CMPT 409 - D100 Spec.Topics/Theoretical Cmpt

Instructor(s): Steve Pearce

SFU Burnaby

Calendar Objective/Description:
Spec.Topics/Theoretical Cmpt

Instructor's Objectives:
This is an intermediate-level course in Quantum Computing with an emphasis on quantum algorithms. Course objectives include a thorough review of quantum mechanics and the basics of quantum computing (students who have not taken either of these subjects will be okay since PHYS 285 is only suggested as a prerequisite); understanding the relationship between classical circuits and quantum circuits (qubits, the Bloch sphere, quantum gates, etc.) and the requisite applied mathematics; fundamental theorems underlying quantum computing (Church-Turing, quantum threshold theorem, no-go theorems, adiabatic theorem, etc.) and the setting within the theory of computation (BQP, QMA and QCMA); understanding the best currently known quantum algorithms (i.e., Deutsch–Jozsa, Grover’s, Shor’s, Fourier, etc.). Also, error correcting codes and fault tolerant quantum computing will be covered in fair detail including the Knill-LaFlamme theorem.

The principal aim of this course is to implement quantum algorithms on virtual quantum computers such as the IBM Q Experience (Quskit), Rigetti pyquil and D-Wave’s Leap.

The only prerequisite is linear algebra - students without CMPT 307 can enroll with a waiver. Also, PHYS 285 is suggested but not mandatory.

I REPEAT - CS STUDENTS WILL NOT BE AT A DISADVANTAGE WITH ONLY A STRONG BACKGROUND IN LINEAR ALGEBRA.

Prerequisites:
see go.sfu.ca

Grading:
TBA in class.

Recommended Books:
An Introduction to Quantum Computing, Phillip Kaye Raymond Laflamme Michele Mosca, Oxford University Press, 9780198570004

Academic Honesty Statement::
Academic honesty plays a key role in our efforts to maintain a high standard of academic excellence and integrity. Students are advised that ALL acts of intellectual dishonesty will be handled in accordance with the SFU Academic Honesty and Student Conduct Policies (http://www.sfu.ca/policies/gazette/student.html).