Syllabus - Graduate Quantum Mechanics

Class Meetings: **4:20 p.m. - 5:35 p.m**. -- Tuesdays and Thursdays
Oceanography & Physics (OCNPS) Building Room **205**
Recitation Sessions by mutual agreement

Instructor:	Dr. Sebastian E. Kuhn
	Eminent Scholar & Professor of Physics
	Physical Sciences Building (PSB II), Room 2100J
	Phone: 683 – 5804 email: skuhn@odu.edu
	Web: http://www.odu.edu/~skuhn/
	Office hours: Mondays 2:00 – 3:00 p.m. (in my office) and Tuesdays 2:00 – 3:00 p.m. in the Physics Learning Center (lobby 2nd floor PSB II), and by appointment (just ask me after class, send email or call)

Textbook:	R. Shankar: "Principles of Quantum Mechanics", 2nd Ed. Springer 1994.
Optional Textbooks:	G. Arfken: Mathematical Methods for Physicists, Academic Press, Inc.
	A. Messiah: "Quantum Mechanics" (2-volume edition bound as 1 book), Dover Publication 1999. A comprehensive collection of material, cheap on Amazon etc.
	D. Griffiths: "Introduction to Quantum Mechanics", 2nd edition (Pearson 2005) and S. Gasiorowicz: "Quantum Physics" 3rd edition (Wiley 2003). Two lower-level books with more basic explanations and applications to help you "make sense of it all".
Grading Scheme:	Homework (30%), Midterm (15%), Participation (15%), Final (40%)
Grading Scale:	A: 90-100% A-: 85-90% B+: 80-85% B: 75-80% B-: 70-75% Below 70%: C (=failing)

INTRODUCTION

This is the first semester of a 2-semester course on Quantum Mechanics. The first semester will concentrate on single-particle states. We will begin with an introduction to the mathematical tools and the background in Classical Mechanics and Electromagnetism that will be needed in this course. We then introduce the "Postulates" of Quantum Mechanics and proceed to study in detail the solutions of the Schrödinger Equation for discrete and continuous systems in 1-3 dimensions. Special emphasis will be given to the harmonic oscillator, symmetries, angular momentum, and spin. We will study the eigenfunctions of hydrogen-like atoms and other examples.

We will mostly follow the content of the book by Shankar, leaving more advanced topics for the next semester and adding topics from other sources. A preliminary schedule is attached.

As part of your required work, you must give a presentation (during class or during recitation) on a topic relevant to Quantum Mechanics. This could be a worked-out problem, a summary on a topic not studied in class, or a report on an article (journal, web). Please see me to help you select your topic.

Policy on Cooperation

I consider it advantageous if students cooperate with each other on homework and studying. In fact, I encourage students very strongly to meet with each other for regular discussions and to tackle assignments together.

However, I require that each student turns in their own (hand- or computer-written) version of each homework and assignment. You must be able to demonstrate that you understand and can reproduce any solution you hand in. Also, NO cooperation is allowed on the Midterm and Final (take home) Exams – everybody has to do ALL of the work her/himself. I consider it unethical and a violation of the honor code to copy the solution of a homework problem or an Exam verbatim from another student's solution or from a book. All material used (other than informal discussions) must be properly cited.

In this context, I want to remind everyone of the **University policy**: Any official sanction for cheating, including the assignment of a grade of F for a quiz or for a course as a penalty for cheating, will appear on the student's permanent academic transcript.

Tentative Schedule PHYS621

Date	Day	Time	Topic	Pages Shankar	HW Set Due
				Arfken Ch.6,	
27-Aug	Tue	4:20 - 5:35	Intro, Math Basics	14,15	
29-Aug	Thu	4:20 - 5:35	Vector Spaces	1 - 18	
3-Sep	Tue	4:20 - 5:35	Operators, Eigenvalues, Eigenfctns	18 - 54	1
5-Sep	Thu	4:20 - 5:35	Infinite Dimensions	54 - 73	
10-Sep	Tue	4:20 - 5:35	Review of Classical Physics	75 - 90	2
12-Sep	Thu	4:20 - 5:35	Electromagnetism	83, 90, 492	
17-Sep	Tue	4:20 - 5:35	Transformations and Symmetry	91 - 105	3
19-Sep	Thu	4:20 - 5:35	Not all is well with Classical Mechanics	107 - 113	
24-Sep	Tue	4:20 - 5:35	The Postulates	115 - 143	4
26-Sep	Thu	4:20 - 5:35	The Schrödinger Equation	143 - 150	
1-Oct	Tue	4:20 - 5:35	Simple Problems, Uncertainty Relation	151 - 167	5
3-Oct	Thu	4:20 - 5:35	Motion in 1 Dimension	237 - 246	
8-Oct	Tue	4:20 - 5:35	Particle in a Box	179 - 184	6
10-Oct	Thu	4:20 - 5:35	MIDTERM EXAM (in-class)		
15-Oct	Tue	No class	*Fall Break*		
17-Oct	Thu	4:20 - 5:35	Classical limit, probability current		
22-Oct	Tue	4:20 - 5:35	Harmonic Oscillator	185 - 196	7
24-Oct	Thu	4:20 - 5:35	Harmonic Oscillator cont'd	197 - 218	
29-Oct	Tue	4:20 - 5:35	Symmetries	279 -	
31-Oct	Thu	4:20 - 5:35		- 304	
5-Nov	Tue	4:20 - 5:35	Angular Momentum	305 -	8
7-Nov	Thu	4:20 - 5:35		- 354	
12-Nov	Tue	4:20 - 5:35	Hydrogen Atom	353 -	9
14-Nov	Thu	4:20 - 5:35		- 372	
19-Nov	Tue	4:20 - 5:35	Spin	373 - 401	10
21-Nov	Thu	4:20 - 5:35	Angular Momentum addition		
26-Nov	Tue	4:20 - 5:35	Review and Summary	403 - 427	
28-Nov	Thu	No class	*Thanksgiving Holiday*		
3-Dec	Tue	4:20 - 5:35	TBA		11
5-Dec	Thu	4:20 - 5:35	TBA		
10-Dec	Tue	3:45 - 6:45	FINAL EXAM (online)		