

Intro to Quantum Mechanics – Fall 2005

PHYS-470

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Class meeting times: Wednesday, 5:30-8:10 PM

Office hours: Open—Mon and Thur 3-3:30 PM, Wed 3-5PM
Sign-up—Mon, Wed, and Thur 2-3 PM

Quantum mechanics is the fundamental theory of the dynamics of the very small: atoms, nuclei, electrons, molecules, etc. It is fundamentally non-deterministic; Newton's laws emerge as the average behavior of an ensemble of identical microsystems. It is at the same time incredibly abstract and very physical. Good stuff.

Roughly, the topics we will cover are the description dynamics of systems with a finite number of degrees of freedom, then wave mechanics, and then the connection between the two. Schrödinger's equation will be the tipping point of the semester.

This class will be taught seminar style. This puts a lot of responsibility on the students. Instead of regular homework, there will be a portfolio system (see below).

Modern Physics, PHYS-370, is required pre-requisite unless granted permission by the instructor. Also, concurrent enrolment in or completion of Calculus III, MATH-313 and Differential Equations, MATH-321 would be helpful, but it is not required. Note: This class will use a lot of math!!!

Course Materials:

Text: *A Modern Approach to Quantum Mechanics*, John S. Townsend, University Science Books, ISBN 0-534-40896-6

Calculator: Scientific calculator.

Communication: This course will use the Blackboard system of American University for distribution of information outside of class time.

- **Email:** You must have an American University email account to use this system; if you use an email provider other than American, forward your American mail to that account. On-line quizzes will be taken through Blackboard, on-line discussion sessions will be managed through Blackboard, and solutions to homework and tests will be posted on Blackboard. Check your email and the class website of Blackboard frequently to stay up-to-date. I usually respond fairly promptly to email and it is my preferred method of communication outside of class and office hours.
- **Discussion Boards:** Please make use of the discussion boards to ask questions, vent frustrations, share neat ideas or websites, etc.
- **Privacy:** For the record, I can track Blackboard viewing, i.e. count the hits on each page and see who accessed it. However, you can post on the discussion board anonymously, and I really can't see you said it.
- **Etiquette:** Express yourself freely in this class, in email and on Blackboard. However, be respectful and polite to your fellow students.

Course requirements and grading: Your final grade will be based on the following:

Presentations	30%
Portfolio	35%
Textbook Review	10%
Final	10%

Grading scale: Everything will be graded on a four point scale.

Attendance: If you miss one class, no problem. For every class you miss beyond one step, your letter grade will drop a step, e.g. from B+ to B or from C to C-. Excused absences (see below) do not follow this rule.

Presentations: During the semester students will give five or six 10-15 minute oral presentations. Students will do at least two presentations on sections of the reading; this will consist of a 5-10 minute informal presentation on the book section and lead a 5-10 discussion afterwards. Students will do at least two presentations on end-of-chapter problems ; this will consist of a 5-10 minute solution to the problem and lead a 5-10 discussion afterwards. Students will sign up for their first two of these presentations during the first day of class, and will sign up for the rest of them at the third class meeting. The presentations will be graded by the instructor.

Portfolio: Students will put together a portfolio to showcase their understanding of the subject. Each portfolio will be divided into three sections. The first section will include the notes you made for your presentations. They should be neat, written in complete sentences, and corrected for any mistakes found during the presentation. The other section will include full solutions to each of the weekly problems (three a week), except for any that you presented to the class. The solutions should be neat and correct. Also, each section should include a one-page response to the material in a particular week. This response could include summary, further questions, and impressions. It should be written in complete sentences and edited for clarity.

Text book Review: In the seventh week of class, on 12 Oct 2005, students will choose a quantum mechanics textbook from a list provided by the instructor. They will prepare a 2-3 page review of the textbook, due 11 Nov 2005. This review should be suitable for posting on the internet and should be addresses to your fellow undergraduates. Sample textbook reviews will be given by the instructor.

Final: There will be a take-home final and it will be cumulative. It will be considered a breach of the Academic Integrity Code if you do not work on it alone, but you may use any non-human resource (books, websites, etc.). Anyone who is found to have cheated will get a failing grade for the entire semester.

Succeeding in this class and getting help: To succeed in this class, it is imperative that you interact with the material every day. Physics is like a foreign language, you cannot learn it just from attending class. Make sure you do the readings before class and lab, do all the warm-up quizzes and homework, come to office hours. This is a three-hour class, so you should spend *at least* six hours a week outside of class time thinking about and practicing physics.

On-line discussions: On Blackboard there will be an on-line discussion board. You can you this to ask me questions publicly, discuss homework with your peers and voice concerns and opinions about the material and the class.

Other Blackboard resources: Lots of other good stuff will be on our course's Blackboard site. Check it out regularly.

Office hours: You are super-welcome to come to office hours. One hour a week is specifically reserved just for this class. We will have a good time there. If you can't make any of the times listed above, call or email me, and we can work something out.

Students with disabilities: You should be registered with the University, who will send me a letter describing your special needs. We can accommodate your needs, but occasionally patience will be required.

Academic Integrity Code: Read it and follow it. It is your responsibility to know it and abide by it. Follow all instruction given here or given on a specific assignment or the full due process of the AIC will come down on you.

Excused absences and extensions: Severe illness, religious observance, University business, and family emergency are acceptable reasons for missing class or needing an extension on an assignment. I have the right to request reasonable documentation, in accordance with University policy. Do not notify me of an absence, such as missing an exam or needing an extension, at the last minute. Use email and notify as far in advance as possible. I will be strict about this .