











Section M	<p>Dr. Sandra Cespedes E-mail: Use Moodle (private message) to ensure your message is seen <u>Lecture:</u> Tuesday - Thursday 1:15 PM - 2:30 PM at H-507 <u>Office Hours:</u> Thursday 3:00 PM to 4:00 PM Replied App: <u>@scespedes</u></p>				
Section W	<p>Dr. Aiman Hanna - Office: ER_1103 E-mail: contact@AimanHanna.com Tel: (514) 848-2424 ext. 7878 <u>Lecture:</u> Monday – Wednesday 1:15 PM - 2:30 PM at MB-2.210 <u>Office Hours:</u> 1) Tuesday 2:00 PM – 3:00 PM; 2) By appointment anytime. Replied App: <u>@dr.hanna</u></p>				
<p>Fastest way to communicate: Through the <i>Replied</i> App at the <u>COMP445W25</u> and <u>COMP445W25TAs</u> groups</p> <div style="text-align: center;">  </div> <table border="1" style="width: 100%; text-align: center;"> <tr> <td style="width: 50%;"></td><td style="width: 50%;">QR will be available shortly</td></tr> <tr> <td></td><td></td></tr> </table>			QR will be available shortly		
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Tutorials & PODs:

Lab instructors, tutors, PODs and markers can be contacted on Replied at COMP445W25TAs group.

Labs:

TA Name	Lab Section	Replied App User-ID
David Bonilla david.bonillaverdugo@mail.concordia.ca	MD: Th 11:45AM - 1:05PM @ H849	TBA
David Bonilla david.bonillaverdugo@mail.concordia.ca	MJ: Th 2:45PM - 4:35PM @ H917	TBA
Alexis Yañez	MI: Tu 11:15AM - 1:05PM @ H831	TBA

alexis.yanez@mail.concordia.ca		
Maryam Hatami maryam.hatami@mail.concordia.ca	MK: Tu 11:15AM - 1:05PM @ H843	TBA
Osama Iskandarani ori00@mail.aub.edu	WJ: We 11:10AM - 1:00PM @ H831	@isk
Mario Chahoud mariochahoud.mc@gmail.com	WK: We 2:45PM - 4:35PM @ H917	@mariochahoud
Mario Chahoud mariochahoud.mc@gmail.com	WI: Mo 11:10AM - 1:00PM @ H917	@mariochahoud
Sepehr Shirani sepishiran@gmail.com	WL: Mo 2:45PM - 4:35PM @ H917	@sepehrshirani

Tutorials:

This is an essential new addition to the course that you'll find highly beneficial. All tutorials will be conducted online via Zoom.

TA Name	Times & Zoom Links	Replied App User-ID
Jason Gerard jason.gerard@concordia.ca	Wednesday 8:00 PM – 9:00 PM https://concordia-ca.zoom.us/j/6398011260	@jasong321
Osama Iskandarani ori00@mail.aub.edu	Monday: 9:50 AM – 10:50 AM https://concordia-ca.zoom.us/j/4976267957	@isk
Shashidhar Krovvidi mariochahoud.mc@gmail.com	TBA	@skrovvidi9
Kamran Ayoubi kamran.ayoubi@mail.concordia.ca	Thursday 3:10 PM - 4:10 PM https://concordia-ca.zoom.us/j/85759334949?pwd=ORYA7FiK1QnZ0T1TZm438tsHr7ZfPa.1	TBA

Markers:

Marker Name	Replied App User-ID
Oghenerukevwe Oyinloye	@rukevweoyinloye
Shashidhar Krovvidi	@skrovvidi9
Sepehr Shirani	@sepehrshirani
Inderjeet Chauhan	@chauhans
Khushi Doval	@khushi
Nisarg Shah	@nisarg

Fatema Gajipurwala	@fatema
Mohammad Rasool Momeni	Android
Ehsan Eslami	@eslamiehsan94
Sahiti Chilakala	@sahitinaidu

Pre-Requisites: COMP 346.

Calendar Course Description: This course introduces the fundamentals of networking protocols and communication technologies. Topics covered include network architectures and service models, principles behind the design of protocol stacks, local and wide area networks, and the Internet. Review of the foundations and performance of application layer protocols, reliable delivery mechanisms, congestion and flow control, control and data planes, routing and switching, error detection and correction, and multiple access protocols.

Objectives: The main objectives of this course are:

1. Introduce the basics of Data Communication, Information, Coding, and Transmission.
2. Understand the ISO OSI and Internet models and the role of layered protocols.
3. Understand and appreciate Networks, Protocols, Network-interconnection and Internet.

Generally, the course targets the coverage of the particulars related to the above subjects, which includes: Top-down view of Network applications, Internet, LAN/WAN architecture, Layered protocol model, The Application Layer (HTTP, FTP, SMTP, DNS, socket programming), The Transport Layer (Multiplexing, UDP, Reliable Data Transfer, TCP), The Network Layer, Virtual Circuit and Datagram networks, Routers, Routing algorithms, The Datalink layer, Error detection and correction, Local Area Networks, Ethernet, Point to point protocol, Wireless and Mobile Networks, Wireless links, Network Standards, Cellular architecture, Security in networks.

Engineering Tools

- Wireshark
- Network programming using Python
- Apache web server
- Dash.js video player
- Network simulator

Specific Knowledge and Skills Needed for this Course: Students taking this course are expected to have sufficient knowledge of the following topics. Should you have difficulties in any of these topics, you are strongly encouraged to review them before the DNE deadline.

- Computer fundamentals: hardware, software, and operating systems
- Python programming
- Basic probabilities

Course Materials

Textbook

The main* and required textbook for the course is:

Computer Networking; A Top-Down Approach by Jim Kurose and Keith Ross, Pearson Higher Education, 8th Edition, 2020. ISBN-13: 9780135928615.

*Notes:

- 7th Edition. ISBN-13: 978-0-13-359414-0, ISBN-10: 0-13-359414-9 is also okay.
- Other references may be needed/used.

Grading Scheme

In general, there is **no fixed**, a priori relationship between the numerical percentage and the final letter grades for this course. Additionally, In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change. However, the following grading scheme may provide as accurate details as possible on the grading scheme of the course.

The course has 4 main components as follows: Theoretical Assignments; Laboratory Assignments; Midterm Exam; and Final Exam.

1. Course requirements and assignments

The course has three categories of evaluation:

- i) Content Checks: based on four (4) theoretical assignments;
- ii) Application of Concepts: based on five (5) guided laboratories; and
- iii) Mastery of Fundamentals: based on one mid-term (MT) and a final exam (FE).

2. Weight distribution and grading scheme

Earning a letter grade:

This course uses specifications grading. The table below shows the requirements necessary to obtain each letter grade. To earn the grade listed in each row, a student must satisfy **ALL** the criteria in that row. In other words, **there is an AND operator among all the requirements in the same row to earn the letter grade of that row.**

To earn	Content checks	Application of Concepts	Mastery of Fundamentals
A	Pass 3+ theoretical assignments	Pass 4+ guided labs	Pass at least 85% of MT and Pass at least 90% of FE
B	Pass 2+ theoretical assignments	Pass 3+ guided labs	Pass at least 70% of MT and Pass at least 78% of FE
C	Not required	Pass 2+ guided labs	Pass at least 55% of MT and Pass at least 60% of FE
D	Not required	Pass 1+ guided labs	Pass at least 45% of MT and Pass at least 50% of FE

An "F" grade is awarded if a student does not meet the requirements for a "D".

Earning plus/minus grades

- To earn an A+: Meet all the requirements of the letter A plus get at least 93% average in the Mastery of Fundamentals category.
- To earn a plus grade for letters B, C, and D: Meet all the requirements for the letter plus either meet the condition for Application of Concepts of the next level up **OR** meet the conditions for the Mastery of Fundamentals of the next level up. Note that meeting the minimum requirements of **only one criterion** of the next level up does not result in moving up to the next letter grade.
- To earn a minus grade for letters A, B, and C: Meet all the requirements for the letter except for exactly one of the following: the condition for Application of Contents **OR** the conditions for the Mastery of Fundamentals. The category not met must meet the minimum requirements for the next lower letter in the same category, and only one category can fail to be met. In other words, if any two categories fail, that means the student earns a lower letter grade instead of just earning a minus grade.

Illustrative Examples

- Student A passed 4 theoretical assignments, passed 5 guided labs, and got 85% and 80% in MT and FE, respectively. The letter grade would be A-. *Explanation: they met all the requirements for the letter A except for one condition--the final exam). Note that a minus is granted because the final exam meets the minimum grade required by letter B.*
- Student B passed 1 theoretical assignment, passed 2 guided labs, and got 85% and 90% in the MT and FE, respectively. The letter grade would be C+. *Explanation: Although the student met the requirements for an A in the Mastery of Fundamentals, the number of approved theoretical assignments and lab assignments situates the student directly in letter C. In other words, to reach the upper rows in the table, it is mandatory to pass at least two theoretical assignments and three lab assignments.*
- Student C passed 2 theoretical assignments, completed and passed the 5 guided labs, and got 75% and 85% in the MT and FE, respectively. The letter grade would be B+. *Explanation: They met all the requirements for a letter B. In addition, the number of labs approved meets the requirements of letter A, hence the plus. Note that, with an additional theoretical assignment approved, the student could have gotten an A- instead of B+.*

3. Method of Marking

- Midterm and Final Exam will indicate the points earned in each correctly answered question. These activities are individual evaluations and will take place in person.
- Guided Labs: Each lab is marked either Pass or No Pass. A description of the tasks required to earn points and the minimum number of points needed to obtain a passing mark will be provided for each lab assignment. Students are expected to submit lab reports/solution and conduct a demo to receive the marks. Students may also be asked to prepare a video demo and submit it along with their work.
- Theoretical Assignments: Each theoretical assignment is marked either Pass or No Pass. Each theoretical assignment includes a pre-selected question that weights 50% of the marks. Students will know in advance what is the question that will be reviewed by markers. Nevertheless, all questions must be answered to earn the other 50%. To pass the assignment, students must obtain in total a minimum of 75%.
- Note: For reasons of fairness, we may choose to scale up/down the marks in a particular exam or assignment to ensure that all aspects of the course receive a fair weight. Before the final grades are assessed, any such "fine-tuning" will be made known to students.

4. Details on assessment tools:

Content Checks

With the theoretical assignments, students are expected to reflect on the concepts discussed in class and solve review questions and practical exercises that help them be prepared for the midterm and the final exams. While discussion of the assigned problems among students is encouraged, each student is to solve and submit the assignments independently.

In each assignment, the teaching team will choose a question to mark out of 50% and will inform students of the chosen question in advance. Students are encouraged to solve the question without the help of external tools other than course materials and lecture notes. However, if the student seeks help from ChatGPT-like tools, besides the answer, it is mandatory to include the prompts used to arrive at the answer. In this case, the student must verify the correctness of the answer and include a justification explaining whether the answer is right or wrong (and why). The remaining questions will not be revised for correctness, but they must be responded fully to obtain the other 50% of the grade.

There will be a total of four (4) theoretical assignments. Although these assignments may not be mandatory to approve the course, at least two (2) need a passing grade to obtain more than a C in the final grade. A theoretical assignment is marked as PASS with a minimum of 75% in the total grade.

Application of Concepts

With the Lab Assignments, students are expected to:

- Learn about packet sniffers and use Wireshark to capture and analyze traffic in a network.
- Apply the concept of layering and encapsulation to investigate communication protocols using Wireshark.
- Extract and identify diverse information from network packets captured using sniffing libraries such as pcap.
- Learn about the TCP/IP stack of protocols through its analysis in action.
- Apply concepts of client/server architectures with a video streaming application.
- Apply the concepts of flow control and congestion control over Internet connections.
- Apply concepts of sockets and network programming using Python.

The course has a scheduled laboratory of two hours per week. There will be a total of five (5) labs, out of which two (2) need a passing grade to pass the course. Each lab will indicate the minimum number of points required to obtain a PASS mark.

During lab sessions, the lab instructors will provide a brief overview of the necessary tools and offer guidance on how to approach the lab tasks. While attendance is not mandatory, it is highly recommended as it will significantly help you complete your lab assignments.

Mastery of Fundamentals

During midterm and final exams, students are expected to demonstrate the mastery of the fundamental concepts of networking discussed in lectures, both in theory and practice. Exams include theoretical questions and practical exercises. In general, students will need to bring their own ENCS calculator to the exams. Both the midterm and the final will be closed-book examinations. The final exam will cover material from the entire course, including lectures, textbook, and assignments.

4. Important Dates and Submission Deadlines:

The Midterm Exam, for all sections, is scheduled for Saturday, March 8, starting at 2:30 PM. **There is no substitution for a missed exam. Your instructor will indicate the exact location of the midterm.** The final will be a three-hour examination during the examination period on a date to be determined later by the Examination's Office.

- Theoretical assignment 1: Week 2
- Theoretical assignment 2: Week 4
- Theoretical assignment 3: Week 7
- Theoretical assignment 4: Week 11
- Lab assignment 1: Week 3
- Lab assignment 2: Week 5
- Lab assignment 3: Week 7
- Lab assignment 4: Week 9
- Lab assignment 5: Week 11

5. Other information:

- All labs and tutorials start on January 20, 2025.
- Assignments.
 - Submissions. All assignments will be published online (no hard copies will be distributed in class).
 - You will have to submit your assignments using Moodle. Assignments uploaded to an incorrect folder in Moodle will not be marked, resulting in a zero mark. No resubmissions will be allowed. Submissions outside Moodle will not be processed.
 - Format: All assignment-related submissions must be adequately archived in a ZIP file using the student ID and last name as the file name. The submission itself must also contain the student name and student ID. Use "official" names only - no abbreviations or nicknames; capitalize the usual "last" name.
 - **IMPORTANT (Please read very carefully):** Additionally, which is very important, for the lab assignments, a demo will take place with the markers afterwards. Markers will inform you about the details of demo time and how to book a time slot for your demo. If working in a group, both members must be present during demo time. Different marks may be assigned to teammates based on this demo. **Now, please read very carefully:**
 - i) **If you fail to demo, a zero mark (No Pass) is assigned regardless of your submission.**
 - ii) **If you book a demo time, and do not show up, for whatever reason, you will be allowed to reschedule a second demo but a penalty of 50% will be applied. [There will be no exceptions to this rule!](#) This may result in a Pass or No Pass depending on the deduction of what would have been your original evaluation in the lab.**
 - iii) **Failing to demo at the second appointment will result in zero marks (No Pass) and no more chances will be given under any conditions.**

Tentative Course Schedule

The schedule is **tentative** and might change anytime.

Week	Topic
1	Outline & Introduction to Networking
2	Introduction – Chapter 1 Application Layer
3 & 4	Application Layer
5 & 6	Transport Layer
7	Transport Layer Data Plan
8	Data Plan
9	Control Plane
10	Control Plane Data-Link Layer
11	Data-Link Layer
12	Data-Link Layer Recap (if time allows)

Graduate Attributes

As part of either the Computer Science or Software Engineering program curriculum, the content of this course includes material and exercises related to the teaching and evaluation of graduate attributes. Graduate attributes are skills that have been identified by the Canadian Engineering Accreditation Board (CEAB) and the Canadian Information Processing Society (CIPS) as being central to the formation of engineers, computer scientists and information technology professionals. As such, the accreditation criteria for the Software Engineering

and Computer Science programs dictate that graduate attributes are taught and evaluated as part of the courses. The following is the list of graduate attributes covered in this course, along with a description of how these attributes are incorporated in the course:

- **Knowledge Base for Engineering**
- **Problem Analysis**
- **Design**
- **Use of Engineering Tools**

Graduate Attribute	Indicators	Level
Knowledge base for engineering: <i>Knowledge of network architectures: OSI and Internet models. Link layer: error detection, multiple access protocols, addressing. Local area networks: Ethernet, ATM, switches, and hubs. Network layer: forwarding and routing, IP, routing algorithms, multicast. Transport layer: connectionless and connection-oriented transport, reliable data transport, congestion control, QoS, UDP and TCP. Application layer: DNS, the web and http, file transfer, and email. Introduction to network security, multimedia protocols and wireless networking.</i>	Knowledge base in specific domain	Intermediate
Problem analysis: <i>Use mathematical modeling to analyze networking metrics such as bandwidth, throughput, delay, etc</i>	Modeling Problem Identification and Formulation	Intermediate
Design: <i>Develop simple system software applications related to the operation of computer networks, such as protocols, routing, security, etc.</i>	Problem identification and information gathering. Architectural and detailed design Implementation and validation	Intermediate
Use of Engineering Tools: <i>Make educated choices as to what data structures and algorithms to use to solve problems following their respective strengths and constraints</i>	Ability to use appropriate tools, techniques, and resources.	Intermediate

Course Learning Outcome (CLOs)

Course Learning Outcome	Related Graduate Attributes
A. Clearly explain the major components of a computer network and the Internet	Knowledge base for engineering
B. Explain the functions and protocols involved in the different layers of the OSI model and the TCP/IP stack	Knowledge base for engineering
C. Describe the operation of networking protocols and perform basic performance analysis	Knowledge base for engineering Problem analysis
D. Develop network-based applications and networking protocols	Problem analysis Design Use of Engineering Tools
E. Identify recent advances in modern networking, mobile networks, and security	Knowledge base for engineering

Web pages and other Resources


The fastest communication is through the  **replied** app at *COMP445W25* and *COMP445W25TAs* groups.

Web Pages

Many resources for the course (slides, assignments, example programs, ...) will be available online through Moodle; (available through the MyConcordia portal www.myconcordia.ca), or through the instructor's website. Your instructor will inform you of the exact link to access the materials.

For Sections M (Dr. Cespedes), please use the Moodle Web site available through the MyConcordia portal www.myconcordia.ca.

For Sections W (Dr. Hanna), the webpage for the course is: www.AimanHanna.com (follow Concordia links afterwards). Other material will be available on Moodle as well; so you will need to consult both locations. The web pages will contain announcements related to the class, pointers to documents, your theory and lab assignments, etc.

The fastest way to communicate is through the  **replied** app at the *COMP445W25* group. General questions for the course should be communicated in that group. For private messages, please create a private group and add *@dr.hanna* or *@scespedes* to it.

Further, a mailing list will be established for the course. You ***will need to subscribe*** to the mailing list. You can subscribe at the following link:

<https://mailman.encs.concordia.ca/mailman/listinfo/comp445-w25>.

In addition, the faculty web pages have a wealth of information pertaining to our computer systems and software, which includes simple user guides, and answers to many standard questions. You should explore these help pages. Begin your exploration from the URL: <http://www.encs.concordia.ca/helpdesk/faq/faq.php>

Finally, the faculty web pages have a wealth of information about our computer systems and software, which include simple user guides and answers to many standard questions. Students are encouraged to explore these help pages. Begin your exploration from the URL: <http://www.encs.concordia.ca/helpdesk/faq/faq.php>

Important Lecture Guidelines (Section W)

Laptops are **STRICTLY PROHIBITED** during the lectures. Other communications devices, such as cellular phones, communication watches, and text/video messaging devices, tablets, pads, and similar devices are also **STRICTLY PROHIBITED**. The usage of any of these materials during the class will result in you being asked to immediately leave the class.

Health and Safety Guidelines

All health and safety rules specific to this course can be found in the lab manual. General health and safety instructions and available health and safety trainings can be found at: Safety Programs - Concordia University (<https://www.concordia.ca/campus-life/safety/general-safety.html>).

Plagiarism

The most common offense under the [Academic Code of Conduct](#) is plagiarism which the Code defines as “*the presentation of the work of another person as one's own or without proper acknowledgement.*”

This could be:

- material copied word for word from books, journals, internet sites, AI-tools, professors course notes, etc.
- material that is paraphrased but closely resembles the original source.
- the work of a fellow student, for example, an answer on a quiz, data for a lab report, a paper or assignment completed by another student.
- a solution or Java code purchased through one of the many available sources.
- ➔ You must also notice that the submission of AI-generated material is strictly prohibited. The submission of such contents is considered as direct plagiarism and violates the University Code of Conduct. Any such submissions, partially or fully, will result in an immediate plagiarism case being submitted to the University. Plagiarism does not refer to words alone; it can also refer to copying images, graphs, tables, and ideas. Presentation is not limited to written work. It also includes oral presentations, computer assignments and artistic works. Finally, if you translate the work of another person into French or English and do not cite the source, this is also plagiarism.

In Simple Words:

Do not copy, paraphrase or translate anything from anywhere without saying where you obtained it!

IP [VERY IMPORTANT: PLEASE READ CAREFULLY]:

Course contents belonging to the instructor and the TAs, including, but not limited to, lectures, course notes, and video recordings of classes/tutorials remain the intellectual property of the faculty member and the TAs. It must not be distributed, published or broadcasted, in any form or shape, in whole or in part, without an explicit written permission of the faculty member or the TA. It is also prohibited for students to use their own means of recording of any elements of a class, lecture, tutorial, etc., without explicit written permission of the instructor. Any unauthorized sharing of course content will constitute a breach of the Academic Code of Conduct and/or the Code of Rights and Responsibilities. As specified in the Policy on Intellectual Property, the University does not claim any ownership of, or interest, in any of such IPs; all university members retain copyright over their work. In addition, please notice the following important information concerning the assignments and the labs: As the assignments remain the sole property of the course instructor, you are not permitted to post the assignments or their solutions anywhere on the Internet either during the course or at any future point of time. Intellectual Property rights are reserved. Violation of such rules during the course, or at any future point, will result in both academic and legal actions.

Content Delivery

Lectures will follow the standard term schedule. However, in the case of switching to an online delivery mode, the instructor will inform students about the methodology for content delivery and lecturing. The course materials will be published in Moodle, including class notes, assignments, important dates, announcements related to the class, and pointers to documents, among others. Course materials are for students' personal use only.