

Computer Networks I CS-3357A Course Outline

1. Course Information

Course Information

- Course title: Computer Networks I
- Course code: COMPSCI 3357A
- Academic term: Fall 2024
- Lectures:
 - Hours: Wednesdays 2:30 – 3:30 pm and Fridays 1:30-3:30 pm

List of Prerequisites

- Computer Science 2210A/B and
- Computer Science 2211A/B.

List of Antirequisites

- ECE 4436A/B
- AISE 4430 A/B

Unless you have either the requisites for this course or written special permission from your Dean's Designate (Department/Program Counsellors and Science Academic Advisors) to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

2. Instructor Information

| Instructors | Email | Office | Phone | Office Hours |
|----------------------------|-------------------------|------------|--------------------------|--|
| Dr. Zubair Fadlullah | Zubair.Fadlullah@uwo.ca | [REDACTED] | [REDACTED] [REDACTED] | Tuesdays: 1-2:30pm Zoom/ MS Teams |
| TA – To be announced later | | | | |

Students must use their Western (@uwo.ca) email addresses when contacting their instructor and TAs.

Office hours will be primarily conducted in Zoom or MS Teams. The office hours information of the instructor and TAs will be announced on OWL. Office hours require prior appointment/scheduling.

3. Course Syllabus, Schedule, Delivery Mode

Course Description

This course provides an introduction to concepts and issues involved in computer networks and data communications. Topics include the Internet, protocol layers and their service models (with a focus on the TCP/IP model), network programming, principles of reliable data transfer, congestion control, routing, error detection and correction techniques, analog and digital data signaling and transmission, and a variety of other topics in network security, multimedia networking, mobile and wireless data communications, and network management, as time permits.

Course-level learning outcomes

Upon completion of this course, a student will be able to:

- Gain knowledge of networking principles with a long shelf-life that will remain relevant even in emerging communication systems and modern network technologies.
- Explain physical and logical organization and layers of computer networks including the Internet.
- Demonstrate an understanding of client-server interactions and applications.
- Develop an understanding of networking fundamentals, such as reliable communication over an unreliable network layer, congestion and flow control, multiplexing, and multiple access channel sharing.
- Demonstrate an understanding of the difference between IPv4 and IPv6 network protocols.
- Demonstrate an understanding of one or more routing algorithms in the context of growingly complex modern networks.
- Compare functionalities of network elements, such as hubs, switches, bridges, routers, firewalls.
- Become familiar with reliability need of networks through hands-on assignments.
- Be able to write socket-based network application programs.

Delivery mode

The course will be delivered in person. Office hours are online (in Zoom/MS Teams) and require prior appointment/scheduling.

Lecture Notes

Course lecture notes will be posted on the course website on a weekly basis, as they are developed. Note that they are provided as a courtesy by the course instructor. Possessing (and even reading) these notes is not a suitable substitute for the lectures.

Course Website

The CS3357A website is accessible through OWL at <https://westernu.brightspace.com/d2l/home>. Class and assignment information will be posted on this website on a fairly regular basis. You are

responsible for reading this information frequently.

Table of contents (tentative schedule)

The course will address as many of the following topics as time will allow:

| | |
|---------------------------|---|
| Networking Fundamentals | <ul style="list-style-type: none"> - A history of computer networking and the Internet - Structure of the Internet - Connectionless and connection-oriented services - Circuit switching and packet switching fundamentals - Protocols - Layered protocol architectures and service models |
| A tour of protocol layers | <ul style="list-style-type: none"> - The OSI and TCP/IP layered architectures; the application layer and sample application services; transport layer services, including discussions of the principles of reliable data transfer and congestion control; network layer services, including routing and multicasting; data link layer services, including error detection and correction techniques and a variety of protocols (Ethernet, wireless 802.11X, etc.); physical layer services, including signaling, analog and digital data transmission, and channel capacity. |
| A tour of protocol layers | <ul style="list-style-type: none"> - The OSI and TCP/IP layered architectures - The application layer and sample application services - Transport layer services, including discussions of the principles of reliable data transfer and congestion control - Network layer services, including routing and multicasting - Data link layer services, including error detection and correction techniques and a variety of protocols (Ethernet, wireless 802.11X, etc.) - Physical layer services, including signaling, analog and digital data transmission, and channel capacity. |
| Network programming | <ul style="list-style-type: none"> - Socket programming - TCP and UDP programming interfaces - Asynchronous communications - Advanced socket options and programming techniques |
| Advanced topics: | <ul style="list-style-type: none"> - Multimedia networking - Network security - Wireless and mobile computing - Network management |

Key Sessional Dates:

Classes begin: September 5, 2024

Last day to add a full-course/first-term half course or drop a course (without showing WDN): Sep. 13, 2024

National Day for Truth and Reconciliation (observed at Western) – no classes: September 30, 2024

Fall Reading Week: October 12 – 20 (including Thanksgiving, October 14)

Classes end: December 6, 2024

Study days: December 7 – 8

Exam period: December 9 – 22, 2024

4. Course Materials

Required Textbook

The following text is required for this course:

- Computer Networking: A Top Down Approach, 8th Edition by Kurose and Ross, published by Pearson Education, 2021.

To obtain a digital version of the 8th Edition of the text, please go to Book Store at Western or see VitalSource here: <https://www.vitalsource.com/en-ca/products/computer-networking-james-kurose-keith-ross-v9780135928523>

Additional references and suggested readings may be provided throughout the course as the assignments require them. Please check back to the course website for updates and more information.

iClicker is likely to be used for interactive in-class participation. Please ensure that you have electronic devices to access virtual clickers such as iClicker.

All course material will be posted to OWL: <https://westernu.brightspace.com/>

Students are responsible for checking the course OWL site (<https://westernu.brightspace.com/>) regularly for news and updates. This is the primary method by which information will be disseminated to all students in the class.

If students need assistance with the course OWL site, they can seek support on the [OWL Brightspace Help](#) page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Recommended References

1. Larry Peterson and Bruce Davie : Computer Networks: A Systems Approach
2. Andrew S. Tanenbaum and David J. Wetherall, Computer Networks (5th Edition), Prentice Hall, 2010
3. W. Stallings, Data and Computer Communications, Prentice Hall, 2002. 3. Leon-Garcia and I. Widjaja, Communication Networks: Fundamental Concepts and Key Architectures, McGraw-Hill, 2000
4. W. Stevens, B. Fenner, and A. Rudoff, Unix Network Programming, Volume 1: The Sockets Networking API

Technical Requirements

Stable Internet connection, computer with working microphone and/or webcam, other hardware or software specifications, to join office hours.

5. Methods of Evaluation

Grading Scheme and Assessment Dates

The overall course grade will be calculated as listed below:

| | |
|------------------------------------|-----|
| Attendance and participation quiz: | 8% |
| Assignments (#): | 37% |
| - Assignment 1: | 5% |
| - Assignment 2: | 10% |
| - Assignment 3: | 12% |
| - Assignment 4: | 10% |
| Quizzes (#): | 10% |
| - Quiz 1: | 5% |
| - Quiz 2: | 5% |
| Midterm Test: | 15% |
| Final Exam: | 30% |

To be eligible to receive a passing grade in the course, your combined midterm test and final exam grade must be at least 40%. Otherwise, the maximum overall mark you can receive is 45%.

General information about missed coursework

Students must familiarize themselves with the *University Policy on Academic Consideration – Undergraduate Students in First Entry Programs* posted on the Academic Calendar:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration_Sep24.pdf

This policy does not apply to requests for Academic Consideration submitted for **attempted or completed work**, whether online or in person.

The policy also does not apply to students experiencing longer-term impacts on their academic responsibilities. These students should consult [Accessible Education](#).

For procedures on how to submit Academic Consideration requests, please see the information posted on the Office of the Registrar's webpage:

https://registrar.uwo.ca/academics/academic_considerations/

All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline.

All Academic Consideration requests must include supporting documentation; however, recognizing that formal documentation may not be available in some extenuating circumstances, the policy allows students to make one Academic Consideration request **without supporting documentation** in this course. However, the following assessments are excluded from this, and therefore always require formal supporting documentation:

- Examinations scheduled during official examination periods (Defined by policy)
- Midterm Test (Designated by the instructor as the one assessment that always requires documentation when requesting Academic Consideration)

When a student *mistakenly* submits their one allowed Academic Consideration request **without supporting documentation** for the assessments listed above or those in the **Coursework with Assessment Flexibility** section below, the request cannot be recalled and reapplied. This privilege is forfeited.

Evaluation Scheme for Missed Assessments

When a student misses the Final Exam and their Academic Consideration has been granted, they will be allowed to write the Special Examination (the name given by the University to a makeup Final Exam). See the Academic Calendar for details (under [Special Examinations](#)), especially for those who miss multiple final exams within one examination period.

Essential Learning Requirements

Even when Academic Considerations are granted for missed coursework, the following are deemed essential to earn a passing grade.

To be eligible to receive a passing grade in the course, your combined midterm test and final exam grade must be at least 40%. Otherwise, the maximum overall mark you can receive is 45%.

Participation

Your participation grade will be determined by your attendance (recorded via iClicker) in-class and participating in the iClicker quizzes/polls. This will be graded as a pass or fail for each lecture.

Up to five (5) lectures can be missed without penalty. First week of class will not count in order to accommodate for late enrollments. After missing 5 lectures, you will be required to contact your academic counsellor to request accommodations, or you will receive a grade of zero for participation in the missed lecture. If you enrolled after the first week of class, your permissible 5 absences will be affected.

To obtain these participation marks you must be physically present in-class and have your own device capable of using iClicker. Any attempt to circumvent the participation system or earn a passing participation grade without attending class is an academic offence and will result in an overall participation grade of zero and the offence being reported to the Dean's Office.

If you have special timetable conflict approved prior to the start of the semester, you may be exempt from the missed lectures.

Quizzes

There are two quizzes. The quizzes will consist in multiple-choice/matching questions/short questions format. The quizzes may be presented on-line through OWL or held in-class depending on the available logistics. Details will be announced later. Quizzes are to be taken individually and without the aid or assistance of any person or persons.

In cases of emergency when a quiz must be missed, students can contact their academic counselling office to retrieve accommodation for an absence. In this case, the weight of the quiz will be carried over

to the final exam.

Tentative Quiz Dates (the exact day(s) in which the quiz will take place will be announced):

| | |
|----------|--|
| Quiz # 1 | (Tentative) Friday, September 27, 2024 |
| Quiz # 2 | (Tentative) Wednesday, October 9, 2024 |

There will **not** be any make-up quizzes. If you cannot write the quiz for a valid reason (i.e. conflict with another university assessment, medical reasons, or religious reasons), you will **have to** contact your academic counsellor to request accommodations to miss the quiz. If you obtain such accommodation, the weight of the quiz will be shifted to the final exam. **Without such accommodations, missing the quiz will result in a mark of zero on the quiz and it cannot be made up.**

Assignments

There are four assignments that require you to apply the topics you learned from the lectures and to implement specific socket programming tasks and network protocols.

All assignments are due via Gradescope at 11:55pm on the due date unless stated otherwise. If an assignment has to be cancelled by the instructors for any reason, the remaining assignments will be reweighted to add up to 37%.

Late Policy on Assignments

It is expected that students budget enough time to properly submit their assignments via OWL and allow for any unforeseen technological issues. Students are expected to regularly backup their assignments and submit well before any deadline.

- Each student will be given **four (4)** “late coupons” in total for the semester that may be used to submit an assignment one day late per coupon (up to a maximum of **3 days late per assignment**). After three (3) days since the due date of each assignment, the submission portal will be closed.
- Late coupons must be used before special circumstances are considered. If more time is needed due to medical or compassionate reasons, students must follow the university’s procedure for Academic Accommodation.
- Late coupons will **not** be replenished. For example, if you use 3 late coupons on Assignment 1, you will only have 1 left for the remainder of the course.
- Each late coupon is valid for a 24-hour period only. For example, if an assignment is due on February 1st at 11:55 pm and the student submits on February 1st at 11:56 pm this would require one late coupon, as would any submission between February 1st at 11:56pm and February 2nd at 11:55 pm. After February 2nd at 11:55pm and up to February 3rd at 11:55 pm, 2 late coupons would be required. After February 3rd at 11:55pm and up until February 4th at 11:55pm 3 late coupons would be required. After February 4th at 11:55pm, no more submissions will be accepted, and a zero grade will be given on the assignment.
- Without any remaining coupons or with less than three coupons, the assignment must be

submitted within 3 days of the original deadline (due submission date), incurring a penalty of 10% of the total marks per day late without a coupon.

- Late coupons will be applied automatically by the TA marking the assignment when an assignment is submitted late. No intervention will be needed from the students. No late coupons will be used if you submit before the deadline or fail to submit an assignment at all.
- An item on OWL will show an estimate of your current late coupons, however, this is not updated live and maybe out of date. It is the student's responsibility to keep track of how many late coupons they have available throughout the semester. Occasionally the teaching assistants may be tardy on updating each student's late coupon total. In case of a discrepancy, the actual number of coupons used (and not what is listed in OWL) will be applied.
- Even with accommodation, no assignment will be accepted after 4 days past the original due date. After this point the only possible accommodation will be moving the weight of the missed assignment onto the other assignments.
- **Late coupons can only be used on assignments.**

Re-submissions are allowed but note that re-submissions after the deadline will be considered late, regardless of when the initial submission was made. The date and time of your most recent resubmission will be used for determining lateness.

Assignments will be submitted through Gradescope (not OWL) unless otherwise stated. You have free access to Gradescope as a Western student. Steps to submit on Gradescope will be explained in more detail closer to the deadline of the first assignment. We will not accept assignments submitted via email or any other format.

In the case of assignments submitted to Gradescope using Auto-graded tests, some of the tests may be provided as public test cases. However, note that additional tests may be run that are hidden from you, so you should create your own additional tests to ensure your code works properly in all cases. It is your responsibility to ensure the tests run and pass on Gradescope in order to get full marks, regardless if the assignment runs on any other platform or environment or IDE.

Assignments are to be done individually, not in groups. The submitted code will be run through a similarity-checking software to look for cheating. **Do not copy or share code in any way.**

Tentative Assignment Due Dates – tentative (all assignments are due at 11:55 pm Eastern time):

| | Assigned date (tentative) | Due date (tentative) |
|---------------|----------------------------------|-----------------------------|
| Assignment #1 | September 20, 2024 | October 4, 2024 |
| Assignment #2 | October 4, 2024 | October 25, 2024 |
| Assignment #3 | October 25, 2024 | November 14, 2024 |
| Assignment #4 | November 14, 2024 | December 5, 2024 |

Please monitor OWL and Gradescope to track the assignment-related information.

It is your responsibility to keep up-to-date backups of all assignment files in case of system crashes or inadvertently erased files. Retain copies of all material handed in, as well as the actual graded

version, to guard against the possibility of lost assignments or errors in recording marks. It is not safe to discard these materials until you are satisfied that your final mark for the course has been computed properly.

The role of tutoring is to help students understand course material. Tutors should not write assignments, projects, or take-home tests for the students who hire them. Having employed the same tutor as another student is not a legitimate defense against an accusation of collusion, should two students hand in work judged similar beyond the possibility of coincidence.

Midterm Test

The midterm test is planned to be held at HSB-40 on Friday, October 25th, during regular class hours. The midterm test will be closed book, with a duration of 1 hour and 40 minutes, and will consist of multiple-choice questions. If any changes to the test format and venue are necessary due to unforeseen circumstances, announcements will be made on OWL.

Missing the Midterm Test: Students with prior timetable special permissions should ensure in advance that they are available to attend the midterm test on the scheduled date. There will be **not** be a makeup midterm test. If you miss the midterm test for any valid reason (i.e. conflict with another university assessment, medical reasons, or religious reasons), follow the university procedure for Academic Accommodation. If accommodation is approved by your Dean's office, your final exam mark will be reweighted to include the weight of the midterm test. In this case, the final exam will be worth 45% (=30% + 15%) of the overall course marks. To be eligible to receive a passing grade in the course, the reweighted final exam grade must be at least 40%. Otherwise, the maximum overall mark you can receive is 45%.

You must notify the course instructor within a week of the missed midterm test, and documentation must be received by your Dean's office within 2 weeks of the missed test. **Without such accommodations, missing the midterm test will result in a mark of zero on the test and it cannot be made up.**

Final Exam

The final exam will be scheduled by the University. The exam period is from December 9 to 22 and the exact date, time, and location for our exam will likely be announced later. The final exam is cumulative, closed book, and is 3 hours in length and will be completely multiple-choice format.

Grade Requirement

To be eligible to receive a grade of 50% or higher (i.e. to pass the course), you must achieve:

- at least 40% on the combined midterm test and final exam

If you fail to meet this condition, your final mark will be either 45% or your calculated grade, whichever is lower.

6. Additional Statements

Religious Accommodation

When conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request an accommodation for their absence in writing to the course instructor and/or the Academic Advising office of their Faculty of Registration. This notice should be made as early as possible but not later than two weeks prior to the writing or the examination (or one week prior to the writing of the test).

Please visit the Diversity Calendars posted on our university's EDID website for the recognized religious holidays:

<https://www.edi.uwo.ca>.

Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf

Academic Policies

The website for Registrar Services is <https://www.registrar.uwo.ca/>.

In accordance with policy,

https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf

the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at their official university address is attended to in a timely manner.

Only a non-programmable calculator is permitted during the final exam. No other electronic devices (including phones, scientific calculators, etc.) are permitted on the final exam.

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

All required assignments may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All assignments submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

Computer-marked multiple-choice tests and exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

iClickers will be used for a. Communicate clearly to students information on how clickers are used including: how the student's privacy will be protected, how clickers may be used by the instructor for data gathering and for evaluating the student, and why they cannot be used by anyone but the student.

In the event of health lock-down, tests and examinations in this course may be conducted using a remote proctoring service. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide **personal information** (including some biometric data) and the session will be **recorded**. Completion of this course will require you to have a reliable Internet connection and a device that meets the technical requirements for this service. More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at:

<https://remoteproctoring.uwo.ca>

Support Services

Please visit the Science & Basic Medical Sciences Academic Advising webpage for information on adding/dropping courses, academic considerations for absences, appeals, exam conflicts, and many other academic-related matters: <https://www.uwo.ca/sci/counselling/>.

Students who are in emotional/mental distress should refer to Mental Health@Western (<https://uwo.ca/health/>) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at

https://www.uwo.ca/health/student_support/survivor_support/get-help.html

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Accessible Education at

http://academicssupport.uwo.ca/accessible_education/index.html

if you have any questions regarding accommodations.

Learning-skills counsellors at Learning Development and Success (<https://learning.uwo.ca>) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: <https://www.uwo.ca/se/digital/>.

Additional student-run support services are offered by the USC, <https://westernusc.ca/services/>.