PHYS 633
Quantum Mechanics

Spring Quarter 2011

MWF at 13:00 at 318 Willamette.

This the third quarter of a one year graduate level course. It is for students who have had an introductory course in quantum mechanics before. Students should also have a good background in mathematics, including linear algebra and complex analysis. Over the year, we start from the beginning and develop the major ideas of quantum mechanics. Thus a student who has not seen some particular idea or method will be able to learn it in this course. However, the pace will be too fast for a student who has not seen any of the ideas and methods.

For spring quarter, we cover Chapters 5, 6, and 7 in the book by Sakurai. This covers approximation methods, the treatment of identical particles, and scattering theory.

Instructor:

- Davison Soper
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- phone: 6-5162
- office: 479 Willamette.
- office hours: Tuesdays and Thursdays 11:00-12:00.

Text:


Schedule:

- We meet on Mondays, Wednesdays, and Fridays.
- We will have to skip class on the first Monday of spring term because a large fraction of the students will be taking the Ph.D. qualifying exam at that time.
- I will be away on Monday and Wednesday, 23 and 25 May. We will schedule makeup classes.

Reading:

- 28 - 31 March: Sakurai, Secs. 5.1 and 5.2. Notes, Perturbation theory for energy levels.

Homework:
There will be problems assigned each week in class, due on Wednesdays. Occasionally a problem will involve computer work. I recommend Mathematica, which is available at UO computer labs. If you already know some other computer language like C++, Fortran, Matlab, or Maple, you can use what you know.

1. Wednesday 6 April. Sakurai chapter 5 problems 1, 2, and 3.

Available notes in .pdf format:

- Vectors for quantum mechanics (6 October 2010).
- Choice of units for quantum mechanics (10 October 2010).
- Position and momentum in quantum mechanics (13 October 2010).
- Path integrals and the classical approximation (15 December 2010).
- The rotation group and quantum mechanics (14 February 2011).
- Comments on Sakurai problem 3.2 (21 January 2011).
- The density operator in quantum mechanics (25 February 2011).
- Galilean boost symmetry (8 March 2011).
- Perturbation theory for energy levels (29 March 2011).

Exams:

- Midterm Exam: TBA.
- Final Exam: 15:15 Tuesday 7 June.

Grading:

The homework assignments will count for 25% of the course grade. There will be one midterm exam, which counts for 25% of the course grade. The final exam will count for 50% of the course grade.

Exams are to be taken without notes or books. That is because I want to encourage you to remember the most important formulas for quantum mechanics. If you will need an obscure complicated formula for an exam question, I will give it on the exam.

Note: I encourage students to work together on the homework. I don't want you to just copy from someone else's work because you won't learn anything that way, but if you work out the solution jointly with someone else or with a group, that's fine. Real science usually involves teamwork, so it's a good idea for you to learn how to work on science with others. This policy is an exception to the normal university rule about doing your own work. Of course, on exams, your paper has to be entirely your own work.

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