PHYS 4707 – DRAFT Course Outline - Fall 2013

Introduction to Quantum Mechanics I

Professor: Pat Kalyniak kalyniak@physics.carleton.ca
Room 3324, Herzberg
(613)520-4376

Lectures: Tuesdays and Thursdays 8:35am – 9:55pm, room TBA.
First class is Thursday September 5; last class is Thursday December 5.

Prerequisites: PHYS 3701 and PHYS 3807 (In the case of students in the Math and Physics program, the equivalent to PHYS 3807 can be satisfied by, for instance, MATH 3057 plus (MATH 4700 or MATH 3008).)
If you have not successfully completed all the prerequisite courses, you must contact me for permission to take this course. Normally prerequisites will only be waived if you have completed comparable course material elsewhere.

Office Hours: TBA
and also by appointment (email me to set up time, as needed)

Text: S. Gasiorowicz, "Quantum Physics", Wiley (third edition), 2003
ISBN: 978-0-471-05700-0
Note that there is supplementary material for the text at Wiley's student companion site (no password necessary)
http://bcs.wiley.com/he-bcs/Books?action=index&itemId=0471057002&bcsId=1533

Website: http://www.physics.carleton.ca/~kalyniak/phys4707/index.html

Marks:			
	Assignments	40%	
	Midterm Exam	20%	(1.5 hours)
	Final Exam	40%	(3 hours)

- There will be 6 assignments given out, one approximately every second week. They are due at the beginning of class, one week after their distribution or as indicated, **in class**. Late assignments will not be accepted without an acceptable reason such as illness. You are encouraged to discuss the problem assignments with other students in this course. However, the work you turn in must be your own. You are also encouraged to consult me when you have questions about the assignments. They are a critical part of the course; figuring out the assignment problems is the best way to learn the material.
- Your homework solutions should be thorough, self-contained, and logical. Explain your steps. Include diagrams if they are useful. Your homework assignments must be legible in the judgment of the marker.

- The midterm exam will be 1.5 hours long, given during the lecture period.
- The final exam will be 3 hours long, given during the final examination period in December.
- In the event that a deferred exam is necessary for a student, that exam will replace only the Final Exam component of the course mark and will only be granted if adequate term work has been completed. A grade of FND will be given in the event of inadequate term work. In this context, adequate term work means earning at least 15 of the 60 possible term marks.
- Feel free to email me with questions during the course or to set up a time to meet.

Course Material:

Most of the course material is contained in Chapters 2 through 10 of the text. However, the course content is **defined by the lectures**. The material in Chapter 1 of the text is covered in earlier courses and, hence, is assumed as prior knowledge. The lectures will be posted in CuLearn.

The course will build on the motivation for the development of quantum mechanics, as discussed in PHYS 2604, and on the introductory wave mechanics formulation of PHYS 3701.

- Introduction and Motivation
- Properties of the wave function; Schrodinger equation; probability interpretation; superposition principle; the probability current
- Wave packets; uncertainty relations; time dependence of waves and wave packets; classical correspondence
- Operator formalism; expectation values; momentum; Hamiltonian; eigenfunction/eigenvalue problems
- Postulates of quantum mechanics; measurement issues
- One-dimensional potential examples; tunneling; parity; Scattering matrix
- Formalism of quantum mechanics; linear vector spaces (Hilbert space); Dirac notation; operator methods
- Angular momentum
- Schrodinger equation in 3-d; central potentials; the hydrogen atom

There are many good **books on quantum mechanics at this level**. Some references are:

- John L. Powell and Bernd Crasemann, Quantum Mechanics, Addison Wesley
- David J. Griffiths, "*Introduction to Quantum Mechanics*", Pearson/ Prentice Hall (2^{nd} edition)

For Department policies, please see:

http://www.physics.carleton.ca/current-undergraduate-students/academic-policies This link contains information regarding the issues of Academic Integrity and of Academic Accommodation. **It is your responsibility to read and be familiar with these policies.**

You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

Pregnancy obligation: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website: http://www2.carleton.ca/equity/

Religious obligation: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website: http://www2.carleton.ca/equity/

Academic Accommodations for Students with Disabilities: The **Paul Menton Centre** for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your ***Letter of Accommodation*** at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (*if applicable*). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally-scheduled exam (*if applicable*) at http://www2.carleton.ca/pmc/new-and-current-students/dates-and-deadlines/

You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodation at http://www2.carleton.ca/equity/