

Syllabus: Grad QM 1

This is a one-semester graduate course on Quantum Mechanics, based on Weinberg's book Lectures on Quantum Mechanics. We assume experience with QM at the undergraduate level, and we may occasionally draw on an undergraduate knowledge of classical mechanics (eg Lagrangians and Hamiltonians) and statistical mechanics.

The purpose of graduate school is to learn to do research. Graduate courses exist to ensure that everyone has an adequate background knowledge and to supply specialized knowledge on advanced topics, but they are not important and should not be central to your life as a graduate student. If you have already taken a graduate QM course or you otherwise believe that you have a very sophisticated knowledge of QM, please let me know and we can determine if it makes sense for you to waive this course requirement.

We will follow Weinberg's book fairly closely, likely in this order (to begin with):

- We will first cover chapter 3 in detail. The goal is to provide a sophisticated overview of the fundamental principles of quantum mechanics, and to understand how many of these are forced upon us by symmetry considerations. Weinberg's books are (on all subjects) the best references if your goal is to understand why the laws of physics are almost inevitable. Weinberg's discussion of interpretations of QM in section 3.7 is also excellent.
- Next we will quickly review parts of chapter 2 (at the very least the harmonic oscillator).
- It would be reasonable for the remainder of the course to focus on almost any combination of (a few of) the remaining chapters; we will likely cover much of chapters 4 and 5, and perhaps a couple of others, depending on our interests.