ENGINEERING 9876: Advanced Data Networks

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Communication *Email, course website, and bulletin board on the website.*

COURSE DESCRIPTION:

This course includes the fundamental concepts, protocols, analysis and modelling techniques, architectures, and applications pertaining to data communications networks.

PREREQUISITES: It is expected that students have had an introductory course in computer networks. If a student does not have this background, the onus is on the student to fill in the necessary background for the various areas of the course. The introductory reference texts listed below are a good foundation for developing this background.

SCHEDULE: LECTURE: Tuesday and Thursday 10:30-11:45 am, Room: EN-4008
TUTORIAL: There will be 2-3 tutorial sessions, which will be mostly used to review mid-term exam papers and cover additional lecture materials. Time and venue will be determined during the term.

CREDIT VALUE: 3 credits

RESOURCES:

TEXT BOOK

- S. Keshav, *An Engineering Approach to Computer Networking*, Addison-Wesley, 1997. (Note: second edition will be available soon).

COURSE NOTES

- Lecture notes will be available through online or will be handed out in class for most lectures.

REFERENCES

Introductory

1. A. Leon-Garcia and I. Widjaja, *Communication Networks: Fundamental Concepts and Key Architectures*, 2nd ed., McGraw Hill, 2004.
2. W. Stallings, *Data and Computer Communications*, 8th ed., Prentice-Hall, 2007.
3. A. Tanenbaum, *Computer Networks*, 4th ed., Prentice-Hall, 2003.

Intermediate

4. W. Stallings, *High-Speed Network and Internets: Performance and Quality of Service*, 2nd ed., Prentice-Hall, 2002.

Advanced

5. D. Bertsekas and R. Gallager, *Data Networks*, 2nd ed., Prentice-Hall, 1992.

+ many, many others (eg. books focussed on networks, the Internet, network security, etc.).

MAJOR TOPICS:

The topics will include, but not be limited to:

- *Introductory Concepts*
  - network topologies, communication architectures
- *Elements of Communication Protocols*
  - packet formats, flow control, error control, protocol analysis
- *Packet Switching*
  - datagram vs. virtual circuit
- *Queuing Theory*
  - M/M/1, M/D/1, and other queues
- *Scheduling*
  - scheduling strategies for best-effort and guaranteed-service connections
- *Routing*
  - distance-vector and link-state routing strategies for packet switching
- *High Speed Switching Architectures*
  - sampling of switch fabric architectures such as broadcast bus, Batcher-Banyan, and Balanced Gamma networks
- *Security* (time permitting)
  - symmetric key and public key encryption, authentication, digital signatures
- *Wireless Sensor Networks* (time permitting)
  - an introduction to wireless sensor networking technologies, challenges, and applications

LEARNING OUTCOMES:

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

- Understand the basic concepts of data communication architectures and protocols.
- Able to analyze the performance of a network using probability tools and queuing theory
- Understand networking techniques including scheduling, routing, and switching
- Understand data network applications

ASSESSMENT:

		Approximate Due Dates
Project:	30 %	
Midterm 1:	15 %	(Oct. 17, 2019, tentative)
Midterm 2:	15 %	(Nov. 14, 2019, tentative)
Final exam:	40 %	

Please note that the two midterm examinations will be in-class tests, tentatively scheduled for Thursday, October 17 (10:30 am-12:00 pm) and Thursday, November 14 (10:30 am-12:00 pm).

PROJECT:

There will be one major project in the course. The nature of the project will be a survey of a topic in an area applicable to the course. The project deliverables are:

(1) project title, due Friday, Sept. 20
(2) project proposal (1 page), due Friday, Sept. 27
(3) seminar (15~20 minutes), presentation schedule starting from the week of Nov. 18
(4) paper (~25-30 pages 1.5 line spaced), due Friday Dec. 6

The project must be new work produced by the student and must not be the repetition of a project from a previous course or other context. Also, although the project will represent a survey of work by other researchers, the organization and wording of your final report must be entirely original. Work that contains any amount of copied material will be given a mark of zero.

PROBLEM SETS:

The course will have several problem sets designed to reinforce the topics covered in the lectures. No marks will be given for the problem sets.

ACADEMIC INTEGRITY AND PROFESSIONAL CONDUCT:

Students are expected to conduct themselves in all aspects of the course at the highest level of academic integrity. Any student found to commit academic misconduct will be dealt with according to the Faculty and University practices. More information is available at www.engr.mun.ca/undergrad/academicintegrity.

Students are encouraged to consult the Faculty of Engineering and Applied Science Student Code of Conduct at http://www.engr.mun.ca/policies/codeofconduct.php and Memorial University's Code of Student Conduct at http://www.mun.ca/student/conduct.

LAB SAFETY:

Students are expected to demonstrate awareness of, and personal accountability for, safe laboratory conduct. Students will immediately report any concerns regarding safety to the teaching assistant, staff technologist, and professor.

INCLUSION AND EQUITY:

Students who require physical or academic accommodations are encouraged to speak privately to the instructor so that appropriate arrangements can be made to ensure your full participation in the course. All conversations will remain confidential.

The university experience is enriched by the diversity of viewpoints, values, and backgrounds that each class participant possesses. In order for this course to encourage as much insightful and comprehensive discussion among class participants as possible, there is an expectation that dialogue will be collegial and respectful across disciplinary, cultural, and personal boundaries.

STUDENT ASSISTANCE:
Student Affairs and Services offers help and support in a variety of areas, both academic and personal. More information can be found at www.mun.ca/student.