

Quantum Mechanics II (PHY 422)

Spring 2017

Dr. Scott N. Walck

Contact Information

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Course Description

Second semester of a study of selected topics in modern physics, utilizing the methods of quantum mechanics. The Schrodinger equation is solved for such systems as potential barriers, potential wells, the linear oscillator and the hydrogen atom. Perturbation techniques and the operator formalism of quantum mechanics are introduced where appropriate. Prerequisites: PHY 211 and MAS 266, or permission. 3 credits.

Learning Objectives

It is expected that students will

1. describe physical situations using the mathematical language of complex vectors and kets
2. interpret the results of experiments in terms of quantum theory
3. apply the postulates of quantum mechanics to specific physical situations
4. calculate probabilities of measurement outcomes
5. calculate the future state of a system from its initial state and its Hamiltonian
6. solve the energy eigenvalue problem for the hydrogen atom

IDEA Objectives

1. Learning fundamental principles and theories, in particular quantum theory
2. Gaining factual knowledge and terminology, especially the terminology of kets and operators in which quantum mechanics is expressed
3. Learning to apply course material to solve problems in quantum mechanics

Textbook

The textbook for the course is *Quantum Processes, Systems, and Information* by Benjamin Schumacher and Michael D. Westmoreland, Cambridge University Press, ISBN 978-0-521-87534-9.

Plan

The plan for this course is to read, do all of the exercises in, and do some of the problems in chapters 12 through 17 (except section 13.4) of Schumacher and Westmoreland. Each student will be expected to do one problem of his or her choice at the end of each chapter. Different students will choose different problems. Each student will present his or her solution to the rest of the class. The exercises distributed throughout the chapter will be divided among the students to do, according to the following table. Students will briefly present the exercises they have done to the rest of the class.

First two letters of last name	Do Exercise c.n if
Bo	$n \bmod 3 = 0$
Ca	$n \bmod 3 = 1$
We	$n \bmod 3 = 2$

Grading

Your grade will be determined by the completeness of the exercises and problems that are assigned to you to do.

Class Schedule

Week of	Topic
01/16	Chapter 12
01/23	Chapter 12
01/30	Sections 13.1–13.2
02/06	Section 13.3
02/13	Chapter 14
02/20	Chapter 14
02/27	Chapter 15
03/06	Spring Break
03/13	Chapter 15
03/20	Chapter 16
03/27	Chapter 16
04/03	Chapter 16
04/10	Chapter 17
04/17	Chapter 17
04/24	Chapter 17
05/01	Chapter 17