Meetings  Monday, Wednesday, and Friday from 1–1:50p in Strain 115. Lab is from 1p–3p on Tuesday afternoons in Strain 115.

Text  The required textbook for this course is available in the bookstore or online:

Robert Sherrer  
Quantum Mechanics: an Accessible Introduction  
ISBN: 0-8053-8716-1  
2006

Description  An introduction to quantum mechanics and its application to: free particles, barriers, the simple harmonic oscillator, the hydrogen atom, angular momentum, spin, and identical particle systems. A computer algebra system will be utilized for problem solving and visualization.

Objectives

• To improve your understanding of the limits of theoretical classical mechanics

• To provide exposure to and insight on physical phenomena that require a quantum mechanical description.

• To assess your understanding of quantum mechanics and the implications of quantum theory.

Reading  Reading will be assigned from the book, handouts, or online resources. In order for group interactions to be productive, these reading assignments are to be completed before class. As a guide to your own studies, the topics we will cover are listed in the schedule at the end of the syllabus. To make the best use of classtime, you are expected to read the corresponding section of the text prior to coming to class. This may represent a departure from your usual routine but it will dramatically improve how well you understand the material.

Reading will be required in the sense that prior to each class, you will be asked to answer a set of questions based on the reading scheduled for that class. These questions will be available online after the previous class session and can be answered any time before 11 AM on the day of class.
Homework

Your opportunity to hone your skills in this course comes in the form of solving problems and participating in class. Each homework assignment has been chosen to reinforce concepts introduced in class and introduce new concepts. Your success in this class depends on mastering these concepts, and homework provides one key venue for practice and mastery.

You are encouraged to work together on problems, although credit should be given where appropriate. Scientific research articles contain a list of cited works, this is partly to establish credit for prior work but also to acknowledge the cooperative nature of scientific progress. If you have received an important hint or suggestion from a peer, please note this in your solution, otherwise excessive similarity between solutions may be mistaken for violations of the honor code.

Homework will be due approximately every class meeting and will be collected at the beginning of the class period. Late homework will be penalized, and cannot be accepted once solutions are made available. All assigned problems will be graded for completeness and a subset will be graded for correctness.

Exams

There will be two 2-hour midterm exams and one 2.5-hour final exam. The midterm exams will take place during the time scheduled for lab. Specific guidelines for each exam will be discussed in class before the test. No make-up exams will be given unless arranged prior to the scheduled exam time.

- Exam 1: Tuesday, March 2, 1p–3p
- Exam 2: Tuesday, April 13, 1p–3p
- Final: Saturday, May 15, 8:30a–11a

Labs

Quantum mechanics typically describes phenomena that involve small length scales and sensitive detection methods. Unlike other upper division courses, there are not many hands-on lab experiments that can be easily completed during a 2 hour lab session. In place of hands-on lab activities, we will use the “lab” time to explore visualizations and simulations of quantum systems, evaluate numerical models, and explore mathematical topics that will be fundamental to our understanding of quantum mechanics.

For the lab portion of the course, you will often work in small groups. You are required to keep your own laboratory notebook. Please bring a lab notebook that you will use only for this course. For each lab, be sure to record the members of your group in your notebook. Each lab write-up should include the objective, theoretical background, a description of the activity (numerical problem, experimental setup, or mathematical topic), data or code, and results and conclusions. It is acceptable to paste figures and data tables into your lab notebook.

Your notebook should include all data you collect, and a printout of the final version of any code you write. If you determine data contains an error, or other problem, make a note and indicate your concern with a single strikeout, do not omit it. Computers will be used often so be sure to include notes in your notebook on when and how the computer was used. It is easy to start using the computer and forget to take notes on what you did. You are responsible for saving copies of the files you generate for this course.

Lab notebooks will be collected and graded periodically throughout the semester. Labs cannot be made up unless arranged prior to the original lab time.
Mud-cards

Occasionally, and only during the last few minutes of class, I will ask you to anonymously write your response to a few questions on a blank index card. One question will probably be “What was the most confusing part of today’s class?” These questions, and your answers, have no bearing on your grade, they simply allow me to respond to specific topics that need to be clarified before the next class period. Of course you are always welcome to ask me to clarify something directly, either in class, or outside class, the Mud cards simply serve as another forum for your feedback as a class. The course website will have a designated area where I will post responses to requests for clarification, general questions about the class material, or mistakes I may have made (yes, it will probably happen).

Grades

Homework 35%
Midterm Exams* 25%
Final Exam* 25%
Lab Activities 15%
Effort, Attitude, Participation ±3%

*In order to pass the course you must make a passing cumulative grade and either i) a passing midterm exam average grade or ii) a passing final exam grade.

Any questions or disputes regarding a lab, homework, or exam score must be made within one week of the work being returned to you.

Make-up

All make-up work must be approved prior to the original due date. Late homework may be accepted without prior arrangements but will be penalized for lateness. Make-up work must be completed within two weeks of the original due date or by the last day of class (10 May 2010), whichever comes first.

Honesty

You have all read and understood Pacific University’s Code of Academic Conduct, and pledged to adhere to the principles and policies outlined therein. Conduct violations include, but are not limited to: looking at another student’s exam during a test, using unapproved notes on an exam, and plagiarism. Any violations of the Code will receive a minimum sentence of a zero-score for the work in question. Depending on the severity of the offence, further action may take place.

Support

Services and accommodations are available to students under the Americans with Disabilities Act. If you require accommodations in this course, contact Edna K. Gehring, Director of Learning Support Services for Students with Disabilities at x2107 or LSS@pacificu.edu. She will meet with you and discuss the services Pacific offers and any accommodations you require for specific courses. It is important that you begin this process at the beginning of the semester, please do not wait until the first test or paper.
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<td>Intro/Blackbody Radiation (1.2)</td>
<td>*Complex Numbers (2.1)</td>
<td>Blackbody Radiation (1.2)</td>
<td>Quantum Light (1.3)</td>
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<td>08 Feb</td>
<td>Quantum Matter (1.4-1.5)</td>
<td>*Operators (2.2)</td>
<td>Schrodinger Equation 1 (3.1)</td>
<td>*Linear Algebra I</td>
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<td>Interpreting and Implications (3.2)</td>
<td>*Linear Algebra II</td>
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<td>3D SE in Rectangular Coords (6.1)</td>
<td>* Operators</td>
<td>Linear Algebra II (6.2)</td>
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<td>3D SE in Spherical Coords (6.3)</td>
<td>Adding Angular Momentum (6.4)</td>
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<td>Hydrogen Atom (6.4)</td>
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