GINA CODY SCHOOL OF ENGINEERING AND COMPUTER SCIENCE

Course number	Course Title	Term
COMP 445	Data Communication & Computer Networks	Winter 2023

Course Instructor	Office	E-Mail	Office Hours
Dr. Sandra Céspedes (Coordinator)	ER 1221	sandra.cespedes@concordia.ca	Thursday 11:00 AM – 12:00 PM or by appointment
Dr. Abdelhak Bentaleb	ER 1223	abdelhak.bentaleb@concordia.ca	Wednesday 3:30 PM – 4:30 PM or by appointment

CLASS, LAB AND TUTORIAL SCHEDULE

Section	Day	Time	Location	Instructor	E-mail
M	MoWe	1:15 pm – 2:30 pm	H 1070 SGW	Dr. Abdelhak Bentaleb	abdelhak.bentaleb@concordia.ca
W	Tu Th	1:15 pm – 2:30 pm	EV 2.260 SGW	Dr. Sandra Céspedes	sandra.cespedes@concordia.ca

Labs					E-Mail	Lab Start Date
To be announced. Please check Moodle for full details						Week 3

COURSE CALENDAR DESCRIPTION

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.

PREREQUISITES

COMP 346

TEXTBOOK AND ADDITIONAL COURSE MATERIALS

- *Required textbook(s):*

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.

- *Instructor's lecture notes: will be posted in Moodle course management site*

GRADING POLICY	
Evaluation Tool	**Weight**
Midterm	20%
Final	50%
Lab assignments	20%
Theoretical assignment	10%
Total	100%

Passing Criteria:

Students must pass the mid-term and the final exam to pass the course. *There is no substitution for a missed exam.*

Important Dates

- Theoretical assignment 1 January 27th, 2023
- Theoretical assignment 2 February 17th, 2023
- Theoretical assignment 3 March 17th, 2023
- Theoretical assignment 4 April 7th, 2023
- Lab assignment 1 February 10th, 2023
- Lab assignment 2 March 24th, 2023
- Lab assignment 3 April 14th, 2023
- The midterm is scheduled on February 22th, 2023, starting at 1:15 PM (section W) and February 23th, 2023 starting at 1:15 PM (section M).
- The final will be a three-hour examination during the examination period on a date to be announced later

GRADUATE ATTRIBUTES: SKILLS TO LEARN AND/OR UTILIZE	
Graduate Attribute	**Indicators**

Knowledge base for engineering: *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.*	1.3: Knowledge-base in a specific domain.
Problem analysis: *Use mathematical modeling to analyze networking metrics such as bandwidth, throughput, delay, etc*	2.2: Modeling.
Design: *Develop simple system software applications related to the operation of computer networks, such as protocols, routing, security, etc.*	4.1: Problem identification and information gathering.
	4.3: Architectural and detailed design
	4.4: Implementation and validation
Use of Engineering Tools: *Make educated choices as to what data structures and algorithms to use to solve problems following their respective strengths and constraints*	5.1: Ability to use appropriate tools, techniques, and resources.

COURSE LEARNING OUTCOMES (CLOS)
By the end of this course students will be able to:

Course Learning Outcome	Relationship to 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

TENTATIVE COURSE OUTLINE	
Topics	**Week**
Outline, Introduction	1
Introduction, Application Layer	2
Application Layer	3
Application Layer, Transport Layer	4
Transport Layer	5
Transport Layer, Recap	6
Midterm, Data plane	7
Data plane, Control plane	8
Control plane	9
Control plane, Link Layer	10
Link Layer	11
Link Layer, Wireless Networks	12
Wireless Networks, Security	13

Other Notes

Lab Assignments: This course has a scheduled laboratory of two hours per week. There will be a total of three (3) lab assignments. Students must submit and pass at least two (2) of the three (3) assignments to pass the course. It is allowed to work individually or in a team of a maximum of two people. A team will submit only one copy of the assignment by one of the members. Please see the submission format below.

A demo for about 10 minutes will take place with the marker. All group members **must** attend the demo and explain their work to the marker. Different marks may be assigned to teammates based on this demo. The schedule of the demos will be determined and announced by the markers, and students must contact the marker to reserve their time slot.

*Demos are mandatory***.** The marking is subject to the following rules:

- If you fail your demo appointment, a zero mark is assigned regardless of your submission
- If you book a demo appointment and do not show up (for whatever reason), you will be allowed to reschedule a second demo with a grading penalty of 50%
- Failing to demo at the second appointment will result in zero marks, and no more chances will be given under any conditions

Theoretical Assignments: There will be a total of four (4) theoretical assignments. The main purpose behind these assignments is to provide students with good preparation for the final. While discussion of the assigned problems among students is encouraged, each student is to solve and submit the assignments independently. For each theoretical assignment, we pick a random question to mark. Besides a correct answer for the selected question, the submission must be complete (i.e., all questions answered) to get full marks. *Late assignments will not be accepted.*

Mid-term and final exams: In general, students will need to bring their own ENCS calculator to the exams. Both the mid-term and the final will be closed-book examinations. The final exam will cover material from the entire course, including lectures, textbook, and assignments.

Grading: There is no standard relationship between percentages and the final letter grades. 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.

Assignments' submission format: All assignments will be published in Moodle (no hard copies will be distributed in class). Students will have to submit their assignments (one copy per group for the Lab 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: The assignments need to be typed. Hand-written (or scanned) assignments will be rejected. All assignment-related submissions must be adequately archived in a ZIP file using the student(s) ID(s) and last name(s) as the file name. The submission itself must also contain the student(s) name(s) and student ID(s). Use "official" names only - no abbreviations or nicknames; capitalize the usual "last" name.

Content Delivery, Materials, and Resources: 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. personal use.

In addition, the faculty web pages have a wealth of information about our computer systems and software, which includes 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

Intellectual property: Content belonging to instructors shared in online courses, including, but not limited to, online lectures, course notes, and video recordings of classes remain the intellectual property of the faculty member. It may not be distributed, published, or broadcast, in whole or in part, without the express permission of the faculty member. Students are also forbidden to use their own means of recording any elements of an online class or lecture without the express permission of the instructor. Any unauthorized sharing of course content may 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 ownership or interest in any student IP. All university members retain copyright over their work.

ON CAMPUS RESOURCES

HEALTH SERVICES An on-campus health clinic and health promotion center with nurses and doctors. SGW 514-848-2424 ext. 3565 LOY 514-848-2424 ext. 3575	**COUNSELLING AND PSYCHOLOGICAL SERVICES** Counsellors (licensed mental health professionals) work with students to address their mental health and wellbeing needs. SGW 514-848-2424 ext. 3545 LOY 514 848-2424 ext. 3555
ACCESS CENTRE FOR STUDENTS WITH DISABILITIES Supports students with a variety of disability conditions (including temporary disabilities arising from illness or injury). Students receive academic support for their educational experience at Concordia. acsdinfo@concordia.ca 514-848-2424 ext. 3525	**SEXUAL ASSAULT RESOURCE CENTRE** Provides confidential and non-judgemental support and services to students, staff and faculty of all genders and orientations affected by sexual violence and/or harassment. Jennifer Drummond, Coordinator jennifer.drummond@concordia.ca sarc@concordia.ca 514-848-2424 ext. 3353
STUDENT SUCCESS CENTRE Support network from first-year to graduation. You'll find one-on-one tutors, study groups, workshops as well as learning and career advisors 514-848-2424, ext. 3921	**DEAN OF STUDENTS** Supports students to enhance their Concordia experience by engaging in student life outside the classroom. Terry Kyle, Manager deanofstudents.office@concordia.ca SGW 514-848-2424 ext. 3517 LOY 514-848-2424 ext. 4239
ABORIGINAL STUDENT RESOURCE CENTRE An on-campus resource for First Nations, Métis and Inuit students that helps them make the most of the many resources available at the university. Orenda Konwawennotion Boucher-Curotte, Coordinator orenda.boucher@concordia.ca 514-848-2424 ext. 7327	**INTERNATIONAL STUDENTS OFFICE** Supporting international students with immigration documents, health insurance, social events, and workshops. iso@concordia.ca 514-848-2424 ext. 3515
STUDENT ADVOCACY OFFICE Advocating for students facing charges under the Academic Code of Conduct or the Code of Rights and Responsibilities. studentadvocates@concordia.ca 514-848-2424, ext. 3992	**MULTI-FAITH & SPIRITUALITY CENTRE** Provides a home for all those wishing to celebrate the human spirit in the widest sense of the word, through programs, events and a quiet space for reflection. Ellie Hummel, Coordinator mfsc@concordia.ca 514-848-2424, ext. 3593
CAMPUS SECURITY Ensures the safety of our members and campus property through prevention, surveillance, intervention, training, and education. Provides emergency medical services. security@concordia.ca 514-848-3717 (dial 1 for urgent situations; dial 2 for non-urgent situations)	**CONCORDIA UNIVERSITY STUDENT PARENTS CENTRE** An accessible space for student parents to study, share interests and develop a support network. Sumaiya Gangat, Coordinator cusp@concordia.ca 514-848-2424, ext. 2431

ACADEMIC HONESTY AND CODE OF CONDUCT

Violation of the Academic Code of Conduct in any form will be severely dealt with. This includes copying (even with modifications) of program segments. You must demonstrate independent thought through your submitted work. The Academic Code of Conduct of Concordia University is available at:
http://www.concordia.ca/students/academic-integrity/offences.html

It is expected that during class discussions and in your written assignments you will communicate constructively and respectfully. Sexist, racist, homophobic, ageist, and ablest expressions will not be tolerated.

ADDENDUM

ACADEMIC CONDUCT ISSUES THAT APPLY IN GENERAL
The basic ten rules that make you a good engineer

The B. Eng. program is set to satisfy most of the requirements for your education and prepares you for a professional engineering career that requires dedication and knowledge. What you learn, and how you learn, will be used extensively in your engineering profession for the next 30 to 40 years. Therefore, the four years spent in the engineering program are crucial towards your professional formation. The first step is for you to learn to "think like an engineer" which means:

- accept responsibility for your own learning
- follow up on lecture material and homework
- learn *problem-solving skills,* not just how to solve each specific homework problem
- build a body of knowledge integrated throughout your program
- behave responsibly, ethically and professionally

One of the mainstays of being a professional engineer is a professional code of conduct and as an engineering student this starts with the Academic Code of Conduct (Article 16.3.14 of the undergraduate calendar). However, you may encounter situations that fall outside the norm and in such cases, you use your common sense.

Further, the following issues should be given serious consideration:

1) Attendance at lectures and tutorials are major learning opportunities and should not be missed. The labs represent a unique opportunity for you to acquire practical knowledge that you will need in your career. Class and tutorial attendance is important for you to comprehend the discipline and make the connections between engineering skills. You are strongly encouraged to participate in the class, ask questions and answer the instructor's questions. Tutorials are just extensions of the classes in which application of the concepts presented during the lectures are presented and problems are practically solved.

2) The decision to write tests that are not mandatory is entirely yours. For example, midterm test are often stated in many courses as optional. However, one the objectives of midterms is to check on your

comprehension of the material and allow time for whatever action is necessary (from more study time to discontinuing a course). Plan to attend the class tests even if they are not mandatory. If you pay attention in the lectures, it will take you significantly shorter time to comprehend the material. **Note also** that if you are in the unfortunate position of being unable to write a final exam due to medical reasons and seek a deferral, this may not be possible if the instructor has no information indicating that you have been attending the course and assimilating the material (ie through midterms, quizzes, assignments etc).

3) Homework is usually mandatory and it has some weight in the final grade (such information is given in the course outline). Homework may also be conceived as training material for the class tests. Under all circumstances, it is highly recommended to carry out the home work on time and submit it on the prescribed date. Late submissions are not granted to individual cases regardless of the reason. This is part of the training for being in the workforce where deadlines have to be met. Please, plan your work such that you submit all the assignments and lab reports on time and in the correct place (not in the corridor or on the street!).

4) Office hours with tutors, lab instructors or class instructors are listed in the course outline/website/office doors. Please respect these office hours and in case you have a serious conflict, contact the instructor asking for a special time arrangement.

5) Class tests (assignments, quizzes) are returned to the student. The final exams are not. If you wish to see your exam paper, be aware that most instructors allow only a narrow window of time for that purpose. For the fall term, exams may usually be reviewed in January and May for the spring term.

6) When you see your marked work (assignments, midterms, final exam etc), be aware that you are supposed to review your material and see the type of errors you made and if marks have been added incorrectly. This is not an opportunity to try and "negotiate" a higher grade with the instructor. If you believe that your grade is not right, you may apply for a formal Course Reevaluation through the Birks Student Centre.

7) Writing tests and exams represents a major component of your course work. These tests and exams have rigorous requirements such as:

- **No cell phone or other communication enabling tool is allowed on the student** during the examination period.
- Only **specified faculty calculators** are allowed during tests and exams unless otherwise indicated by the instructor.
- Usually, **no materials** are allowed in the exam unless otherwise announced.

Get used to signing in and out of your exam. Make sure that you leave your exam papers with the invigilator. There are rules concerning general exam issues in the UG Calendar. These requirements are there to eliminate any possible misunderstanding and you are asked to **respect the rules**. Disciplinary measures are taken when the rules are not followed.

8) Respect your colleagues and those that you meet during the class: tutors, instructors, lab instructors, technical personnel, assistants, etc. Use appropriate communication means and language. Be considerate for all human beings. This includes small things such as turning off cell-phones before a class begins. Concordia University is a very diverse group of people and a very large multicultural community.

9) Communication is part of your future profession. Learn how to communicate effectively and efficiently in the shortest time possible. Write short but meaningful e-mails, make effective phone calls, etc. If your instructor accepts emails make sure that your request is clear with the course number and your name in the *Subject* line. Do not ask for special treatment as instructors have to treat all students equitably.

10) Respect all the above and you will get closer to your future profession.