

Course Overview

An introduction to the principles of quantum mechanics, the Schrodinger equation and solutions for one-dimensional problems, the Dirac formalism, angular momentum and quantum mechanics in three dimensions, the central potential, spin, and additions of spins.

Prerequisites: PHYS 3305, and either MATH 3304 or PHYS 4321.

This is a flipped active-learning class in which students can expect to do preparatory work before class and then work in small groups during class.

Instructor Biography

Prof. Dalley is a theoretical physicist who has worked in Oxford, Cambridge, Princeton and CERN. He been teaching physics courses at SMU, from non-science majors to graduate students, since 2006. Prof. Dalley has received both an Outstanding Professor Rotunda Award and the Provost's Teaching Recognition Award. At SMU he also directs science outreach programs and professional development courses for high-school physics teachers.

Learning Outcomes: The student should be able to apply their knowledge of Quantum Mechanics in solving non-relativistic physics problems in one, two, and three dimensions, including the use of angular momentum, the Hydrogen atom, and simple applications to multi-particle systems.

Class Meeting: Tu/Th 3:30 p.m. – 5:00 p.m. FOSC 157

Instructor: S. Dalley, Room 207 Fondren Science, sdalley@smu.edu

Office Hours: Mo 2:00 – 4:00 pm

Text: [Introduction to Quantum Mechanics](#) (3rd Edition) by David J. Griffiths and Darrell F. Schroeter, ISBN-13: 978-1-107-18963-8. Other editions OK if you make the translation between problem numbering.

Course Homepage: <http://www.physics.smu.edu/sdalley/5382/5382home.htm>

Date	TOPIC	Pre-Class Prep	hb 3e (pb 2e)	hw
8/21/2018	Schrodinger Equation & Statistical Interpretation	Read 1.1-1.2		
8/23/2018	Probability & Normalization	Read 1.3-1.4 Do Prob 1.5		
8/28/2018	Momentum	Read 1.5 Do Prob 1.7		1
8/30/2018	Uncertainty Principle	Read 1.6 Do Prob 1.9 (1.12)		
9/4/2018	Stationary States	Read 2.1 Do Prob 2.2		2
9/6/2018	Infinite Square Well	Read 2.2 Do Prob 2.5		
9/11/2018	<i>Chap 1.1-2.2 review</i>			3
9/13/2018	<i>Test 1</i>	1.1 - 2.2		
9/18/2018	Harmonic Oscillator (algebraic method)	Read 2.3.1 Do Prob 2.10 (2.12)		
9/20/2018	Harmonic Oscillator (analytic method)	Read 2.3.2 Do Prob 2.41 (2.44)		
9/25/2018	Free Particle	Read 2.4 Do Prob 2.20 (2.23)		4
9/27/2018	δ-Function Potential	Read 2.5 Do Prob 2.27 (2.29)		
10/2/2018	Finite Square Well	Read 2.6 Do Prob 2.29 (2.31)		
10/4/2018	<i>Chap 2.3-2.6 review</i>			5
10/11/2018	<i>Test 2</i>	2.3 - 2.6		
16-Oct	Hilbert Space & Observables	Read 3.1-3.2 Do Prob 3.3		
18-Oct	Eigenfunctions & Statistical Interpretation	Read 3.3-3.4 Do Prob 3.7 (3.12)		
23-Oct	Uncertainty Principle	Read 3.5 Do Prob 3.18 (3.22)		6
25-Oct	Vectors and Operators	Read 3.6 Do Prob 3.25 (3.28)		
30-Oct	<i>Chap 3 review</i>			7
1-Nov	<i>Test 3</i>	3.1 – 3.6		
6-Nov	Schrodinger Equation in Spherical Coordinates	Read 4.1 Do Prob 4.7 (4.9)		
8-Nov	Hydrogen Atom	Read 4.2 Do Prob 4.12 (4.10)		
13-Nov	Angular Momentum	Read 4.3 Do Prob 4.22 (4.19)		8
15-Nov	Spin $\frac{1}{2}$	Read 4.4.1 Do Prob 4.32 (4.34)		
20-Nov	Electron in a Magnetic Field	Read 4.4.2 Do Prob 4.35 (4.37)		9
27-Nov	Addition of Angular Momenta	Read 4.4.3 Do Prob 4.37 (4.39)		
29-Nov	Interpretation Revisited	Chap 12. Present one subchap		10
12/07/18	<i>Final Exam 3-6 pm</i>	Chaps 1 – 4		

- I will use your official SMU e-mail address to communicate with you – please check it!
- Academic Dishonesty will result in a course F grade and filing with the Dean of Student Life.
- During class, phones should be put away except when needed for course-related tasks.

Assessment

PARTICIPATION (15%)

Before each class you are expected to read relevant sections of the textbook and attempt the suggested problem; you are encouraged to provide a question to guide what we will do in class. You are required to submit your attempt at the problem at the start of class (the effort not the correctness is what counts). In class, you are expected to work with other students meaningfully in a small group to solve problems. In the last class you will make a 10 minute presentation and lead a discussion on a unique chosen topic.

HOMEWORKS (25%)

Post-class homework assignments usually consisting of 1-2 problems per week are due most weeks and must be turned in at the **beginning** of class on the due date to gain credit. Assignments are linked on the course website and due dates shown on the syllabus. No late homeworks are accepted, but the lowest homework will be dropped.

IN-CLASS TESTS (8% each)

There will be three 75-min in-class tests on recent topics. You may use a calculator and the course textbook during the tests.

TEST REDOs (4% each)

You have the opportunity to correct your graded Tests in your own time. Redos must be submitted within one week of receiving your graded Test back. If no Redo is submitted, the original Test score will count for the Redo credit.

FINAL EXAM (24%)

There will be a 3 hr comprehensive final exam. You may use a calculator and the course textbook during the exam.

Course Grade

Grade Boundaries are roughly defined as

A > 90% > A- > 85% > B+ > 80% > B > 75% > B- > 70% > C+ > 65% > C > 60% > D > 50% > F

Disability Accommodations: Students needing academic accommodations for a disability must first register with Disability Accommodations & Success Strategies (DASS). Students can call 214-768-1470 or visit <http://www.smu.edu/Provost/ALEC/DASS> to begin the process. Once registered, students should then schedule an appointment with the professor as early in the semester as possible, present a DASS Accommodation Letter, and make appropriate arrangements. Please note that accommodations are not retroactive and require advance notice to implement.

Religious Observance: Religiously observant students wishing to be absent on holidays that require missing class should notify their professors in writing at the beginning of the semester, and should discuss with them, in advance, acceptable ways of making up any work missed because of the absence. (See University Policy No. 1.9.)

Excused Absences for University Extracurricular Activities: Students participating in an officially sanctioned, scheduled University extracurricular activity should be given the opportunity to make up class assignments or other graded assignments missed as a result of their participation. It is the responsibility of the student to make arrangements with the instructor prior to any missed scheduled examination or other missed assignment for making up the work. (University Undergraduate Catalogue)

Attendance: If you are absent from class frequently or for a prolonged period, I will enquire by email if everything is OK. If I do not receive a prompt response, or the response is of concern, I will forward the details to the Dean of Student Life for follow up.