Course Outline
Carleton University, School of Computer Science
COMP 5114 - Quantum Communications and Networking
Fall 2019

Instructor: Michel Barbeau
Classroom: 615 SA
Class Times: 2:35 PM - 5:25 PM Tuesday
Office hours: 12:00 PM to 2:25 PM Tuesday, Room 5318 HP

Course Description

Classical communications; such as sonars, cellular networks and the Internet; use macroscopic properties of acoustic, electromagnetic or light waves. In contrast, quantum communications use microscopic properties of light. Using an appropriate encoding, photons are used for communications. Applications of quantum communications include secret communications, quantum networking and distributed quantum computing. Quantum physical laws insure confidential communications. Quantum communications and networking enable the transfer of quantum states from one location to another and pooling of quantum computation resources for solving complex problems and distributed computing issues. This course is about quantum communications and networking, that is, the use of photons to represent and transmit information. It covers the theoretical (mathematical principles) and practical aspects (implementation and software simulation) of quantum communications and networking.

Topics Covered

- Quantum Computing
- Quantum Algorithms
- Teleportation
- Quantum Communications
- Quantum Data Link
- Quantum Networking
- Quantum Cryptography

Prerequisites

None.

Course Objectives

At the end of this course, you will:

- Understand key principles enabling quantum communications.
- Know physical, link and network layer protocols used for quantum communications and networking.
- Understand and be able to analyze key mechanisms used for quantum communications and networking.
- Know emerging concepts in the field of quantum communications and networking.
- Know resources presenting recent research results in the field of quantum communications and networking.
- Be able to identify gaps in past research works and open issues in the field of quantum communications and networking.
- Be able to develop and demonstrate; e.g., through an analytical model and a simulation; a solution to an open research problem in the field of quantum communications and networking.
- Know how to present, both orally and on paper, a solution to a quantum communications and networking open research problem.

Textbook

Michel Barbeau, Hands-on Quantum Communications and Networking, Available on cuLearn.

Evaluation

Component	Weight	Due Date
Exercises	30	weekly
Presentation 1	10	Oct. 29
Presentation 2	10	Dec. 3
Research paper	50	Dec. 8

Attendance

Class attendance is very important, as students will be responsible for all items discussed in class.

University Policies

Student Academic Integrity Policy

Every student should be familiar with the Carleton University student academic integrity policy. A student found in violation of academic integrity standards may be awarded penalties which range from a reprimand to receiving a grade of F in the course or even being expelled from the program or University. Some examples of offences are: plagiarism and unauthorized co-operation or collaboration. Information on this policy may be found in the Undergraduate Calendar.

Plagiarism

As defined by Senate, "plagiarism is presenting, whether intentional or not, the ideas, expression of ideas or work of others as one's own". Reported offences will be reviewed by the office of the Dean of Science.

Unauthorized Co-operation or Collaboration

Senate policy states that "to ensure fairness and equity in assessment of term work, students shall not co-operate or collaborate in the completion of an academic assignment, in whole or in part, when the instructor has indicated that the assignment is to be completed on an individual basis". Please refer to the course outline statement or the instructor concerning this issue.

Academic Accommodations for Students with Disabilities

The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally-scheduled exam (if applicable) at http://www2.carleton.ca/pmc/new-and-current-students/dates-and-deadlines

Religious Obligation

Write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to

exist. For more details visit the Equity Services website: http://www2.carleton.ca/equity/

Pregnancy Obligation

Write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website: http://www2.carleton.ca/equity/

Medical Certificate

The following is a link to the official medical certificate accepted by Carleton University for the deferral of final examinations or assignments in undergraduate courses. To access the form, please go to http://www.carleton.ca/registrar/forms