Course Outline
Carleton University, School of Computer Science
COMP 4900C - Quantum Techniques in Computing, Communications and Networking
Fall 2022

Instructor: Michel Barbeau
Classroom: Room location is posted on the public class schedule
Class Time: Wednesday 14:35 - 17:25
Office hours: 1:00 PM to 14:20 PM Tuesday, Room 5410 HP

Course Description

Quantum communications and networking enable the transfer of quantum states from one location to another and the pooling of quantum computation resources for solving complex problems and distributed computing issues. This course is about quantum communications and networking. It covers the theoretical (mathematical principles) and practical aspects (implementation and software simulation) of quantum computing, communications, and networking.

Topics Covered

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

Course Objectives

At the end of this course, you will:

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

Textbook

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

Evaluation

Component	Weight	Due Date
Exercises	40	weekly
Project proposal presentation	5	Nov. 2
Project demo	5	Nov. 30 & Dec. 7
Project report	50	Dec. 9

Attendance

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

University Policies

For information about Carleton's academic year, including registration and withdrawal dates, see Carleton's Academic Calendar.

Pregnancy Obligation. Please contact your instructor 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 https://carleton.ca/equity/focus/discrimination-harassment/religious-spiritualobservances/.

Academic Accommodations for Students with Disabilities. If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC 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 your instructor as soon as possible to ensure accommodation arrangements are made. For more details, visit the Paul Menton Centre website.

Survivors of Sexual Violence. As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: carleton.ca/sexual-violence-support

Accommodation for Student Activities. Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor 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, see the policy.

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. Examples of punishable offences include: plagiarism and unauthorized co-operation or collaboration. Information on this policy may be found here. 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". Such reported offences will be reviewed by the office of the Dean of Science. Standard penalty guidelines can be found here.

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.