Life Centre, 519-888-4096

Off-campus Resources:
- Good2Talk (24/7): Free confidential help line for post-secondary students. Phone: 1-866-925-5454 (Ontario and Nova Scotia only)
- Here 24/7: Mental Health and Crisis Service Team. Phone: 1-844-437-3247 (Waterloo Region only)
- OK2BME: set of support services for lesbian, gay, bisexual, transgender, or questioning teens. Phone: 519-884-0000 extension 213 (Waterloo Region only)
- EMPOWER ME 1-833-628-5589 from Canada/US. Other countries see: http://studentcare.ca/rte/en/IHaveAPlan_WUSA_EmpowerMe_EmpowerMe
- EMPOWER ME in China:
  - China North 108007142831
  - China South 108001402851