

Physics 237: Quantum Mechanics I

Spring 2026

Here we introduce the formalisms used to calculate quantum-mechanical wavefunctions and the properties of quantum states: solution of the Schrödinger equation, and the algebra of operators on state vectors in Hilbert space. We apply these formalisms to simple quantum systems, such as 1-D barriers, wells, and tunneling; harmonic oscillators; 3-D hydrogenic atoms; rotating and vibrating diatomic molecules; and atoms distributed in a lattice.

Professor: Dan Watson, dmw@pas.rochester.edu, www.pas.rochester.edu/~dmw. Though he has been on the faculty for a long time, this is his first opportunity to teach upper-division quantum mechanics.

Teaching assistants: Vedang Bhelande, vbhe@le.rochester.edu; Roshan Mehta '27, rmehta15@u.rochester.edu; Hifsa Qayyoom '27, hqayyoom@ur.rochester.edu. None of them have TA-ed with Dan before, though Hifsa and Roshan have each taken two of Dan's courses.

Textbook: David J. Griffiths and Darrell F. Schroeter, *Introduction to quantum mechanics*, third edition (2018). Another great book by the author of the standard junior/senior classical electrodynamics textbook. It is also the textbook for PHYS 237's successor course, PHYS 246. Dan uses a Kindle electronic version of this edition; he recommends it highly due to easy searchability and light weight. Too bad buying e-books doesn't save as much money as it used to: it was only about \$3 less than a brand-new hardcover copy. Used hardcover copies can be had from online bookstores for a little more than half the price of a new one. As is also the case for Griffiths' electrodynamics book, this one is a Keeper; few of your friends who took the course last year will be found willing to sell you their copy, even if they're not taking PHYS 246.

In addition we will assign a few readings in Richard Feynman's *The Feynman Lectures on Physics*. This classic, available for free online courtesy of Caltech, is a good resource to bookmark and read at every stage of your physics education.

Website: www.pas.rochester.edu/~dmw/phys237/. Therein one will find complete lecture presentations, a calendar of class meetings and office hours, quiz and exam solutions, practice exams, and even a copy of this document.

BlackBoard: Not in this course. Instead ...

Box: Each student will receive a personal Box folder, for return of graded quizzes and exams.

Lectures: 12:30-1:45 PM Tuesdays and Thursdays, in 206 Gavett Hall, conducted by Dan. All students are expected to attend all of the lectures. Ideally, each lecture presentation will appear on the website about a week before it is given. We encourage everyone to bring a laptop or tablet to lecture, and to take real-time notes on electronic copies of the lectures.

Workshops: 4:50-7:30 PM Mondays, Wednesdays and Thursdays, in 305 Hylan, also 305 Hylan, and 102 Hylan, respectively, conducted by Roshan, Vedang, and Hifsa, also respectively. All students are expected to attend one workshop per week. If, in any week, you cannot make it to the workshop for which you are registered, just tell the TAs, and appear in another one. Attendance is noted, becoming part of the class-participation score.

Mastery of workshop and homework problems. Each Tuesday, a problem set will be assigned. These sets of problems are meant to be worked out during the following seven days: working both alone and in teams; working both in workshop under the guidance of the TAs, and outside of class.

This is the activity in which you will learn the most about how to do quantum mechanics. As with every other topic within physics, one will only get a start on how to use quantum mechanics by watching derivations and examples in lecture, or by working on problems in groups under TA guidance in workshop. Our goal is your **mastery** of the concepts and techniques we present. Mastery will predominantly come from spending quality time **alone** in the solution of each assigned problem. Your instructors and classmates can help you a lot, especially in the initial stages of digestion of a topic. Ultimately, though, mastery is a solitary activity.

We select workshop/homework problems to span all of PHYS 237's material, in relatively uniform fashion.

Assessment. You will be graded based on the extent to which you demonstrate mastery of the types of problems in the weekly problem sets. We will assess mastery with weekly **quizzes** and a final **exam**.

- During the first 30 minutes of each Tuesday lecture, we will give a quiz, based upon the previous week's lectures, workshop and homework problems: 12 quizzes in all, for the semester. (A practice quiz is provided which covers the first week's materials. Solutions to each quiz will be posted on the PHYS 237 website.

To each quiz you may bring a writing instrument and one 3 inch \times 5 inch index card of notes, using both sides of the card. All other items must be packed away out of reach until the quiz is handed in. You will hand your cheat-card in along with your quiz. Both (graded) quiz and cheat card will be returned to you via Box before the next quiz.

- During finals week, we will give a comprehensive, 3-hour final exam, worth 42% of the final grade.

You may bring to the final a supply of writing instruments and two 8.5 inch \times 11 inch sheets of notes, using both sides of each sheet. All other items must be packed away out of reach until the exam is handed in.

- Like all in-class assessments, the quizzes and final exam are **samples** of your mastery of the material presented in lecture and textbook; they will not cover this material as completely as the workshop/homework problems.

No electronics – calculators, phones, computers or network access – are allowed during the quizzes or exam. These, and all other belongings besides writing instruments and cheat cards/sheets, must be packed away out of reach until the quiz or exam is handed in.

Prepare for each quiz by **mastering** the problems in each problem set, and understanding the derivations, discussions, and examples presented in lecture. Read **thoroughly** the assigned sections in the textbook, and the additional assigned readings from the Feynman Lectures v.3. Make the upcoming quiz's cheat sheet as you work through the problem set. Similarly for the final exam: understand all the problems on each problem set and quiz, comparing your own solutions with those posted on our website. Refine your cheat card from the quizzes to produce the cheat sheets for the final. Test these cheat sheets by taking the practice final exam, which will be posted on the PHYS 237 website ahead of the final.

If you miss a quiz or exam due to illness or emergency, a makeup may be scheduled by appointment. **All makeups will be oral examinations**, lasting as long as the quiz or exam they replace, and will be administered and graded by Dan.

Class participation: Each workshop attended earns a class participation point; the fraction of those possible determines the class-participation portion of one's grade, 5% of the total.

Grades: Based 5% on class participation, 60% on the quizzes, and 35% on the final exam. The lowest score among the 12 quiz scores will be dropped from the calculation, making each remaining score worth 5.45%. In terms of the percentage of the maximum possible score, the grading scale is:

Percentage score	≥ 85	≥ 80	≥ 75	≥ 70	≥ 65	≥ 60	≥ 55	≥ 50	≥ 40	< 40
Final grade	A	A-	B+	B	B-	C+	C	C-	D	E

We round the final scores up to integers before assigning final grades.

Academic honesty disclaimer: For our purposes, **cheating** consists of submission of quiz or exam solutions that are not one's own work, submission of such work under someone else's name, or other violation of the exam rules. According to University rules, any detected act of cheating that is not the result of a simple misunderstanding must be handed over to the Board on Academic Honesty for investigation.

Help: Quantum mechanics is notoriously confusing and counterintuitive. So please take advantage of all the help your instructors can provide. Our office hours are posted on the [Contacts](#) page of the class website. Please come and talk to us whenever you want. Or join us on Zoom, via the link on the [Contacts](#) page. Or email us with questions. We will be happy to deal with specific questions about the course, homework or exams, but are also interested in talking to those who find a problem or topic confusing enough that they're not even sure what to ask.