

Physics and Quantum Computing Seminar

Physics 330, Fall 2022

Time: W 12:00-12:50, 210 Thaw

General Information:

Instructor: Michael Hatridge

Instructor Office: 203 Allen Hall

Office Hours: By appointment

Email: hatridge@pitt.edu

Credits: 1 credit, grading will be S/NS

Meeting time: 1 hr./wk.

Textbook: There is no formal textbook for this course. For some meetings we will assign readings in advance to guide and inform our discussion. As first-year students, some of the technical elements of quantum computing, and quantum in general, are a number of courses in your future, but there are several books I can recommend, either now or as a reference in future to give you a picture about the field you are entering. They include Exploring the Quantum by Haroche and Raimond, Quantum Computer Science, An Introduction, by David Mermin, and Quantum Computing since Democritus by Scott Aaronson. I think the middle to later chapters of each book tend to be tough going as the authors build up steam, but the introductory chapters often offer compelling and interesting ideas about why the field exists.

Course Description and Objectives: Introduce first-year students to the field, practice, research, and opportunities in Physics and Quantum Computing. Students will be able to describe the variety of pursuits that physicists and computer scientists pursue; explain both basic and recent topics in QC/QI; and understand and articulate their own career interests. This is intended to be taken for a satisfactory/non-satisfactory grade.

Organization of Course Content: In-class time will focus on discussions, interactive exercises, and presentations. Out-of-class time will be spent reading material and reflecting on questions about physics and quantum computing and the students' plans for the future.

Student Presentations:

Each student will prepare a 5 minute presentation and 1-1.5 page written presentation on a topic decided on in week ~ 7 of the course. Potential topics are flexible, but most will fall roughly into the categories "I want to do X when I get out of college", or "Y is an exciting topic in Physics and

QC because...". The presentations will be graded on clarity of presentation and explanation of your chosen topic *to an audience of your fellow students*.

Grading policy:

35% participation

40% writing assignments

25% in-class presentation

There is a degree of flexibility in the course content to cover topics of concern and interest to the students.

Planned topics, which we will amend given speaker availability and interest include:

- Intro: what is Physics, what is CS, and how do they come together in Quantum Computing and Quantum Information?
- The good and bad aspects of 'thinking like a physicist'
- Guest Speaker: PQI and Quantum around the Pitt Campus
- A bit on managing your college career and graduating in four or five years
- Guest Speaker: Computer Science in the era of big data
- Guest Speaker: An experimental physics professor
- Tools for playing with quantum: QuTIP, Qiskit, and the IBM Quantum Cloud
- Guest Speaker: A CS professor
- What am I going to do once I leave? The AIP Career Toolbox.
- Guest Speaker: A former Pitt student now doing academic/industrial QC/QI research
- Guest Speaker: A theoretical physicist
- Resources for your journey: advisors, library skills, student counseling
- Student 5 minute presentations