

Intro to Quantum Mechanics
PHYS 4382 001
Physics Department
Fall 2022



Instructor Information



Instructor: Simon Dalley

Email: sdalley@smu.edu

Office Location: 207 Fondren Science

Office Hours:

M-F 4-5 pm in Zoom: meeting ID 477 628 4599 Passcode dalleyphys

Preferred Method of Contact:

email

Additional Information:

Prof. Dalley is severely immuno-compromised. So please wear masks, keep a 10-foot social distance from him, and use the back row of seats in class.

Welcome Message/Bio:

Prof. Dalley has been teaching physics courses at SMU from nonscience majors to graduate students since 2006. He 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 highschool physics teachers.

Course Details

Location: DALL0351

Meeting Dates and Times:

08/22/2022	12/05/2022	02:00:00 PM	03:20:00 PM
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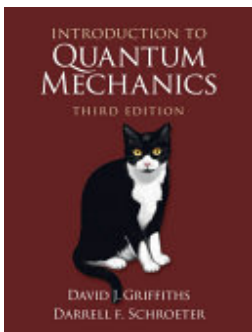
Credit Hours: 3.00

Course Description: 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 PHYS 4321 or MATH 3304 (formerly MATH 3353 prior to Fall 2017).

Student 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.

Required Texts and Materials



Introduction to Quantum Mechanics

ISBN: 9781107189638

Authors: David J. Griffiths, Darrell F. Schroeter

Publisher: Cambridge University Press

Publication Date: 2018-08-16

Edition: 3rd

Grading Policies/Grading Scale

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

Assignment Group Descriptions

PARTICIPATION (20%)

Before each class you are expected to read relevant sections of the textbook and attempt the suggested problem from Griffiths or Warmup sheet (10% of course grade, ½ for effort ½ for correctness). Work must be uploaded to the Canvas Assignment before the deadline for credit. The lowest two scores are dropped to cover for any issues (absence, illness, brainfog, bad luck, etc.)

In the last class you will make a 10 minute presentation and lead a discussion on a unique chosen topic (10% of course grade).

HOMEWORKS (25%)

Post-class homework assignments are due most weeks and must be uploaded to the Canvas Assignment before the deadline for credit. The lowest homework score will be dropped to cover for any issues (absence, illness, brainfog, bad luck, etc.)

IN-CLASS TESTS (7% each)

There will be three in-class tests on recent topics. You may use a calculator, printout of Fundamental Constants and Mathematical Formulas from the covers of Griffiths (provided), and one letter-sized sheet of notes (both sides) with anything written on it.

TEST CORRECTIONS (3% each)

You have the opportunity to correct your graded Tests in your own time. Corrections together with the original graded test must be uploaded to the Canvas Assignment within about one week of receiving your graded Test back. The corrections credit will be determined by the original test score + corrections. If no corrections are submitted, the original Test score alone will count for the corrections credit.

FINAL EXAM (25%)

There will be a 3 hr comprehensive final exam. You may use a calculator, printout of Fundamental Constants and Mathematical Formulas from the covers of Griffiths (provided), and three letter-sized sheets of notes (both sides) with anything written on them.

Course Policies

Prof. Dalley is immuno-compromised. Masks and social distancing from the instructor are required at all times.

Communication

For personal messages, please contact me via your smu email. I will respond to your email within a few hours typically. Responses might be slightly delayed on holidays and weekends. I will communicate with the class via Canvas Announcements. It is your responsibility to check Canvas Announcements and your SMU email.

Academic Dishonesty

Students are expected to embrace and uphold the SMU Honor Code. Violations of the Honor Code will be acted upon in accordance with the policies and procedures outlined in the Mustang Student Handbook. This course operates a policy of zero tolerance toward Academic Dishonesty in any form in any graded assessment. It will usually result in an F grade for the course and a filing with the Dean of Student Life (Honor Code Violation). Examples of academic dishonesty include: Communication via any method with anyone else or internet sources during any exam. Sharing or copying wording for an assignment intended to be done individually (plagiarism).

Attendance

The teaching strategy for this course relies on active group participation of all students, so you are expected to attend every class. All the assignments and in-class questions used for student discussion will be made available in Canvas, while the syllabus has already built into it automatic score drops that can be used to cover about one week of absence for any reason. If you contract any contagious illness, such as COVID-19, flu, cold, etc. you should not come to class until you are no longer contagious. Provided you notify me of your absence in advance, you will be given deadline extensions or alternative ways to make up any credit not covered by an automatic drop. Unavoidable multiple or prolonged absences will be treated on a case-by-case basis; contact me to discuss whether and how the absence can be made up in that case.

Title IX and Disability Accommodations

Disability Accommodations

Students who need academic accommodations for a disability must first register with Disability Accommodations & Success Strategies (DASS). Students can call 214-768-1470 or visit smu.edu/DASS to begin the process. Once they are registered and approved, students then submit a DASS Accommodation Letter through the electronic portal, *DASS Link*, and then communicate directly with each of their instructors to make appropriate arrangements. Please note that accommodations are not retroactive, but rather require advance notice in order to implement.

Sexual Harassment

All forms of sexual harassment, including sexual assault, dating violence, domestic violence and stalking, are violations of SMU's Title IX Sexual Harassment Policy and may also violate Texas law. Students who wish to file a complaint or to receive more information about the grievance process may contact Samantha Thomas, SMU's Title IX Coordinator, at accesssequity@smu.edu or 214-768-3601. Please note that faculty and staff are mandatory reporters. If students notify faculty or staff of sexual harassment, they must report it to the Title IX Coordinator. For more

information about sexual harassment, including resources available to assist students, please visit smu.edu/sexualmisconduct.

Pregnant and Parenting Students

Under Title IX, students who are pregnant or parenting may request academic adjustments by contacting the Office of Student Advocacy and Support by calling 214-768-4564. Students seeking assistance must schedule an appointment with their professors as early as possible, present a letter from the Office of the Dean of Students, and make appropriate arrangements. Please note that academic adjustments are not retroactive and, when feasible, require advance notice to implement.

Academic Policies

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. [Click here for a list of holidays.](#)

Medical-Related Absences

To ensure academic continuity and avoid any course penalties, students should follow procedures described by their instructors in order to be provided with appropriate modifications to assignments, deadlines, and exams.

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 that were missed as a result of their participation. It is the responsibility of the student to make arrangements for make-up work with the instructor prior to any missed scheduled examinations or other missed assignments. (See current [Catalog](#) under heading of "Academic Records/Excused Absences.")

Final Exams

Final course examinations shall be given in all courses where appropriate, and some form of final assessment is essential. Final exams and assessments must be administered as specified in the official examination schedule. Exams cannot be administered or due during the last week of

classes or during the Reading Period. Syllabi must state clearly the form of the final exam or assessment, and the due date and time must match the official SMU exam schedule. Final exams are not required to be provided online.

Academic Dishonesty

Students are expected to embrace and uphold the [SMU Honor Code](#). Violations of the Honor Code will be acted upon in accordance with the policies and procedures outlined in the [Mustang Student Handbook](#).

Student Support Services

Student Academic Success Programs

Students needing assistance with writing assignments for SMU courses may schedule an appointment with the Writing Center through Canvas. Students who would like support for subject-specific tutoring or success strategies should contact SASP, Loyd All Sports Center, Suite 202; 214-768-3648; smu.edu/sasp.

Caring Community Connections Program

CCC is a resource for anyone in the SMU community to refer students of concern to the Office of the Dean of Students. The online referral form can be found at smu.edu/deanofstudentsccc. After a referral form is submitted, students will be contacted to discuss the concern, strategize options, and be connected to appropriate resources. Anyone who is unclear about what steps to take if they have concerns about students should contact the Office of the Dean of Students at 214-768-4564.

Mental Health Resources: On-Call and Ongoing Counseling Services

Throughout the academic year, students may encounter different stressors or go through life experiences which impact their mental health and academic performance. Students who are in distress or have concerns about their mental health can schedule a same-day or next-day appointment to speak with a counselor by calling [Counseling Services](#). Counselors are available at any time, day or night for students in crisis at this number: 214-768-2277 (then select option 2) They will be connected with a counselor immediately. Students seeking ongoing counseling should call the same number (214-768-2277, then select option 1) during normal business hours to schedule an initial appointment.

Campus Carry Law

In accordance with Texas Senate Bill 11, also known as the 'campus carry' law, and following consultation with entire University community, SMU chooses to remain a weapons-free campus. Specifically, SMU prohibits possession of weapons (either openly or in a concealed manner) on campus. For more information, please see: smu.edu/campuscarrylaw.

Course Schedule

Date	TOPIC	Pre-Class Prep	Hw
8/23	Schrodinger Equation & Statistical Interpretation	Read 1.1-1.2	
8/25	Probability & Normalization	Read 1.3-1.4 Do WU1	
8/30	Momentum & Uncertainty Principle	Read 1.5-1.6 Do Prob 1.7	1
9/01	Math Review		
9/06	Stationary States	Read 2.1 Do Prob 2.2	2
9/8	Infinite Square Well	Read 2.2 Do WU2	
9/13	<i>Chap 1.1 - 2.2 review</i>		3
9/15	<i>Test 1</i>	1.1 - 2.2	
9/20	Harmonic Oscillator (algebraic method)	Read 2.3.1 Do Prob 2.10	
9/22	Harmonic Oscillator (analytic method)	Read 2.3.2 Do Prob 2.41	
9/27	Free Particle	Read 2.4 Do Prob WU3	4
9/29	δ-Function Potential	Read 2.5 Do Prob 2.23	
10/04	Finite Square Well	Read 2.6 Do WU4	
10/06	<i>Chap 2.3 - 2.6 review</i>		5
10/13	<i>Test 2</i>	2.3 - 2.6	
10/18	Hilbert Space & Observables	Read 3.1-3.2 Do Prob 3.3	
10/20	Eigenfunctions & Statistical Interpretation	Read 3.3-3.4 Do Prob 3.7	
10/25	Uncertainty Principle	Read 3.5 Do Prob 3.18	6
10/27	Vectors and Operators	Read 3.6 Do WU5	
11/01	Schrodinger Equation in Spherical Coordinates	Read 4.1 Do Prob 4.7	
11/03	Hydrogen Atom	Read 4.2 Do Prob 4.12	
11/08	<i>Chap 3 review</i>		7
11/10	<i>Test 3</i>	3.1 – 3.6	
11/15	Angular Momentum	Read 4.3 Do WU6	8
11/17	Spin $\frac{1}{2}$	Read 4.4.1 Do Prob 4.32	
11/22	Electron in a Magnetic Field	Read 4.4.2 Do Prob 4.35	9
11/29	Addition of Angular Momenta	Read 4.4.3 Do Prob 4.38	
12/01	Interpretation Revisited	Chap 12. Present one	10

		subchap	
12/14	<i>Final Exam 11:30 am - 2:30 pm</i>		