ECE 487 Data Communication Networks

Winter 2022 - January 05 to April 08

Class time: Tuesday & Thursday, 9:30-10:50am Location: ETLC E1013

Instructor:

Hai Jiang, PhD, PENG
780-4927702
hai1@ualberta.ca
Room 11-367, Donadeo Innovation Centre for Engineering
Office Hours: 9:30~10:30am Monday; 11:30am~12:30pm Wednesday (available by office phone 780-4927702)

Course Description:

*3 (fi 8) (either term, 3-0-0) Network topologies. Layered architectures and the Open Systems Interconnection (OSI) reference model. Peer-to-peer protocols, medium access control protocols, and local area network standards. Packet switched networks and routing, the TCP/IP suite of protocols. Credit may be obtained in only one of ECE 487, CMPUT 313 or CMPE 487.

Course synchronous and asynchronous content delivery schedule:

The delivery of classroom lectures will be recorded for the purpose of supporting or enhancing teaching and learning. The camera will be positioned to focus on the instructor and podium only. It is not the intent to capture the image of students or other participants. However, their image may be captured if they walk into the field of view. Mics will be positioned to record the instructor's voice. It is not the intent to capture students' voices. However, dialogue of student attendees who are sitting very close to the mics may be picked up by the mic recording.

Notices will be posted in classrooms where lectures are being recorded to inform any students and course participants that the lecture is being recorded.

When lectures are offered online, the delivery of the lectures will also be recorded for the purpose of supporting or enhancing teaching and learning. Students have the right to not participate in the recording and are advised to turn off their cameras and audio during the lectures; they can still participate through text-based chat. It is recommended that students remove all identifiable and personal belongings from the space in which they will be participating.

Recordings of this course will be disclosed to students and Teaching Assistants enrolled in this section of the class. Recordings will NOT be used or disclosed for any other purpose unless required or authorized by law.

The recordings will be securely stored within the University records system (e.g. UAlberta Google Drive) and/or that of an approved and authorized University service provider (e.g. UAlberta Zoom). The lecture recordings will be retained for no longer than is necessary for the purposes for which the recordings were created. Access to the recordings will be limited to those that need to know in order to perform their duties as University employee's or as required or authorized by law.

TA Information:

Kapil Gangwar (kgangwar@ualberta.ca)
Wenlu Yu (wenlu3@ualberta.ca)

Course Objectives & General Content:

Network topologies. Layered architectures and the Open Systems Interconnection (OSI) reference model. Peer-to-peer protocols, medium access control protocols, and local area network standards. Packet switched networks and routing, the TCP/IP suite of protocols.

Learning Outcomes:

By the end of this course, students should be able to:

1. Explain the Internet Nuts and Bolts and describe its services.
2. Analyze delay, loss and throughput of a packet switch network.
3. Explain designing principles for protocols currently used at different layers of the Internet, and explain addressing at different layers.
4. Explain some important application-layer protocols such as HTTP, SMTP, and DNS.
5. Describe design principles for reliable data transfer.
6. Explain various mechanisms used in the design of TCP including flow control mechanism and timeout mechanism.
7. Design a simple error detection/correction code for a given communication channel.
8. Explain how network address translation works.
9. Design routing methods for a small network graph.
10. Explain BGP and OSPF protocols at a high level.
11. Design communication methods according to system/user requirements.
12. Design potential solutions to improve protocols currently used in the Internet.

Marking Scheme:

Activity	(A)Synchronous	Due/Scheduled	Weight
Assignments (online submission)		Best 8 among totally 9 assignments. Due 4pm Thursday (20% penalty if late by up to 1 hour; 50% penalty if late by 1~4 hours; submission not accepted if late by more than 4 hours)	24%

Midterm Examination	Synchronous	Tuesday March 1, 2022, in class	26%
Final Examination	Synchronous	2~4pm Thursday April 14, 2022	50%

The Faculty recommended grade point average for a 400 level course is 3.1. Instructors have the leeway to deviate from this average and can assign grades based on their own scheme. All grades are approved by the department chair (or delegate). The office of the Dean has final oversight on all grades.

Term Work

All term work solutions will be posted no later than the last day of classes. All term work will be returned to students by the final day of classes, with the exception of major term work due in the last week of classes. The latter will be returned by the day of the final examination or the last day of the examination period if there is no final examination in the course as per university policy; instructors will make accommodations to return these term work. It is the responsibility of the student to pick up all their term work at the specified time and place. Any unreturned term work, shall be retained and then shredded six months after the deadline for reappraisal and grade appeals. Final examinations will be kept for one year as required by university guidelines and the Government of Alberta's Freedom of Information and Protection of Privacy Act.

Calculator Policy

There is no calculator policy in this course; students are free to use the calculator they wish for all assessments.

Text and References (Mandatory):

B. A. Forouzan, Data Communications and Networking, 4th or 5th Edition, McGraw Hill.

Website:

eClass

Did you know that the University of Alberta has various low-to-no-cost services to help students succeed? Visit http://www.deanofstudents.ualberta.ca/ for information about the academic, wellness, and various other support services available to U of A students. It's never too early or too late to seek help!

Topics Covered in this Course:

Topics	Approximate Time in Weeks	Concepts/Details
Networks and Services	1	Introduction to network topologies; message, packet and circuit switching; the Internet; key factors in evolution of communications networks.
Layered Architecture	1	OSI reference model; overview of TCP/IP architecture.
Peer-to-Peer Protocols	2.5	Error detection/correction; ARQ protocols; HDLC.
Medium Access Control Protocols and Local Area Networks	2.5	Multiple access communications; random access protocols (ALOHA and its derivations); scheduling algorithms (reservation, polling, token-passing); LAN standards (Ethernet, Wi-Fi); LAN bridges.
Packet Switched Networks	2	Datagrams and virtual circuits; routing in packet networks (routing tables, link state vs. distance vector routing, shortest path algorithms); traffic management and quality of service.
TCP/IP	3	Internet protocol addressing; IPv4; TCP, UDP, application layer protocols.

UNIVERSITY AND FACULTY POLICIES

COURSE OUTLINE POLICY

The policy about course outlines can be found in Course Requirements, Evaluation Procedures and Grading of the University Calendar, see https://calendar.ualberta.ca/

RESPECT AND PROFESSIONALISM

The Faculty of Engineering is committed to fostering and protecting an equitable, inclusive, and respectful work and study environment in line with University of Alberta policies and professional engineering industry standards. University is an opportunity for students to explore areas of interest and to potentially pursue a career in a specific field. The Faculty of Engineering prepares students to uphold industry standards to become a Professional Engineer (P. Eng). Respect, professionalism, and accountability must be upheld within the Faculty of Engineering.

Harassment and discrimination are serious issues that have a negative effect on culture and therefore the Student Code of Behaviour states that no student shall discriminate against or harass any person or group of persons. The Faculty expects an environment free of harassment, discrimination, and bullying. Please refer to the University's Discrimination, Harassment, and Duty to Accommodate Policy for definitions.

SAFETY DURING LEARNING ACTIVITIES

In all Faculty of Engineering courses, labs, seminars or other learning activities, safety is of paramount importance. In some cases, laboratory work in a program requires high standards for risk management to keep potential hazards safely under control. Anyone found to be unable to function safely, due to intoxication, harassment or discriminatory behaviour, or other reasons, in the class, lab, seminar or other learning activity may be asked to leave or be removed for their and the safety of other participants and instructors in alignment with the Student Code of Behaviour. As members, or prospective members, of the engineering profession, it is your responsibility to identify and inform the proper authorities of an unsafe work/learning environment.

AUDIO/VIDEO RECORDING

Audio or video recording, digital or otherwise, of lectures, labs, seminars or any other teaching environment by students is allowed only with the prior written consent of the instructor or as a part of an approved accommodation plan. Student or instructor content, digital or otherwise, created and/or used within the context of the course is to be used solely for personal study, and is not to be used or distributed for any other purpose without prior written consent from the content author(s).

Only those items specifically authorized by the instructor may be brought into the exam facility. The use of unauthorized personal listening, communication, recording, photographic and/or computational devices is strictly prohibited. Students should refrain from bringing any unauthorized electronic device into an examination room, including cell phones, high tech watches, high tech glasses or other such devices.

ACADEMIC INTEGRITY

Students at the University of Alberta must read and follow, in its entirety, the

Code of Student Behaviour

Failure to know the code is not an acceptable excuse for breaking the code.

The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behaviour (on the University Governance website) and avoid any behaviour which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

Engineering students studying in the province of Alberta should also follow the

Code of Ethics

by The Association of Professional Engineers and Geoscientists of Alberta (APEGA).

The Code of Student Behaviour should not be too hard to follow. Listen to your instructor, be a good person, and do your own work, as this will lead you toward a path to success. Failure to follow the code can result in a grade of ‘F’ for the course, a transcript remark, suspension, and even expulsion from the university.

"Integrity is doing the right thing, even when no one is watching"
C. S. Lewis

Engineering at Alberta

NEED HELP?

There are a lot of services available to students on campus and in Edmonton, and sometimes it's hard to know where to go. While this isn't a comprehensive list, the services shown here should at least give you some ideas about where to start. If you're still not sure, check out the services just beneath this box—they'll give you the guidance you're looking for.

DON'T KNOW WHERE TO GO?

UASU Cares
uasucares.su.ualberta.ca

Office of the Student Ombuds
Call when you don't know how to solve a problem. Earlier is better.
780-492-4689

24/7 HELP

U of A Need Help Now
ualberta.ca/current-students/need-help-now

Edmonton Distress Line
780-482-4357 (HELP)

WELLNESS

ACCESS Open Minds
Appointment-based support from social workers.
Make an appointment: 780-248-2016 or accessom@ualberta.ca

ACCESS Outreach
Drop-in, single-session support and referrals.
289 CAB; M-F, 8:30am-4:30pm

Counselling and Clinical Services
Free, short-term, appointment-based counselling and psychiatric services.
Book initial consultation: in person at 2-600 SUB or call 780-492-5205
2-600 SUB; M, R, F, 8:00am-4:30pm; T,W, 8:00am-7:00pm

Interfaith Chaplains Association
Get guidance, care, and support, whether or not you identify with a particular faith.
Make an appointment: chaplain@ualberta.ca

The Landing
Offers support to students on matters of gender and sexual diversity.
0-68A SUB; M-R, 11:00am-4:00pm

Peer Support Centre
Anonymous, confidential help from trained students. Drop in, call, or make an appointment.
Help line: 780-492-4357 (HELP)
2-707 SUB; M-F, hours vary

Sexual Assault Centre
Free, anonymous, and confidential drop-in counselling.
2-705 SUB; M-F, 9:00am-5:00pm

ACADEMIC

Engineering Student Services
Drop-in, first-come, first-served advising.
2-300 Donadeo ICE; hours vary

Engineering Student Success Centre
Drop-in tutoring for first-year courses.
ECERF W2-023; M-R, 10:00am-8:00pm; F, 10:00am-3:00pm

Academic Success Centre
Many services to maximize your academic success.
1-80 SUB; M-F, 8:30am-4:30pm

Accessibility Resources
Connects students with disabilities to accommodations.
1-80 SUB; M-F, 8:30am-4:30pm

FINANCIAL

Engineering Student Services
Drop-in, first-come, first-served advising.
2-300 Donadeo ICE; hours vary

Campus Food Bank
Many food support options available.
SUB 1-81; 12:00-6:00pm

Student Connect
Offers support for many issues, including financial support.
Administration Building; hours vary

SOCIAL

Unitea
Arrange a time to socialize with a peer.
www.ualberta.ca/community-social-work/unitea

BearsDen
Find student groups, local events, and volunteer opportunities.
www.alberta.ca/myuab2022/engage

WORRIED ABOUT SOMEONE?

HIAR (Helping Individuals at Risk)
If you're worried about someone because of the things they've been saying or doing, or there's a noticeable change in their behaviour (often in multiple ways), contact HIAR, who will protect your confidentiality and help decide how best to support the person.

Phone: 780-492-4372
Email: hiarua@ualberta.ca

CONFIDENTIAL SUPPORT

Office of Safe Disclosure and Human Rights
The OSDHR advises confidentially on sensitive issues you may not feel comfortable solving on your own. Contact the OSDHR if you want to get help or to make a report while keeping your privacy.

Phone: 780-248-1894
Email: osdhr@ualberta.ca

Engineering Wellness
www.uab.ca/enggwell