UNIVERSITY OF SASKATCHEWAN

Department of Computer Science
176 Thorvaldson Building
110 Science Place, Saskatoon, SK, S7N 5C9, Canada
Telephone: (306) 966-4886, Facimile: (306) 966-4884

CMPT 434-02
Winter 2016-2017

Course Syllabus
CMPT 434: Computer Networks

Catalogue Description

The principles and practice of computer networking, focusing on the Internet and its structure, protocols, and applications. Topics include network applications and programming, reliable data transfer, flow and congestion control, routing, multimedia networking, local area networks, security, and network management.

Prerequisite(s):	CMPT 332. NOTE: Students with credit for CMPT 424 may not take this course for credit.
Class Time and Location:	MWF 9:30 A.M. Thorvaldson 205A
	No Tutorials
Website:	bblearn.usask.ca

Instructor Information

Instructor	Dwight Makaroff
Contact:	Email: makaroff@cs.usask.ca, Phone: 966-8656
Office Hours:	Location: Thorvaldson 281.3
	Hours: By appointment

Course Objectives

After completing this course, students should be able to do the following tasks:

- Define and describe the layered structure of a typical networking architecture.

- Design and potentially implement state machine based models of network protocols.

- Describe the components of network addressing in IPv4 and IPv6 and how addresses are used in routing and forwarding of packets/messages.

- Implement client-server and peer-to-peer applications using reliable and unreliable socket communication.

- Compare and contrast the various approaches to multiple-access communication channels.

- Describe the organization of wireless networks and the support for mobile users.

- Implement, simulate, and/or evaluate methods of congestion control with respect to issues of performance, reliability and fairness.

- Define and design network architectures out of typical software and physical components (switches, routers, hubs, firewalls, access points, hosts, etc.).

- Compare and contrast how frames/packets are delivered between hosts and switches/routers at the datalink and network layers.

- Evaluate the need for and effectiveness of error detection/correction mechanisms in different network deployment contexts.

- Determine the role and appropriate use of encryption and decryption algorithms in network applications.

- Describe the purpose of different message types in transport, session and application layer protocols.

- Compare and contrast different approaches to quality of service in networks carrying time-sensitive data.

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Student Evaluation

Grading Scheme

Requirements: There will be 3 equally-weighted assignments (due approximately every 3-4 weeks), a mid-term exam (held in-class), a team project (research topic or implementation topic) and a final examination during the regular examination period. Exact dates will be announced as the course progresses. The approximate weightings for the assignments and examinations are as follows:

Project	17%
Assignments	18%
Midterm Exam February, 2017	15 %
Final Exam	50%
Total	100%

Criteria That Must Be Met To Pass

All components of the course must be completed in order to achieve a passing grade in the course. This includes both exams and every assignment. Failure to do so will result in an automatic failure of the course. Submission of assignments must be a credible attempt to solve the problems in the assignment in the judgment of the marker.

Final Exam Scheduling

The Registrar schedules all final examinations, including deferred and supplemental examinations. Students are advised not to make travel arrangements for the exam period until the official exam schedule has been posted.

Note: All students must be properly registered in order to attend lectures and receive credit for this course.

Textbook Information

Required Text

- Title: Computer Networks

- Author: Andrew S. Tanenbaum and David J. Wetherall

- Publisher: Pearson/Prentice Hall

- Edition/Year/ISBN: 5th Edition/2011/ISBN-13: 9780132127066

Recommended Texts

- Essential for everyone to have for their career. Many should already have this.

  - Title: The C Programming Language
  - Author: Brian Kernighan and Dennis Ritchie
  - Publisher: Prentice Hall
  - Edition/Year/ISBN: 2nd/1988/0-13-110362-8

Lecture Schedule

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Topic	Topic/Subtopics
Background and Physical Layer	Transmission media, limits on achievable data rate, digital modulation, communication infrastructures, socket programming. Duration: 1.5 weeks Readings: Chapter 1, 2 - Tanenbaum
Data Link Layer	Framing, error detection and correction, protocols for reliable data transfer. Duration: 1 week. Readings: Chapter 3
Multiple Access Protocols and Local Area Networks	Classes of multiple access Ethernet, link layer switching, VLANs, 802.11, 802.16, Bluetooth, RFID. Duration: 1.5 weeks Readings: Chapter 4
Network Layer	Datagram vs. virtual circuit networks, routing, congestion control, quality of service, network layer addressing in the internet, IP and related protocols, routing in the Internet, Software Defined Networking. Duration: 3 weeks Readings: Chapter 5
Transport Layer	Internet transport protocols, TCP connection establishment and release, data transfer in TCP, flow control, congestion control, evolution of TCP, delay-tolerant networking. Duration: 1.5 weeks Readings: Chapter 6
Application Layer	DNS, email, the Web, streaming media, content delivery, P2P Duration: 2 weeks Readings: Chapter 7
Network Security	Encryption/decryption algorithms, digital signatures, message digests, public key management, authentication, security in the Internet, social issues. Duration: 1.5 weeks Readings: Chapter 8

Course Procedures

- Facilities. Students will be using the Linux computers in the Spinks Lab to do most of their work, and are expected to be familiar with the use of these facilities.

- This course will be administered with BlackBoard. Those unfamiliar with the use of BlackBoard are strongly encouraged to make use of the resources available to learn BlackBoard. BlackBoard has a Dis-

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cussion Forum and it will be used to disseminate answers to questions regarding assignments, lecture material, etc. **Many important things may happen there that will not be repeated in class, so daily reading of the bulletin board is required.**

- The course will make regular use of Internet facilities. Page Locations will be given during lectures and on BlackBoard.

- Assignment descriptions will be made available in electronic form only. Submissions will be in electronic form only.

- Version control using SVN at svn.cs.usask.ca is required for every assignment and will be verified by submitting meaningful SVN logs.

- Final Note: As a 4th year course, the delivery of the material will be in a more interactive manner than most previous courses. Students will be responsible for reading the text and learning the material in it. As much as possible, lecture time will be used primarily for

    - highlighting specific material in the text,

    - covering supplementary material as required, and

    - answering student questions.

Policies

In general, the U of S Course Policy Document defines the policies for this course. Course Policy Document
 Some further details are elaborated on in this section.

Late Assignments

In general, late assignments are not accepted. If there are extenuating circumstances whereby it is impossible to hand in an assignment on time, please see the instructor for special accommodations. This policy may change for different assignments.

Missed Assignments

If an assignment is missed, it is not possible to receive a passing grade in the course.

Missed Examinations

1. "Students who have missed an exam or assignment must contact their instructor as soon as possible. Arrangements to make up the exam may be arranged with the instructor. Missed exams throughout the year are left up to the discretion of the instructor if a student may make up the exam or write at a different time. If a student knows prior to the exam that she/he will not be able to attend, they should let the instructor know before the exam."

2. "Final exams - a student who is absent from a final examination through no fault of his or her own, for medical or other valid reasons, may apply to the College of Arts and Science Dean's office. The application must be made within three days of the missed examination along with supporting documentary evidence. Deferred exams are written during the February mid-term break for Term 1 courses and in early June for Term 2 and full year courses."

Incomplete Course Work and Final Grades

When a student has not completed the required course work, which includes any assignment or examination including the final examination, by the time of submission of the final grades, they may be granted an extension to permit completion of an assignment, or granted a deferred examination in the case of absence from a final examination. Extensions for the completion of assignments must be approved by the Department Head, or

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Dean in non-departmentalized Colleges, and may exceed thirty days only in unusual circumstances. The student must apply to the instructor for such an extension and furnish satisfactory reasons for the deficiency. Deferred final examinations are granted as per College policy.

In the interim, the instructor will submit a computed percentage grade for the course which factors in the incomplete course work as a zero, along with a grade comment of INF (Incomplete Failure) if a failing grade. In the case where the instructor has indicated in the course outline that failure to complete the required course work will result in failure in the course, and the student has a computed passing percentage grade, a final grade of 49% will be submitted along with a grade comment of INF (Incomplete Failure).

If an extension is granted and the required assignment is submitted within the allotted time, or if a deferred examination is granted and written in the case of absence from the final examination, the instructor will submit a revised computed final percentage grade. The grade change will replace the previous grade and any grade comment of INF (Incomplete Failure) will be removed. For provisions governing examinations and grading, students are referred to the University Council Regulations on Examinations subsection of the Calendar.

Academic Honesty

The University of Saskatchewan 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 Student Conduct & Appeals subsection of the University Secretary Website and avoid any behaviour that 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.

All students should read and be familiar with the Regulations on Academic Student Misconduct,
http://www.usask.ca/secretariat/student-conduct-appeals/StudentAcademicMisconduct.pdf,
as well as the Standard of Student Conduct in Non-Academic Matters and Procedures for Resolution of Complaints and Appeals,
http://www.usask.ca/secretariat/student-conduct-appeals/StudentNon-AcademicMisconduct.pdf.

Academic honesty is also defined and described in the Department of Computer Science Statement on Academic Honesty:
http://www.cs.usask.ca/undergrad/honesty.php.

For more information on what academic integrity means for students see the Student Conduct & Appeals subsection of the University Secretary Website at:
http://www.usask.ca/secretariat/student-conduct-appeals/forms/IntegrityDefined.pdf

Examinations with Disability Services for Students (DSS)

Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Disability Services for Students (DSS) if they have not already done so. Students who suspect they may have disabilities should contact DSS for advice and referrals. In order to access DSS programs and supports, students must follow DSS policy and procedures. For more information, check http://www.students.usask.ca/disability/, or contact DSS at 966-7273 or dss@usask.ca.

Students registered with DSS may request alternative arrangements for mid-term and final examinations. Students must arrange such accommodations through DSS by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by DSS.