PHYS4600: Quantum Mechanics, Spring-2017

Course Syllabus (updated 1/4/17)

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MON, WED, FRI: 8:00 – 8:50 AM in Science Hall-W3015

Contact Info:

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Required Texts:

Quantum Mechanics: An Accessible Introduction by Robert Scherrer
(Publisher: Pearson Education, Inc., – 2005, ISBN# 0-8053-8716-1)

Other Recommended Texts:

- John S. Townsend, *A Modern Approach to Quantum Mechanics* (University Science Books, 2000). An intermediate level text with detail elementary derivations.

- David J. Griffiths, *Introduction to Quantum Mechanics* (Prentice Hall, Englewood Cliff, NJ, 1995): One of the most popular undergraduate texts.

- Stephen Gasiorowicz, *Quantum Mechanics* (John Wiley & Sons, Inc., New York, 1974): A relaxed treatment for undergraduate level quantum mechanics.

- Richard L. Liboff, *Introductory Quantum Mechanics*, 4th edition (Addison Wesley, New York, 2003): A text with challenging concepts by offering an extensive list of subjects.

- Yoav Peleg, Reuven, and Elyahu Zaarur, *Schaum's Outline of Theory and Problems of Quantum Mechanics* (McGraw-Hill, New York, 1998). An introductory text with many solved problems.

- Eugen Merzbacher, *Quantum Mechanics* (John Wiley & Sons, New York, 1998): A text that illustrates the links to many different phenomena and subfields of physics.

- Nouredine Zettili, *Quantum Mechanics*, Concepts and Applications, 2nd edition (John Wiley & Sons, New York, 2009): A more mathematical text with many solved problems.

- Claude Cohen-Tannoudji, Bernard Diu, and Franck Laloë, *Quantum Mechanics* (John Wiley & Sons, New York, 1977): A popular undergraduate level text contains many detailed derivations.

General Course Objectives

- To learn foundations and techniques of Quantum Mechanics.
- To develop an understanding and appreciation of the principles of Quantum Mechanics.
- To develop analytical thinking skills through extensive problem-solving.
- To illustrate the power of Quantum Mechanics by the wide variety of applications.

General Course Contents and List of Topics

1. Survey of Modern Physics: Chapter 1
2. The Schrodinger Equation (SE): Chapter 3
3. Properties of Operators: Parts of Chapter 2 and Chapter 5
4. One-Dimensional Time Independent SE: Chapter 4
5. Three-Dimensional Time Independent SE: Chapter 6
6. Spin Angular Momentum: Chapter 8
7. Time-Independent Perturbation Theory: Chapter 9
8. The Variational Principle: Chapter 10
9. The Multi-particle SE: Chapter 13
10. Scattering Theory: Chapter 12

Note: Mathematical chapters will not be covered formally, but these chapters will be discussed with physics when needed.

Evaluation:

Examinations: There will be three in class exams during the semester and a comprehensive final exam at the end of the semester.

Exam I:	FEB 01 (tentative)
Exam II:	MAR 15 (tentative)
Exam III:	APR 12 (tentative)
FINAL EXAM:	MAY (Cumulative, date to be announced)

Final Grade Determination:

Your final grade will be based on the four exams, homework, and lecture/take-home quiz grades as follows:

Homework	25%
Lecture Quizzes	10%
Each in class exams	15%
Final exam	20%

NOTE: Any additional work will be counted under one of the four categories above in an appropriate manner.

Final Grades will be as follows:

$A \geq 85\%$ $B \geq 75\%$ $C \geq 65\%$ $D \geq 55\%$ $F < 55\%$

Lecture:

I strongly recommend you to read the sections of the text or my notes before come to the lecture. The pre-class reading provides an introduction to the material whether you understand it completely or not; the lecture elaborates on the reading and addresses potential difficulties. The text serves as a reference and a study guide. You should be aware that there might be some material in the text that we may not discuss in the lecture but will ask you to read on your own and hold you responsible for.

There will be take-home and in-class quizzes involving both multiple-choice type questions and long questions. **In-class quizzes will not be announced in advance. You must hand in solutions to take-home quizzes at the beginning of the following class. Make-up quizzes will not be arranged.**

Homework Assignments:

Approximately, there will be one homework assignment every week. Students are encouraged to work together on these problems but submit their own solutions. You can hand in your HW solutions in class or you can drop them in my office before the due date/time. **Late homework will not be accepted.** For full credits, you **must** follow the homework guidelines given in the end of this syllabus.

PHYS 4600 Home Page:

The Physics 4600 home page includes items such as: (1) homework assignments/solutioons and exam solutions (2) this syllabus (3) office hours (4) announcements etc. I will post my hand written lecture notes in the course website as the class goes on. The website for Physics 4600 course is located D2L.

Office Hours:

My office hours are on Mondays, Wednesday, and Friday as follows.

MON: 2:00-3:00PM, WED: 11:00AM-1:00PM, and FRI: 1:00-3:00PM.

If you need to see me some other times, you can email me and make an appointment or simply stop by my office to see whether I am available to talk to you. When you have a question or feel confused, or need to discuss anything, please see me.

Use of Electronic Devices:

You are not allowed to use any electronic devices during the lecture unless you use them for Quantum mechanics educational purposes. If I notice that you are surfing web or texting while I am engaging with you, I will ask you to LEAVE the classroom.

Students with disabilities:

If you are a student entitled to an accommodation, you must see me before the accommodation can be made for you. You must bring an appropriate letter from the students with disabilities office along with you.

Attendance Policy:

You are expected to prepare for, arrive on time, and attend all scheduled classes and lab sessions. A student who misses more than 10% of class time may be subjected to withdrawal from the class. In the event of illness or emergency, you are expected to inform me the reason and valid documentations.

If you miss a scheduled class session without an excused absence is not entitled to any special consideration to make up missed work. These students will be treated in accordance with the Augusta University standard attendance policies.

Academic Honesty and Integrity:

Each student in this course is expected to abide by the Augusta University Code of Academic Honesty and Integrity. You are encourage o work together and discuss concepts with other students. You can give "consulting" help or receive 'consulting" help from such students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of the work done by someone else.

Disorderly Conduct:

Augusta University prohibits behavior that disrupts the academic, research or service mission or activities of the University, or disrupts any activity or event of the University community. Some examples of disorderly conduct include, but are not limited to, the following: conduct which causes a breach of the peace; lewd, obscene or indecent conduct; conduct which interferes with or disrupts activities or functions sponsored or participated in by the University or by members of the University community; conduct that is disruptive to a classroom lecture, lab, or other teaching or research entity of the University, interfering with or obstructing pedestrian or vehicular traffic; obstructing or interfering with ingress or egress of campus buildings or facilities; conduct which interferes with the rights of others; unauthorized use of electronic or other devices to make an audio or video record of any person without his or her expressed or implied consent when such recording is likely to cause injury or distress.

In addition to the above-mentioned policy, you are also obligated to follow the Student Manual guidelines which is available at gru.edu/students/conduct/documents/fy15_student_manual.pdf.

Other Policies:

Standard Augusta University policies will be followed for all others (such as attendance policy, grade change policy, etc.). These policies are available at http://policy.gru.edu/.

Disclaimer:

I reserve the right to alter conditions and items found in this document at any time during the course of the semester through an announcement made in a scheduled lecture session.

Copyright Statement:

Guidelines for Presentation of Homework Solutions

Quantum Mechanics - Spring 2017

Theja De Silva, Department of Chemistry and Physics, Augusta University

Grading homework is never an easy task, so please help me by making your solutions neat and clear. It is to your advantage to do so, as well, because the amount of feedback and credit that I can give to you will depend on whether I can follow your work. Here are some points to keep in mind while writing your solutions. I will take off points, or even not grade your work at all, if you do not follow reasonably well these guidelines. Full credit can be assured only if your solution is correct *and* your presentation is acceptable. For full credits, you *must* show all your work.

1. Use standard *unfolded* 8½ by 11 inch paper.

2. Please staple together all of your pages and be sure to write your name on each page.

3. Print your name and the number of the assignment at the top of the first page.

4. Do not use red ink or red pencil.

5. Present your solutions in the order that the problems are assigned. Number them as in the assignment. I do not expect to hunt through your pages for randomly ordered or unlabeled problems.

6. Each solution to a problem or answer to a question should begin at the left margin of the paper. In other words, do not work in multiple columns. Your work should flow neatly from left to right and top to bottom.

7. Some notes explaining what you are doing, when not obvious, are always appreciated and often necessary in order to make sense of your work.

8. If a graph or plot is requested, then it should be done to proper scale on graph paper (computer generated graphs, such as those plotted by Mathematica, are even better).

9. Integrals can be done by referring to a standard table of integrals or by a symbolic computer program. *But if you do so, then you must state clearly from where you obtained the integral.*

10. Each of the homework problems will be graded using 1-5 scale.