PHYS 576 B Wi 23: Selected Topics In Experimental Physics

Jump to Today ✎ Edit

Implementations in Quantum Information

Control and Characterization of Quantum Systems is a project-based course is designed to highlight the challenges of implementing quantum information systems. The course will utilize IBM and IonQ quantum simulators as well as IonQ's and Rigetti's quantum hardware, accessed through Microsoft Azure. The course satisfies "Implementations in Quantum Information" requirement for the QISE certificate. (https://www.quantumx.washington.edu/training/graduate-certificate-in-quantum-information-science-and-engineering/)

The schedule for the course is here (https://docs.google.com/document/d/1s8SnsK4uMF5POzHKvTDn3-M-lh7v4asZLsuU9YTkZ4I/edit?usp=sharing) .

Course Logistics:

Time: Tuesdays 1:30 -4:20 M
Location: PAT C211 (Physics and Astronomy Tower)

Instructors:
Kai-Mei Fu
office: PAB 445
e-mail: kaimeifu@uw.edu
office hours and location: TBD

Linghua Zhu
Office: BAG 311B
email: linghua8@uw.edu
office hours and location: TBD
Guest instructors: Rahul Trivedi (UW ECE) and Andrea Coladangelo (UW CSE)

Azure Quantum Office Hours:
Thursdays 8:30-9:30 on Microsoft Teams link (https://aka.ms/AQ/OfficeHours) .
There are always several engineers available to answer questions at all levels (no wait!)
You can also e-mail **azurequantuminfo@microsoft.com (mailto:azurequantuminfo@microsoft.com)**

Prerequisites:
1 quarter of graduate-level quantum information (CHEM 561, PHYS520, CSE 599Q) or permission from instructors.

Recommended Text:
Nielsen and Chuang: Quantum Information and Computation
Learning quantum computation using Qiskit (https://qiskit.org/textbook/preface.html)

Software:
We will using python, Jupyter notebooks, qiskit, the Azure Quantum platform. Set up will be in the first class.
We may also be directly interfacing with IonQ's platform.
Slack channel: TBD

Coursework and grading:
Course participation: 5%
Problem sets and projects: 75%.
Problem set: Must be individually submitted. A series of shorter questions.
Projects: can work in a group of up to three and submit 1 solution/report.
Both problem sets and projects are submitted as Jupyter notebooks with explanatory text.
Final Project and presentation: 20%
Due dates:
Problem sets are due by 11:59 PM on Tuesdays and are submitted through Canvas.

Class participation: There are several ways to get class participation points. You can post to the discussion board or Slack (ask or answer), you can ask or answer a question during class. You can be an active member during TA or professor office hours. I do call on students during class, so if you come you will get participation points.

Academic Misconduct:

The University takes academic integrity very seriously. Behaving with integrity is part of our responsibility to our shared learning community. If you're uncertain about if something is academic misconduct, ask me. Acts of academic misconduct may include but are not limited to:

Cheating: Working together and exchanging ideas on problem sets is encouraged but copying solutions or providing solutions to copy is cheating.

Plagiarism: Representing the work of others as your own without giving appropriate credit to the original authors.

Students shall adhere to the University of Washington's Student Code of Conduct (https://www.washington.edu/cssc/for-students/student-code-of-conduct/)

Concerns about behaviors prohibited by the Student Conduct Code will be referred for investigation and adjudication by the College of Engineering Dean's Office and the University's Office of Community Standards and Student conduct.

The TA is instructed to alert me on any suspicion for academic misconduct- and I will take it from there.

Diversity and Inclusion

I am committed to creating an inclusive environment in which all students are respected and valued. I will not tolerate disrespect or discrimination on the basis of age, ability, ethnicity, race, gender identity or expression, marital or parental status, military or veteran status, national origin, political affiliation, religious or spiritual beliefs, sex, sexual orientation, socioeconomic status, or other visible or non-visible differences. We will endeavor to refer to each other by our preferred names and pronouns https://www.mypronouns.org)-- for instance, I am Professor Fu, or Kai-Mei (since this is an advanced undergraduate class) and use they/them pronouns.

Disability and Access:

Link (https://depts.washington.edu/uwdrs/faculty/syllabus-statement/) to UW Disability and Access: https://depts.washington.edu/uwdrs/faculty/syllabus-statement/

Your experience in this class is important to me. It is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law. If you have arranged accommodations through Disability Resources for Students (DRS), please communicate those accommodations to me at your earliest convenience so we can discuss your needs and appropriate arrangements in this course. If you have not yet established services through DRS, but have a temporary health condition or.

Religious Accommodations:

Link (https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/) to Religious Accommodations Policy:

Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's policy, including more information about how to request an accommodation, is available at Religious Accommodations Polic (https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/) y. Accommodations must be requested within the first two weeks of this course using the Religious Accommodations Request form (https://registrar.washington.edu/students/religious-accommodations-request/) .

Date	Subject	Lecturer	Reading	Homework due dates
Week 1	(1) Intro to qiskit and Azure, Quantum. (2) Measurement, density matrix and state tomography	Kai-Mei Fu		
Week 2	Teleportation and noise	Kai-Mei Fu		
Week 3	Mapping a Hamiltonian to a quantum circuit, Trotterization I	Linghua Zhu		
Week 4	Mapping a Hamiltonian to a quantum circuit, Trotterization II	Linghua Zhu		
Week 5	Variational Quantum Eigensolver and H_2 I	Linghua Zhu		
Week 6	Variational Quantum Eigensolver and H_2 I	Linghua Zhu		
Week 7	Benchmarking I	Rahul Trivedi		
Week 8	Benchmarking II	Rahul Trivedi		
Week 9	Quantum Control I	Andrea Coladangelo		
Week 10	Project work			
Exam Week	Final project presentations, TIQM room 1:00 p.m.			