

PHY 341 - Quantum Mechanics I, Spring 2021 UMass Dartmouth

Lectures: MWF 12:00-12:50pm, Synchronous online

<https://umassd.zoom.us/j/9637607654?pwd=cnBzQXFJUmx1MW12WHILb0FkSIRKdz09>

Zoom ID/code: 963 760 7654 / eigenstate

Text: *Introduction to Quantum Mechanics*, D Griffiths, 2nd ed.

Reference: *Quantum Mechanics*, D H McIntyre

Instructor: Dr. Jay Wang, 2-204B, jwang@umassd.edu, 508-999-9136

Office Hours: MWF 11-12pm, by appointment, or just zooming-by

Course site: <http://jwang.sites.umassd.edu/p341/>

Welcome to Quantum Mechanics I. This course is intended as an introduction to the theoretical development of Quantum Mechanics, including the wave function and Schrödinger's equation, basic principles of Quantum Mechanics and its application to simple systems like the atomic hydrogen.

The objectives are: to gain a fundamental understanding of physical concepts; to develop important analytical, mathematical, and computational problem-solving skills; and to inter-relate basic principles and practical applications.

Homework will be assigned regularly. There will be two tests and the final exam. This course values efforts like attendance, class participation, extra credit work, office visits, etc. The final grade will consist of homework, the tests and final exams, and effort indicators as follows:

<u>Category</u>	<u>Percentage</u>	<u>Date</u>	<u>Grade Criteria</u>
Homework	40%	Weekly	$90 \leq A < 100$
Test 1	15%	Feb 19, F	$80 \leq B < 90$
Test 2	15%	Mar 26, F	$70 \leq C < 80$
Final	20%	May 4, T	$60 \leq D < 70$
Effort	10%	24/7	$0 \leq F < 60$

Information

1. Lectures and recitations. Lectures cover materials found in and, sometimes, out of the text. Important elements will be emphasized in the lecture. But before- and after-class reading as assigned is required for successful completion of homework and exams. Recitation exercises will be held as needed to go over problem solving/reviewing of covered material. Note, however, you are expected to do the bulk of homework. Group study is highly recommended.

2. Homework assignments. Homework will be assigned on a regular basis. It will include problems from text as well as handout including numerical problems on topics discussed in class. Each assignment is usually due in class one week following its assignment and coverage in lecture. The precise due date will be confirmed in class. You will have about one week to complete each assignment. Late homework will generally not be accepted, except for occasional, non-habitual cases which are subject to the bidaily half-life rule.

Quantum mechanics is a beautiful and elegant theory. But no one seems to be born with the intuition of quantum mechanics. Therefore it is essential to be able to do as many problems as you can (homework and extra problems you find on your own) to develop a feel for quantum mechanics. The emphasis on computation in this class is to help master the essential concepts of quantum mechanics.

3. Exams. The tests are sectional and the final exam is comprehensive. They will emphasize the material covered in lectures. Unless other arrangements are made with the instructor prior to the test date, zero points will be given if the test is not taken. A typical test includes mostly problems and concepts, but may also contain topical mini essays. Partial credit will be given for relevant steps of problem solving.

The final exam will be given only at the scheduled time. It is in the usual classroom (SEng-102).

4. Extra credit/help. Opportunities exist for extra credit up to 10% toward your final grade. They may include effort and activities such as participating in group discussions in the classroom, doing extra credit assignment and course-related projects, writing a paper on a topic relevant to this course, etc. But, extra credit will be considered for the final grade only if your core-course performance is satisfactory (60% or better).

5. Covid-19 information.

- This class will be conducted online synchronously via zoom and also asynchronously with video-recorded course material (via email or course website). The synchronous part will be used to engage you interactively for discussions or working through sample problems, and the asynchronous part will be used for you to learn or familiarize yourself with certain topics. Experiences in the education community so far, though limited, seem to indicate the synch-async combination to be more engaging and effective. We will try to find the right balance with your input, but *you are expected to have studied the posted material asynchronously before the class*. You can ask questions about that material in class, of course, but it will not be wholly repeated in synchronous sessions.
- There will be no P/NC option to this class for Spring 2021.
- In remote learning, more than usual, you are expected to be familiar with and follow the policies of academic integrity as given in the student handbook

<https://www.umassd.edu/studentaffairs/studenthandbook/>

Syllabus

Tentative Schedule, PHY 341, Spring 2021, UMass Dartmouth			
Date	Chap	Sections to read	Topics
Jan 20, W	1	Sec 1-6	The Schrödinger equation wave function and probability interpretation operators and expectation values uncertainty principle
	2	Sec 1-6	Time-independent Schrödinger equation 1D systems: particle in a box harmonic oscillator, potential wells bound and unbound (continuum) states
Sectional conclusion. Test 1, Ch 1, 2, Feb 19, F			
Mar 3, W	3	Sec 1-6	Formal principles of quantum mechanics Hilbert (function) space, eigenvalues and eigenfunctions, Hermitian operators, Dirac notation, basis set
Sectional conclusion. Test 2, Ch 2, 3, Mar 26, F			
Mar 31, W	4	Sec 1-4	Schrödinger equation in 3D radial and angular wave functions structure of the hydrogen atom angular momentum and spin
Apr 28, W		Last class	
May 4, T		Final Exam 11:30-2:30pm, Comprehensive	