

Course Syllabus

CP/PC 351: Quantum Computing

Department of Physics and Computer Science, Faculty of Science, Waterloo

Fall | 2019

Instructor Information

Dr. Shohini Ghose | N20176H (Science Building)

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Weekly Office Hours: Tuesdays 4pm – 5pm or By Appointment

Course Information

CP/PC 351: Quantum Computing

TR 11:30am – 12:50pm, BA 112

Prerequisites : MA122 and registration status: Year 3 or Year 4, majoring in physics, computer science, mathematics or chemistry

Exclusions: CP310A, PC310A

Course Overview and Approach

What it's all about: Quantum computing offers the possibility of dramatic advances in computational power compared to the best computers we have today. In addition, novel quantum protocols such as teleportation and unconditionally secure communication have already been demonstrated. This course provides an introduction to this exciting and cutting-edge field. Topics include an overview of quantum theory, quantum algorithms, teleportation, secure quantum communication, error correction and the latest state-of-the-art experiments. No prior knowledge of quantum mechanics is required.

Topics we will tackle:

- Introduction to quantum logic and quantum information
- Quantum teleportation
- Simple quantum algorithms
- Quantum factoring
- Grover's search algorithm
- Quantum cryptography
- Quantum error correction

Course Tools and Learning Materials

- Textbook: David Mermin, [Quantum Computer Science](#), Cambridge University Press.

Note: Audio or video recording and/or broadcasting of the lectures is not permitted without prior approval of the instructor.

The educational materials developed for this course, including, but not limited to, lecture notes and slides, handout materials, examinations and assignments, and any materials posted to MyLearningSpace, are the intellectual property of the course instructor. These materials have been developed for student use only and they are not intended for wider dissemination and/or communication outside of a given course. Posting or providing unauthorized audio, video, or textual material of lecture content to third-party websites violates an instructor's intellectual property rights, and the Canadian Copyright Act. Recording lectures in any way is prohibited in this course unless specific permission has been granted by the instructor. Failure to follow these instructions may be in contravention of the university's Code of Student Conduct and/or Code of Academic Conduct, and will result in appropriate penalties. **Participation in this course constitutes an agreement by all parties to abide by the relevant University Policies, and to respect the intellectual property of others during and after their association with Wilfrid Laurier University.**

Student Evaluation

Assessment	Weighting	Date
Assignments	30%	Due date will be indicated when each assignment is posted
Midterm exam	30%	October 29, in class
Final Project	40%	Last week of class. More information will be posted on MLS

- You must pass the midterm exam to pass the course.
- You will work in groups of 3 or 4 on your assignments and your final project.
- You will select your group members yourself and stay with the same group throughout the term. If you would like assistance with finding group members please contact me as soon as possible.
- Each group will submit a single joint solution for each assignment problem.
- Each group will submit a single joint final project paper.
- Late assignments will not be accepted without medical or other supporting documentation.

University and Course Policies

1. **Academic Calendars:** Students are encouraged to review the [Academic Calendar](#) for information regarding all important dates, deadlines, and services available on campus.
2. **Special Needs:** Students with disabilities or special needs are advised to contact Laurier's Accessible Learning Centre for information regarding its services and resources.
3. **Plagiarism:** Wilfrid Laurier University uses software that can check for plagiarism. If requested to do so by the instructor, students are required to submit their written work in electronic form and have it checked for plagiarism.

- 4. Academic Integrity:** Laurier is committed to a culture of integrity within and beyond the classroom. This culture values trustworthiness (i.e., honesty, integrity, reliability), fairness, caring, respect, responsibility and citizenship. Together, we have a shared responsibility to uphold this culture in our academic and nonacademic behaviour. The University has a defined policy with respect to academic misconduct. As a Laurier student you are responsible for familiarizing yourself with this policy and the accompanying penalty guidelines, some of which may appear on your transcript if there is a finding of misconduct. The relevant policy can be found at Laurier's [academic integrity](#) website along with resources to educate and support you in upholding a culture of integrity. Ignorance is not a defense.
- 5. Classroom Use of Electronic Devices:** Students are encouraged to make informed decisions regarding technology use during class and assessment. Some devices are distracting during learning and can disrupt the learning of others. Off-task use of technology (e.g., communicating with friends or family; using social networking sites; playing games; accessing the internet on websites that do not relate to the course; reading an electronic book that is not related to the course; playing music or video, etc.) during instruction which are distracting to self or others are prohibited. If your use of technology is disruptive to the class, you may be asked to leave the lecture. For more information see [Policy 9.3](#)
- 6. Final Examinations:** Students are strongly urged not to make any commitments (i.e., vacation) during the examination period. Students are required to be available for examinations during the examination periods of all terms in which they register. Refer to the Handbook on Undergraduate Course Management for more information.

Multi-campus Resource:

- Good2Talk is a postsecondary school helpline that provides free, professional and confidential counselling support for students in Ontario. Call 1-866-925-5454 or through 2-1-1. Available 24-7.

Kitchener/Waterloo Resources:

- [Waterloo Student Food Bank](#): All students are eligible to use this service to ensure they're eating healthy when overwhelmed, stressed or financially strained. Anonymously request a package online 24-7. All dietary restrictions accommodated.
- [Waterloo Foot Patrol](#): 519.886.FOOT (3668). A volunteer operated safe-walk program, available Fall and Winter daily from 6:30 pm to 3 am. Teams of two are assigned to escort students to and from campus by foot or by van.
- [Waterloo Student Wellness Centre](#): 519-884-0710, x3146. The Centre supports the physical, emotional, and mental health needs of students. Located on the 2nd floor of the Student Services Building, booked and same-day appointments are available Mondays and Wednesdays from 8:30 am to 7:30 pm, and Tuesdays, Thursdays and Fridays from 8:30 am to 4:15 pm. Contact the Centre at x3146, wellness@wlu.ca or @LaurierWellness. After hours crisis support available 24/7. Call 1-844-437-3247 (HERE247).