

PHYSICS 284, QUANTUM MECHANICS I, Spring-2013

Lecture: 10:00-10:50 a.m., MWF in Moulton-215

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Office Hours: M,W,F 9:00-10:00 a.m., by appointment or Walk-in.

Textbook: Introduction to Quantum Mechanics (2nd ed.) by David J. Griffith

Course Objectives: I would like to introduce you to the physics of the quantum world. You will learn the rules of this bizarre world. The events leading to the 'spectacular' failure of classical mechanics and the subsequent development of the 'desperate' new quantum mechanical laws will be discussed. You will learn how to apply these laws to simple systems (e.g., one-dimensional harmonic oscillator, particles trapped in potential wells, hydrogen atom, diatomic molecules, etc.). We shall discuss the philosophical implications of these laws: the quantum reality and the branching worlds.

Grading: The final letter grade of a student will be based on three regular exams, three quizzes, the final exam, and the homeworks. The points are distributed as:

Regular exams (3 x100)	300
Final exam (150)	150
Quizzes 3 x 40	120
Homework	100
Numerical Homework	30
Total	700

Grading Scale: The letter grade of a student will be determined from the curve of the distribution of the total score of all students in the class. However, students receiving 90%, 80%, 65%, and 55% of the total score are guaranteed to receive, respectively, the letter grades "A", "B", "C", and "D".

Homework and Practice Problems: The Homework and Practice problem sets are designed to elucidate the ideas discussed in the lectures. Practice problem sets will be distributed each day of the class and we shall work on these problems together for about 8 minutes. I urge you to participate in this process and communicate to me any difficulties that you may be experiencing. This will help you to stay alert during the class and prepare you for the next day's lecture.

The Homework problem sets will be distributed periodically. You will have at least a week to work on these problems. You should turn in your solutions to these problems at the beginning of the class on the due date. You will lose 1 point per problem if you submit the problems on the due date but at a different time (other than at the beginning of the class). In case of late submission your score will be multiplied by the factor $\exp(-0.2d)$ where d is the number of days you are late. No credit will be given after the solutions are discussed in the class. If you are not finished, it may be a good idea to turn in as much as you can by the due date and time.

You may collaborate with other students in the class on the homework problems, but you must write your solution independently. Please write clearly.

Extra Credit Points: A student may be given up to 15 extra credit points for class participation. A student may be given extra negative points for any improper behavior in the class; a few examples of improper behaviors are (1) chatting or making distracting noise, reading newspaper or working with the computers during lecture class, and (2) cheating during an exam. There is NO LIMIT to the extra negative points a student can get.

Tentative Schedule: (Please read the chapters prior to class lecture)

Chapters	Topics	# of Lectures
	Introduction: A bit of Quantum History	4
	Particle Nature of Waves: Plank, Einstein, Compton	
	Wave Nature of Particles: deBroglie, Bohr	
	The Philosophy of Quantum Theory	
1	The Wave Function, Normalization, Uncertainty Principle	17
2	Time-independent Schroedinger's Equation	
2	Stationary States	
2	The infinite square well	
2	The Simple Harmonic Oscillator	
2	The free particle	
2	Barrier Potentials, Delta-Function Potential	
2	Square Well Potentials	
3	Hilbert Space, Hermitian Operator	3
4	Hydrogen Atom	8
4	Eigenvalues, Quantum Numbers, Degeneracy	
4	Angular Momentum	

4	Electron Spin, Spin-Orbit Interaction	
5	Identical Particles, Exchange Interactions	3

`Quantum mechanics is very impressive. But an inner voice tells me that it is not yet the real thing. I am at all events convinced that God does not play dice'--- Albert Einstein

`Albert, stop telling God what to do'--- Neils Bohr