

PHYS 500A (Graduate Quantum Mechanics)

Syllabus, Fall 2026

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Content:

This one-semester course is an introduction to quantum mechanics at the graduate level. One semester is hardly enough time to review the highlights of the quantum theory as it existed in the early 20th century, let alone to cover more modern developments. Most of your learning will take place on your own, in reading texts and solving problems. In the class meetings we will cover the following topics:

- From Stern-Gerlach to the postulates of quantum mechanics; linear algebra.
- Hamiltonian and time evolution.
- A landscape of quantum mechanical systems.
- Path integrals and Dirac charge quantization.
- Angular momentum and the rotation group.
- Hydrogen-like atoms.
- Approximate methods.
- Time-dependent problems, and scattering.

Textbook and supplementary material:

1. The primary text for this course is the Second or Third Edition of Sakurai & Napolitano, *Modern Quantum Mechanics* (either edition will do).
2. Hitoshi Murayama has excellent lecture notes accompanying the Graduate Quantum Mechanics course Physics 221A at UC Berkeley. They are available at <http://hitoshi.berkeley.edu>.
3. My lecture notes are available on Brightspace.
4. There are many other books that you should use as resources in addition to S&N. I recommend Feynman & Hibbs, *Quantum Mechanics and Path Integrals*; Baym, *Lectures on Quantum Mechanics*; and Dirac, *The Principles of Quantum Mechanics*.

Course format:

Lectures:	Wednesdays, 0930-1220 in Clearihue D134.
Extra meeting:	Every other week we will meet informally for one hour, with students presenting calculations on various topics.
Quizzes:	There will be in-person quizzes at the beginning of class every other week.
Final oral exam:	There will be individual oral examinations during the Final Exam period between December 10 and December 23.
Final exam:	There will also be a scheduled written final examination.

Grades:

1. Final: 30% oral exam. See [here](#) for a description of letter grades at UVic.
2. Final: 30% written exam.
3. Quizzes: 20%
4. Regular presentations: 20 %

Learning outcomes:

- 1.

General comments:

1. In the age of generative AI, problem sets are obsolete. All graded components of this course will instead rely on a combination of in-person written and oral assessment.
2. This being said, it is still the case that, like generations of students stretching back into history, you will best learn the material by solving problems. Many problems. Toward this end I will post suggested exercises to the Brightspace page. I cannot encourage you enough: solve them on your own, write them up in LaTeX, discuss them with your classmates and me endlessly. By doing so you will invest in your own mastery. I advise spending at least 10 hours/week outside of class solving problems.
3. Please take advantage of my office hours. I am here to help, discuss, bounce ideas off of, etc. I also encourage you to team up with your classmates and come together.
4. I will administer short, ~ 15 minute quizzes every other week during the Fall term, beginning September 16, then September 30, and so on. These quizzes will be given at the beginning of the week's Lecture, and will be returned the following week.
5. The Final has two components. There will be individual 30 minute oral examinations, and a standard written component. Before the written exam, I will post a practice exam and its solutions to the Brightspace page.
6. To prepare you for the oral exam, we will have additional meetings for one hour every other week where 2-3 students will practice presenting computations to me and the rest of the class. Your participation in those meetings will be 10% of the final grade. On the Brightspace page you will find a document summarizing the format and expectations for these exams.