

COMP 4900A & COMP 5114 (Winter, 2025)

Quantum Communications and Networking

Instructor: Michel Barbeau

Email: MichelBarbeau@cunet.carleton.ca

Office Location: Room 5336, Herzberg Building

Best Ways to be in Touch: in class, via email, or during office hours (Mondays 13:00 – 14:20, Herzberg Room 5336)

Teaching Assistant: A list of teaching assistants and their contact/office hours information will be posted once the course starts.

Class Location: Please check Carleton Central for the room location.

Lecture Times: Mondays, 14:35 - 17:25

Course Website:

<https://brightspace.carleton.ca/d2l/home/292681>

- Brightspace access for University of Ottawa Students; please see information here: <https://gradstudents.carleton.ca/faculty-of-graduate-and-postdoctoral-affairs-access-to-brightspace/>
- *uOttawa OCICS students will not have access to Carleton Central. For now, please list the room location on Brightspace. Graduate Studies is working on a more permanent solution.*
- University of Ottawa Students who need access to SCS IT resources such as openstack and nextcloud must submit a request to SCS Tech Support SCS.Tech.Support@cunet.carleton.ca. The request must be sent from their @cmail.carleton.ca email address and the email should say which resource is required and for which course (including section).

Important dates and deadlines can be found here:

<https://carleton.ca/registrar/registration/dates/academic-dates/>, including class suspension for fall, winter breaks, and statutory holidays.

Course Calendar Description

Quantum communications and networking; the use of individual photons and teleportation to represent and transmit information. Theoretical (mathematical) principles. Practical aspects (implementation and software simulation) of quantum communications and networking.

Learning Material(s) and Other Course/Lab-Related Resources

Students are not required to purchase textbooks or other learning materials for this course.

Textbook: “Michel Barbeau, Hands-on Quantum Communications and Networking, Available on Brightspace.”

Topics Covered and Learning Outcomes

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

Learning outcomes

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

Assessment Scheme

Grade Breakdown

COMP 4900		
Component	Weight	Due Date
Assignments	40	weekly
Project proposal presentation	5	Feb. 24
Project demo	5	April 7
Project report (presentation & demo required before submitting a report)	50	April 8

COMP 5114		
Component	Weight	Due Date
Assignments	30	weekly
Presentation 1	10	Feb. 24
Presentation 2	10	April 7
Research paper (presentations 1 & 2 required before submitting a paper)	50	April 8

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

Late and Missed Work Policies

All assignments are compulsory and must be uploaded to the course web site in Brightspace on the due date and time.

If unforeseen circumstances arise that prevent you from completing your deliverables on time (five days or less);, you can submit an [Academic Consideration for Coursework Form](#) or (greater than days) a [Long Term Academic Consideration Form](#).

School of Computer Science Laptop Requirement (only applies to on-campus courses)

Every student that has been enrolled in a 1000-level (i.e., first year) course offered by the School of Computer Science after the 2020/2021 school year is required to have a laptop. This includes COMP1001, COMP1005, and COMP1006. For more information, please visit <https://carleton.ca/scs/scs-laptop-requirement/> and then review the requirements at <https://carleton.ca/scs/scs-laptop-requirement/laptop-specs/>.

Undergraduate Academic Advisors (only for COMP 4900 students)

The Undergraduate Advisors for the School of Computer Science are available in Room 5302HP; or by email at scs.ug.advisor@cunet.carleton.ca. The undergraduate advisors can assist with information about prerequisites and preclusions, course substitutions/equivalencies, understanding your academic audit and the remaining requirements for graduation. The undergraduate advisors will also refer students to appropriate resources such as the Science Student Success Centre, Learning Support Services and Writing Tutorial Services.

Graduate Academic Advisors (only for COMP 5114 students)

The Graduate Advisors for the School of Computer Science are available in Room 5302 HP; or by email at grad.scs@carleton.ca. The graduate advisors can assist with understanding your academic audit and the remaining courses required to meet graduation requirements.

SCS Computer Laboratory

Students taking a COMP course can access the SCS computer labs. The lab schedule and location can be found at: <https://carleton.ca/scs/tech-support/computer-laboratories/>. All SCS computer lab and technical support information can be found at: <https://carleton.ca/scs/tech-support/>. Technical support staff may be contacted in-person or virtually, see this page for details: <https://carleton.ca/scs/tech-support/contact-it-support/>.

Mental Health and Wellness

The [Carleton Wellness Website](#) is a wonderful resource link to include in the course outline for students.

Academic Accommodations and Regulations

Academic Accommodation

Carleton is committed to providing academic accessibility for all individuals. You may need special arrangements to meet your academic obligations during the term. The accommodation request processes are outlined on the Academic Accommodations website (<https://students.carleton.ca/course-outline/>).

Academic Integrity

Students are expected to uphold the values of academic Integrity, which include fairness, honesty, trust, and responsibility. Examples of actions that compromise these values include but are not limited to plagiarism, accessing unauthorized sites for assignments or tests, unauthorized collaboration on assignments or exams, and using artificial intelligence tools such as ChatGPT when your assessment instructions say it is not permitted.

Misconduct in scholarly activity will not be tolerated and will result in consequences as outlined in [Carleton University's Academic Integrity Policy](#). A list of standard sanctions in the Faculty of Science can be found [here](#).

Additional details about this process can be found on [the Faculty of Science Academic Integrity website](#).

Students are expected to familiarize themselves with and abide by [Carleton University's Academic Integrity Policy](#).

"If you are unsure of the expectations regarding academic Integrity (how to use and cite references, if unauthorized collaboration with lab- or classmates is permitted (and, if so, to what degree), then you must ASK your instructor. Sharing assignment or quiz specifications or posting them online (to sites like Chegg, CourseHero, OneClass, etc.) is ALWAYS considered academic misconduct. You are NEVER permitted to post, share, or upload course materials without explicit permission from your instructor. Academic integrity offences are reported to the office of the Dean of Science. Information, process and penalties for such offences can be found on the ODS webpage: <https://science.carleton.ca/students/academic-integrity/>."

AI Use

"Many of the assessed activities in this course were designed to be completed by an individual working alone. Unless it is explicitly stated otherwise, the use of any AI system will be considered academic misconduct. This includes, but is not limited to, chatbots or code generators (e.g., ChatGPT, Google Gemini, Microsoft Copilot), research assistants (e.g., Elicit), and image generators (e.g., Stable Diffusion, Dall-E), etc."

"An exception to the above rule is made for automated grammar and punctuation checking tools (such as Grammarly)."

"References to any material you use but did not originate must use the IEEE/APA/MLA citation style. Failure to reference materials correctly can result in severe penalties, and the use of manufactured (i.e., falsified) or misleading references will be treated as evidence of plagiarism and considered academic misconduct. "

"Everything you submit for evaluation (i.e., assignments, quizzes, tutorials, examinations, etc.) must be the result of your own work and only your own work. If you copy more than five consecutive words or any non-trivial snippet of code from a single source without providing a valid reference, then that is considered plagiarism and an example of academic misconduct."

Student Rights & Responsibilities

Students are expected to act responsibly and engage respectfully with other students and members of the Carleton and the broader community. See the [7 Rights and Responsibilities Policy](#) for details regarding the expectations of non-academic behaviour of students. Those who

participate with another student in the commission of an infraction of this Policy will also be held liable for their actions.

Student Concerns

If you have any concerns regarding this course, your first point of contact is me. Please email me or visit during my student hours, and I will do my best to address your concerns. If I cannot resolve the issue, the next point of contact is the School of Computer Science at studentconcerns@scs.carleton.ca. If the concern remains unresolved, the final point of contact is the Office of the Dean of Science at ODScience@carleton.ca. Please follow this order of contact.

Note: You can also bring your concerns to [Ombuds services](#).