PHYS 417
Topics in Quantum Physics

Spring Quarter 2006

MWF at 13:00 at 318 Willamette.

This is the third quarter of a three quarter course. The first two quarters, PHYS 414 and 415 are prerequisites. We will review the structure of quantum mechanics, filling in any gaps in understanding the mathematical formalism and its interpretation. Then we will study scattering theory and the perturbative expansion of the scattering matrix. We will also study a variational method for finding approximate solutions to the Schroedinger equation.

Instructor:

- Davison Soper
- email: soper@physics.uoregon.edu
- phone: 6-5162
- office: 479 Willamette/ 120B Willamette.
- office hours: Tuesdays and Thursdays 11:00-12:00.

Text:


Homework:

There will be problems assigned each week in class, due on Monday. Some of the problems 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.

Graders for problems:

- Yupeng Kong
  - Email: ykong@uoregon.edu.
  - Office: 218 Willamette
  - Office hours: .

Problem assignments:

- 10 April.

Available notes in .pdf and .nb format:

- Choice of units for quantum mechanics.

Paper:

I will ask students to turn in a short paper (about four pages). The paper should involve an original calculation (or possibly an experiment if you would like) that investigates or illustrates something in quantum physics. A computer calculation would be quite appropriate, but an analytical calculation is fine also.
The papers are to be done collaboratively by groups of between two and four students, with each paper submitted by all of its authors. I will assign a grade to each paper, which will count for each author of the paper. Thus this is to be a team effort. Each group should choose a subject of interest to it. A small group is often much more effective than a single person for getting something creative done, but it takes some practice to learn how to operate in a small group. If a group is having trouble operating effectively, I can offer advice to the group. In the event that a group breaks up, I could accept papers from subgroups or individuals.

Groups should form themselves and propose a subject by 28 April. Each group should turn in a draft paper by 26 May. The final paper is due by 5 June.

**Exams:**

- Midterm Exam: 13:00 Wednesday 3 May (in class).
- Final Exam: 15:15 Thursday 15 June.

**Grading:**

The homework assignments will count for 15% of the course grade. There will be one midterm exam, which counts for 25% of the course grade. The paper counts for 10%. 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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