Organization

Text:

Modern Quantum Mechanics, J.J. Sakurai (Addison-Wesley,revised edition 1994)
Hand outs on second quantization, path integrals, quantum information

Quantum mechanics books on reserve in the physical sciences library:
G. Baym, *Lectures on Quantum Mechanics*
E. Merzbacher, *Quantum Mechanics*
C. Cohen-Tannoudji, J. Dupont-Roc, and G. Grynberg, *Photons and Atoms*
J.J. Sakurai, *Modern Quantum Mechanics*

Lecturer:

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Grading:

The Stanford honor code is in effect with instructions for homework collaborations.

There will be a homework assignment every second week of the course. These will be handed out at the beginning of the lecture and are due two weeks later. The final will be a take home written exam and you"ll have ample time to complete it.

Grades:
Homework 50%
Final 50% (take home exam 14/12/05 - 21/12/05)

Appendix to Honor Code: collaboration on Homework.

Most scientific work is done in collaborations and much can be learned by collaborating with others. However, there is no substitute for learning by thinking about physics and solving problems yourself. The primary purpose of the assignments in this course is to help you learn the material. Although your solutions will be graded and you will recieve a grade for the course, these grades are actually secondary.

We want to steer a middle way between doing assignments entirely alone or mainly in collaboration with others. Here is how you should work:

- You should first attempt to solve the problems yourself. If you manage to do them in a reasonable amount of time with a reasonable amount of effort, so much the better. This will certainly give you the most personal satisfaction and you will maximize your learning/effort ratio. If there are very subtle points in a problem, I will break it into a number of steps or I will include hints to help you get started.
- If you are stuck on one or more problems, you may discuss them with other students or with me during office hours. However, this should be limited to understanding the essential point(s) so that you can go ahead to solve most of the problem yourself.
- You may use some help of references, but you should not simply go on a systematic search for the solution in the literature. For many problems a literature search would actually be a waist of time anyhow.
- In any event, the solutions you turn in should be in your own words and your own style. You should not simply copy a solution from a friend or a book.
- If you do use help from a friend, a book or from me, include an acknowledgement. After all in real scientific papers we use acknowledgements and references to give credit to others for their help.

I hope that this policy will encourage you to learn the material by solving each problem in the most effective way.

None of this is intended to discourage you from discussing the material in the lectures and text or from consulting other references to help you understand difficult concepts or derivations. In fact looking at this subject from a number of different points of view can be an invaluable learning experience.

Full Honor Code in effect for Final !

Tentative Syllabus

1. Organization and introduction to some physics in the course
2. Quick review of Dirac style quantum physics (Sak Ch 1).
3. Time evolution (Sak 2.1); Schrödinger,Heisenberg and Interaction picture (Sak 2.1,2.2,5.5); time-dependent perturbation theory up to Fermi's golden rule (Sak 5.6-5.8).
4. Role of symmetry (Sak 4.1): translations (4.3), rotations (Sak 3.1-3.3), gauge (Sak 2.6).
5. The harmonic oscillator(Sak 2.3), identical particles and second quantization (handout).
6. Quantization of the electromagnetic field and interaction with matter (handout).
7. Feynman path integrals and propagators (Sak 2.5, handout)
8. Quantum information: Bell's inequalities (Sak3.9), density matrices (Sak3.4), quantum measurement theory (handout), Shannon and von Neumann entropy (handout), dense coding, no-cloning theorem and quantum teleportation (handout).