

Physics 1370- Introduction to Quantum Mechanics I

University of Pittsburgh

Fall 2019

Instructor: Michael Hatridge

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Office Hours: We will determine regular walk-in office hours after surveying the class. Office hours are also available by appointment.

Final Exam: TBD

Textbooks:

- John S. Townsend, *A Modern Approach to Quantum Mechanics* (University Science Books, 2012). (required)
- David J. Griffiths, *Introduction to Quantum Mechanics, 2nd ed.* (Cambridge, 2017). (This is an optional text which is easy to read and makes a good second source for explanations of many core concepts).
- Michael A. Nielsen and Isaac L. Chuang, *Quantum Computation and Quantum Information, 2nd Ed.* (Cambridge, 2010). (This is an optional text that is the standard text for graduate studies in quantum information. It is rather tough, but a great resource for advanced topics).

Course Description:

The aim of this course is to provide a solid foundation in the basic concepts of quantum mechanics. Rather than initially focus on the historical development of quantum mechanics and continuous wave functions in space (a.k.a wave mechanics), we will take few-dimensional quantum objects, i.e. spins, as our initial focus (a.k.a. matrix mechanics). This has the advantage of explaining key quantum concepts such as superposition and unitary evolution as finite-dimensional matrices rather than as operators on continuous systems, which require constant differentiation and integration to obtain answers. Focusing on discrete systems will also allow us to connect to applications such as NMR/MRI and quantum information, which we will address as time allows. This is the first semester of a two-semester sequence; this semester we will roughly cover Townsend Ch. 1-7 (plus special topics and amendments). There will be two midterms and a final exam. There will be ~10-11 homework assignments, which students will turn in physically. If you have a conflict which will prevent you from completing your homework in a timely manner or taking an exam on the date it is offered, contact me well in advance to potentially arrange an alternate due date/testing date; no credit will be given for unexcused late homework.

Students are encouraged to interact with the instructor and reach out with questions both in and out of class; the instructor will also frequently pose questions to the members of the class, both verbally and through a 'clicker' interface. For out of class contacts, walk-in office hours are the best method as answering complicated questions over email is not ideal; additional office hours can be arranged by appointment. You will also occasionally work during class on tutorials with

a classmate. Each tutorial will be preceded by a pre-test and the pre-test and tutorial will generally take the whole class period. You should complete the tutorial at home if you did not complete it during the class. The post-test for each tutorial will be given in the following class. Tutorials will reinforce the material covered in lecture but sometimes they will be used to introduce new material. A majority of the questions in the pre-test and post-test for the tutorials will be conceptual.

Class Grade Breakdown

There will be approximately one problem set per week, two midterm exams, and a final exam. The final grade will be determined by homework, tutorial pre- and post-tests and class quizzes (30% total weight), mid-term exams (2 @ 20% each), and a final exam (30%). Pre-tests will be given immediately after lecture, and will be graded for participation only. Post-tests will be given after tutorials, and will be graded for correctness. There are no makeup opportunities for receiving credit for taking the pretests.

If you have a conflict which will prevent you from completing your homework in a timely manner or taking an exam on the date it is offered, contact me well in advance to potentially arrange an alternate due date/testing date; no credit will be given for unexcused late homework.

Religious Observances and Class Activities

In case your religious observances conflict with class activities / tests / homework assignments due dates etc., please alert your teacher to such possible conflicts as soon as possible and in advance.

Academic Integrity

Students in this course will be expected to comply with the University of Pittsburgh's Policy on Academic Integrity <<http://www.provost.pitt.edu/info/ai1.html>>. 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.

Disability Services

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and Disability Resources and Services (DRS), 140 William Pitt Union, (412) 648-7890, drsrecep@pitt.edu, (412) 228-5347 for P3 ASL users, as early as possible in the term. DRS will verify your disability and determine reasonable accommodations for this course.

Statement on Classroom Recording

To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion and/or activities without the advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the student's own private use.