Phys 3770: Special Topic in Quantum Information (formally Topics in Quantum Physics)

Spring 2021
TuTh 11:05AM-12:20 PM
Location: Zoom 918 5616 8275 (no room is currently assigned to this course)
PW: 240282

Michael Hatridge, Assistant Professor
Office: virtual
hatridge@pitt.edu
Office Hours: TBD / by appointment

Logistics: I will establish 2 hrs. per week of regular office hours, with additional availability by email appointment (please request the day in advance). Pending student agreement, classes will be recorded and made available for asynchronous access, see Canvas for detailed instructions on accessing lectures.

Course Description
This course will serve as an introduction to the field of Quantum Information and Quantum Computing, beginning with basic concepts such as entanglement and state teleportation and building towards applications such as Shor's algorithm, quantum cryptography, and quantum search. Nielsen and Chuang's Quantum Computation and Quantum Information will serve as the textbook for the course, and key topics including quantum bits, circuits, and algorithms will be covered, as well as decoherence, quantum errors and correction schemes, and quantum measurement and noise. We will also address different physical implementations of quantum computing systems (ex. trapped ions and superconducting circuits), their challenges and advantages, and survey recent developments in the field.

Course Text: Quantum Computation and Quantum Information by Nielsen and Chuang. This book is both a tough read and an excellent resource. If you are planning to work in the field I recommend purchasing a personal copy.

Other helpful texts on quantum mechanics: Townsend, Sakurai, Griffiths

Homework (65 % of total grade)
Homework will be assigned ever 1-2 weeks, with 6-10 total assignments. Each assignment will be given with a due date. Each student will be granted two 'free' assignments which can be submitted up to one week late. If your circumstances require further accommodation, please notify me as soon as possible. Homework will be submitted electronically via Canvas. You must show enough work to demonstrate that you have worked the problem. There is an easy instructor error to make in Canvas which renders homework unsubmittable, if you see this notify me so I can correct the issue.

Final Project (35 % of total grade)
At the end of the semester, each student will give an oral presentation 15 min. long on a topic mutually agreed upon by student and professor. It will be accompanied by a 3 pg.

written report (not including figures) on the same topic. Both oral and written components must properly cite and credit sources. Projects will be selected ~ week 6 of the course (as a homework assignment). I strongly encourage those already doing physics research to pick a topic outside their direct research experience.

Canvas:
The University of Pittsburgh provides a web-based resource called Canvas, which is a portal to web sites for individual courses. A Canvas site for this course has been created and there you can view announcements, send email to the instructor, and download course material such as the syllabus and in-class slides or recordings. Reading and homework assignments will all be announced on Canvas. To access Courseweb go to https://canvas.pitt.edu/. Use your Pitt email username and password to login to Canvas. If you have forgotten your username and password or need to set up an account, contact the help desk at 412-624-4357, or 4-HELP. Once you have logged into the system simply click on the link for this course to access the available material.

*Note: users can configure which site changes trigger email notification, I recommend activating email notification for course announcement and new assignments.

Academic Integrity:
Students in this course will be expected to comply with the University of Pittsburgh's Policy on Academic Integrity. Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity. This may include, but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy. Furthermore, no student may bring any unauthorized materials to an exam, including dictionaries and programmable calculators.

To learn more about Academic Integrity, visit the Academic Integrity Guide for an overview of the topic. For hands- on practice, complete the Understanding and Avoiding Plagiarism tutorial.

Disability Resource Statement:
If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and the Office of Disability Resources and Services, 140 William Pitt Union, 412-648-7890/412-624-3346 (Fax), as early as possible in the term. Disability Resources and Services will verify your disability and determine reasonable accommodations for this course. For more information, visit www.studentaffairs.pitt.edu/drsabout.