University of California at San Diego – Department of Physics – Prof. John McGreevy

Quantum Mechanics C (Physics 130C) – Winter 2014

ADMINISTRATIVE INFORMATION

Lectures:

TTh 11:00-12:20 in Mayer Hall 5301.

Lecturer: John McGreevy

Mayer Hall 5222; email: mcgreevy at physics.ucsd.edu

Office Hours: Tuesday 3:30-4:30pm, or by appointment.

Discussion Section:

Tuesday 2-3:20 in Mayer Hall 5301.

TA: Shauna Kravec

Mayer Hall 4206; email: skravec at ucsd.edu

Office Hours: Wednesday 11am-12 noon, or by appointment.

Use of the Web:

The course web page is

http://physics.ucsd.edu/∼mcgreevy/w14/.

Problem sets, solutions, lecture notes, handouts, announcements, *etc* will be distributed via this page. You should check it regularly.

Content:

A tentative outline of the course material can be found here:

http://physics.ucsd.edu/∼mcgreevy/w14/130C-outline.pdf .

Texts:

I do not plan to follow any textbook very closely. My posted lecture notes will be the main text. I will, however, refer you to relevant sections of the following books, which have been placed on reserve at S&E Library (or are available electronically):

Quantum Physics by Michel Le Bellac.

Quantum Mechanics by D. Griffiths.

Principles of Quantum Mechanics by R. Shankar. We will use this book for its discussion of path integrals and WKB and Berry phases, as well as the Dirac Hamiltonian, if we get there. It is wordy, but the words are wise.

Lecture Notes on Quantum Computing and Quantum Information, by John Preskill. These notes by John Preskill have the advantage of being free. They are a little more advanced and sometimes more mathy than 130C, but are of high quality. I will follow the logic of Chapters 2-4 of these notes for much of the first part of our course, and will give pointers to the sections which you should find accessible and useful.

Quantum processes, systems, and information by B. Schumacher and D. Westmoreland. This book is an introduction to quantum mechanics from the point of view of quantum information theory. This approach is useful in that it isolates the aspects of the subject which are different from classical mechanics, without the "distraction" of the physical world. Conversely, you are less likely to develop your intuition about the physical world by studying this book. An electronic version of this book is accessible via the UCSD library, here!

Feynman Lectures on Physics, Volume III, by Feynman, Leighton, Sands. A treasure.

Quantum Mechanics (non-Relativistic Theory) by Landau and Lifshitz. Classic terse Russian text.

Lectures on Quantum Mechanics by G. Baym. A little more advanced than our course but has lots of good things.

Lectures on Quantum Mechanics by S. Weinberg. A new book by a master expositor.

Consistent Quantum Theory by R. B. Griffiths. A serious treatment of measurement.

Grading:

Grades will be determined by a weighted average of:

- **Problem sets** (25%)
- **One mid-term exam** (30%): There will be one exam during the semester, in class, during lecture time. **The exam date is Tuesday, February 11, 2014.**
- **A Final Exam** (40%): There will be a comprehensive final exam during finals week, on Thursday, March 20, 2014, from 11:30-2:29, location TBA. This exam will cover all the material from the quarter.

You may notice that these numbers do not add up to 100%. I reserve the right to alter grades to reflect class participation, improvement, effort and other qualitative measures of performance.

I do not grade on a predetermined curve. If the class as a whole demonstrates exceptional mastery of quantum physics, the grades will be exceptionally high. Because of this absolute (not a relative) standard, helping fellow students to learn the material cannot lower your grade. Teaching is a great way to learn. And, it can improve your understanding when your fellow students return the favor.

Problem sets:

Problem sets are a very important part of this course. Sitting down yourself and trying to reason your way through a problem not only helps you learn the material deeply, but also develops analytical tools fundamental to a successful career in science. I recognize that students also learn a great deal from talking to and working with each other. We therefore encourage each student to make his/her own attempt on every problem and then, having done so, to discuss the problems with one another and collaborate on understanding them more fully. Such collaboration adds most to the understanding of those participants who have done the most by themselves first. The solutions you write up after any discussion and then submit must reflect your own work. They must not be transcriptions or reproductions of other people's work.

In doing the problems, you should feel free to use whatever computational software (*e.g. Mathematica*) you find useful; please make a note in your write-up when you do so.

Problem sets will be posted on the course web page

http://physics.ucsd.edu/∼mcgreevy/w14/hw.html .

They will generally be due at the beginning of lecture on Thursdays. I will endeavor to post solutions on the web page later that day. A subset of the problems will be graded; which subset will not always be announced in advance. The graded homework will be returned in the recitation sections the following week.

It may be possible to find on the internet solutions to problems similar to the ones assigned in this class. The use of such solutions will only impede the development of your understanding of physics. It is completely antithetical to the purpose of our endeavor here. I strongly urge you to avoid the temptation.

You are responsible for making sure that you understand how to solve all the homework problems, including the ones which were not graded. Read the posted solutions and compare them to yours!

For practical, not punitive reasons, late homework will not be graded. For conflicts that are known in advance, such as religious holidays or unavoidable travel, arrangements should be made with the TA to turn in your problem set in a timely manner.

However, we have a statistical response to the fact that stuff happens: your lowest problem set score will be discarded at the end of the semester; only the remaining $n-1$ will be used in determining your grade.

Miscellaneous unsolicited advice about how to do well in this class:

Come to lecture! I will post my lecture notes, but they are intended as a supplement to what is presented in lecture, not a substitute.

Keep up with the material. Review the lecture notes from previous lectures before the next one. The structure of this course is a bit of an experiment, and I am relying on all of you to follow its twists and turns. I will post the relevant reading assignments in advance; read ahead.

Start the homework problems as early as possible. Give yourself some time to think about them, and keep them in mind when you are reading and in lecture.

Go to discussion section! It's a great opportunity develop your working knowledge of the subject. Shauna is an expert quantum mechanic and has a great plan for making the sections useful and fun.

Ask lots of questions: in lecture, in office hours, in discussion section. The fact that you can ask questions is the point of having classes and not just letting everyone learn on their own.