Physics 341: Intermediate Quantum Mechanics
Fall 2012

Professor:	Phone	Office	E-mail
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Class meetings: MWF 1:00-2:20 PM AHON 102

This is not a lecture course. Class time will be spent discussing, reviewing, and building on the assigned reading. Class participation and preparation are required. Frequent unexcused absences and tardiness will result in grade reduction. You are required to read the book before class and be prepared to discuss the reading, do the example problems, and fill in missing mathematical steps. This will count toward your participation grade.

Goals: After completing this course, students will be able to

- Describe what a wave function is and what it depends on
- Describe the properties of wave functions for several simple potentials including the Bohr atom
- Normalize wave functions
- Calculate expectation values
- Determine how wave functions change with time
- Construct individual wave functions from generating functions
- Determine probabilities of measuring particular states
- Discuss the difference between bound and scattering states
- Determine if an operator corresponds to an observable
- Find eigenvalues and eigenstates of an operator
- Use Dirac notation to represent wave functions
- Use raising and lowering operators to calculate wave functions
- Describe angular momentum and spin and how they add
- Describe the difference between bosons and fermions

Text:

Introduction to Quantum Mechanics by David Griffiths

This is a standard textbook for upper division quantum mechanics courses and is written by the best writer of physics textbooks. But, don't just read this textbook, pause often to think about what you've read to be certain you understand it. Try to work out the example problems before looking at the given solution. Since there will be **no** lecture, the book is your primary source of information. All assigned reading, even if not covered in class, is your responsibility.

Unit Q: The Laws of Physics are Universal of *Six ideas of Physics* by Thomas A. Moore

This was the required textbook for Physics 233 and we will use it again in this class.

Prerequisites: Physics 231-233, Calculus 1-3, and Differential Equations

Syllabus:

This syllabus is subject to change. The current, up-to-date version will be located on the class web site at http://newton.uor.edu/facultyfolder/julie_rathbun/phys341.html.

Office hours: MWF 11 am – noon

You are welcome and encouraged to meet with me at any time which is mutually agreeable, even if it is not during my official office hours. I'm normally in the office MWF 9:30 AM to 4 PM and my class schedule (so you know when I'm busy) is posted on my web page http://newton.uor.edu/facultyfolder/julie_rathbun/.

There are likely 2 times you'll have questions about a given homework set. The first will be when you've just started a problem and you're uncertain what the problem is saying or it seems to be missing information – these types of questions cannot be asked at the last minute. The second is closer to the end if you get stuck.

I do my research off campus most Tuesdays and Thursdays this semester, but I am always available by e-mail. If your question is urgent, please e-mail me a phone number and I will call you as soon as possible.

Exams:

The **final exam** will be **Thursday, December 13th at noon**. This time cannot be changed. This exam is cumulative. There will also be two 80 minute, in-class exams. Exams will be closed book and will contain both conceptual and quantitative problems. You may use a calculator for basic functions (addition, subtraction, multiplication, division, powers, exponentials, logarithms). You are on your honor not to use a calculator for advanced functions (including integration, differentiation, solving equations, unit conversions) or to store formulas or notes of any type in its memory. A formula sheet will be provided.

Homework:

Physics is not a spectator sport! You will not learn to solve problems without regular practice, so homework is an essential part of this course. Homework will be collected approximately once a week. However, DO NOT wait until the last day to start it as you will not have enough time and have nowhere to go for help. You can expect to spend as many as 15-20 hours per week on homework (in ADDITION to reading the text). If you are spending more than this, please see me so that we can make sure you are spending your time efficiently. You are encouraged to work with your classmates on homework sets. However, you must write up the solutions alone (two sets should not be identical). As in "real life", you should give credit to any sources (including the textbook and the internet) or people (including your classmates) you find helpful. Also, by citing specific sections or equations from the text, your homework sets will be more useful to you in the future. To receive full credit, homework must be legible and your logic must be easy to follow (this goes double for exams). Obtaining the correct answer does not guarantee full credit. If I can't figure out what you are trying to do, you will get no points, even if you show a correct answer. (This goes for exams, too.) A solution with no written explanation is never sufficient. The meanings of equations, and their symbols, should be provided. Homework is due at 9:30 AM unless otherwise noted. No late homework will be accepted.

Grading: Final grades will be based on the following:

In-class Exams	30%
Final Exam	25%
Homework	25%
In class activities, incl. participation	20%