Course Objectives

The course aims at providing background in the rapidly growing field of mobile wireless networks, and wireless sensor networks. Course contents emphasize understanding of both simulation and analytical tools with broad applications to the design, modelling, performance evaluation, and optimization of computer networks. Recent research topics such as sensor networks for object detection and tracking, vehicular networks, and underwater sensor networks will be used to provide context for discussions. Knowledge acquired in the course will be used in exploring simplified problems in contemporary research topics in the field of wireless sensor and actuator networks.

Prerequisites: a course on computer networks (e.g., CMPUT 313), a course on design and analysis of algorithms (e.g., CMPUT 204), and a course on probability theory; consent of the instructor

Course Topics: The course is roughly structured around selected topics in the following four modules.

1. Experimentation and Simulation with Applications to Modelling the Wireless Physical Layer. Basic concepts in experimentation and discrete event simulation; basic concepts of the wireless physical layer: signal bandwidth, signal to noise ratio, channel capacity, practical models of large scale path loss, modulation, basic aspects of frequency hopping and direct sequence spread spectrum techniques.

2. Modelling using Markov Chains. Review of useful discrete and continuous distributions with applications to networking; Little’s result; Markov processes and Markov chains; applications to analyzing MAC protocols.

3. Graph and Network Algorithms. Overview of some graph and network problems that arise in the design of wireless adhoc and sensor networks; useful solution paradigms; the notion of approximation algorithms.


Grading

Attendance & participation 10 %
Mini-projects (4) 70 %
Term project 20 %

Throughout our meetings, we will discuss some short homework-style problems intended to deepen your understanding of the material; your participation in this part carries 10%.

There will be four mini-projects corresponding to the four modules discussed in the course. Part of the context and scope of each mini-project will be developed interactively with the participants. The projects are intended
to provide hands-on exploration of simplified problems of contemporary importance (e.g., design of sensor networks for particular applications, networks that use new technologies, and/or networks that work in new environments).

– The term project can be an extension of one of the mini-projects pursued in the term done either experimentally or by conducting a literature survey.

Textbooks and References

There is no required textbook for the course. At times, I will refer to material posted on the web, or handed out in the classroom. A good deal of background material can be found in the following books.


Notes on Assigning a Final Letter Grade

Marking your course work, as well as assigning a final letter grade is a subjective matter in graduate courses. In this course, a grade of B+ or B (good) is earned if you have completed all tasks assigned to you, and your performance on each task is deemed to be good relative to graduate students that I have taught in the past. A grade of A or A- (excellent or very good) is earned if you exceed the above standards in some components of the course. A+ (excellent) means that you have many distinguished contributions (or, one of a kind contribution). Lastly, a grade of B- or C+ (satisfactory) is earned if you have shown understanding of the material by earning 60% of the marks, but performance has been notably below average in the critical parts of the course.

Important University of Alberta Policies

Policy about course outlines can be found in Section 23.4(2) of the University Calendar. (GFC 29 SEP 2003)

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 (online at www.ualberta.ca/secretariat/appeals.htm) 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. (GFC 29 SEP 2003)