Introduction to quantum information processing (CMSC 45x)

Description: Quantum information processing seeks to exploit quantum mechanical principles to provide a qualitatively different and more powerful way of processing information than is allowed by classical physics. This course aims to give a basic foundation in the field of quantum information processing. As this is a multidisciplinary subject, the course will cover basic concepts in theoretical computer science and physics in addition to introducing core quantum information topics. No previous background in quantum mechanics is expected or required.

Topics: Basics of computational complexity; basics of quantum information; quantum phenomena; quantum circuits and universality; relationship between quantum and classical complexity classes; simple quantum algorithms; quantum Fourier transform; Shor factoring algorithm; Grover search algorithm; physical realization of quantum computation; error correction and fault tolerance; quantum key distribution.

Prerequisite: MATH 240 (Introduction to linear algebra) or permission of instructor.


Recent enrollments for a similar course (CO 481/CS 467/PHYS 467) offered annually at Waterloo:
• Winter 2010: 7 CO + 14 CS + 14 PHYS = 35
• Winter 2012: 15 CO + 22 CS + 24 PHYS = 61
• Winter 2014: 5 CO + 17 CS + 30 PHYS = 52