Physics 500A Quantum Mechanics Fall 2016

Instructor: Jon Sharman
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Time and place: 9:30 – 12:30 Clearihue C 116

Office Hours: **5:30-8:30**

Outline: This is the first half of a two semester graduate quantum mechanics class. Lectures are once a week and office hours still need to be sorted out. Grading scheme will be 65% homework, 35% final project.

Plan: A rough outline, the lectures will be two hours of notes with one hour of working through problems. There will be a 10 minute break in the middle. Most of what you are going to learn in this class will not come from lectures, but from your own study. This is how real research happens, part of what you need to learn in grad school is how to teach yourselves. I encourage you to discuss the material from this class with other graduate students, myself, other faculty members, and postdocs. You should think about PHYS 500A as a collection of topics in QM which are not usually emphasized in undergraduate courses, and which are used to solidify what you learned in your undergraduate Quantum class. We will be using states, operators, and their matrix representation, using the Dirac notation. The physics topics include the harmonic oscillator, quantized electromagnetic field, coherent states, time evolution, symmetries, an- agular momentum, particles in electromagnetic fields, the Aharonov-Bohm effect, magnetic monopoles, density operators, and quantum statistical mechanics.

Homework assignments: Feel free to consult any books or research papers to solve the homework problems. It's a good idea to discuss the problems amongst yourselves, but the final written solution must be your own. I will not distribute the marked assignments in class, we'll meet and discuss the problems one on one. Each assignment will have a pick-up date, typically about two weeks from the due date. Assignments which are not picked up by the pick-up date are recycled and do not contribute to the final grade. If you write computer code to solve a problem, write a human-readable explanation of what you are doing (and comment it properly), and attach a hard copy print-out of the code to your handwritten solutions. References to Wikipedia in your solutions are not accepted. Late assignments are not accepted. Your solutions must be clear and tidy, providing detailed explanations of what you are doing.

Mathematica Tools: It's a good idea to familiarise yourself with some mathematical software tool like Maple or Mathematica. There will be assignment problems that require numerical solutions.

Books: I'm going to be using Sakurai's "Modern Quantum Mechanics". Either edition is fine.