

# Phys 444: “Quantum Theory”--- fall 2009

## Course Information:

Instructor: Dr. L. Gan

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Web site: <http://people.uncw.edu/ganl/phy444/index.htm>

Classes meet: Tue at 2:00pm-3:15pm

Wed at 2:00pm-2:50pm

Thur at 2:00pm-3:15pm

DL Rm. # 213

Office hours: Tue 11:00am-1:30pm

Thur 11:00am-1:30pm

Other hours by appointment only

## Required Text:

*“Introduction to Quantum Mechanics”*, by **David J. Griffiths**,  
Second Edition, Prentice Hall

## Supplementary Readings:

- “Principles of Quantum Mechanics”, Hans O. Ohanian Addison-Wesely
- “Introductory Quantum mechanics”, R. Liboff , Prentice Hall
- “Understanding Quantum Mechanics”, M. A. Morrison, Prentice Hall
- “Quantum Physics”, by S. Gasiorowicz, John Wiley & Sons

## Course Objectives:

- Summarize experiences and theories formulated during the early decade of the 20<sup>th</sup> Century.
- Develop the physical principles and mathematical background important to quantum mechanical description.
- Establish the mathematical properties of the waves that describe free particles.
- Solve the Schrodinger equation for different potentials. These include step potentials, one-dimensional barrier problems, infinite square wells. Harmonic Oscillator Schrodinger equation.
- Understand the basic postulates of Quantum Mechanics, which serve to formalize the rules of Quantum Mechanics.
- Solve the Schrodinger equation in spherical coordinates and apply it to the problem of the Hydrogen Atom and theory of Angular Momentum (Orbital and Spin).

## **Important!!!**

Read ahead of the lecture and solve the weekly homework problems assigned. Weekly reading assignment is given below in the course outline. Even if you only read the assigned sections for about 30 minutes before each class, you will be much better prepared.

## **Homework:**

Homework will be assigned every week. It will be collected on Thursday during the class in one week after each assignment is announced. Show all works clearly. Late homework **will not be accepted**. It is absolutely essential that you work out the assigned problems.

## **Examinations:**

There will be two tests during the semester and a three-hour comprehensive final exam. The exams will consist of a mixture of multiple choice, conceptual questions, and selected problems. The tentative dates of these exams are given below in the course outline. Do not miss any of these exams.

## **Make-up Exams:**

There will be no make-up exams. In case of evidence of extraordinary circumstance, each case will be discussed and evaluated on an individual basis. No general policy will apply to the class as a whole.

## **Grading:**

Homework:	25%
Two tests:	40%
Final examination:	35%

## **Grading scale:**

90 -100 .....	A
80 - 89 .....	B
70 - 79 .....	C
60 - 69 .....	D
Below 60 .....	F

## **Attendance:**

**YOU ARE EXPECTED TO ATTEND ALL OF THE LECTURES!** Your final grade will be dropped by **half a letter grade** if you have more than five absences. No absences can be excused. Attendance will be taken at the beginning of each class and will be closed 15 minutes after the class starts. Please do not be late!

## **Academic Integrity:**

All members of UNCW's community are expected to follow the academic Honor Code. Please read the UNCW Honor Code carefully (as covered in the

UNCW Student Handbook). Academic dishonesty in **any** form will not be tolerated in this class.

### Disability Services:

Students with diagnosed disabilities should contact the Office of Disability Services (962-7555). Please give me a copy of the letter you receive from Office of Disability Services detailing class accommodations you may need. If you require accommodation for test-taking please make sure I have the referral letter no less than three days before the test.

### Violence and Harassment:

UNCW practices a zero tolerance policy for any kind of violent or harassing behavior. If you are experiencing an emergency of this type contact the police at 911 or UNCW CARE at 962-2273. Resources for individuals concerned with a violent or harassing situation can be located at <http://www.uncw.edu/wsrc/crisis.html>.

### Phys 444: “Quantum Theory” – Course Outline:

Date	Topic	Text Reference
Week 1 (Aug. 19)	Introduction to Quantum Physics, Wave Function	Chapter 1: 1.1, 1.2,
Week 2 (Aug. 25)	Momentum, Uncertainty Principle, Time-Independent Schrodinger equation, Stationary State	Chapter 1: 1.3, 1.4, 1.5, 1.6 Chapter 2: 2.1
Week 3 (Sept 1)	Infinite Square Well, Harmonic Oscillator	Chapter 2: 2.2, 2.3
Week 4 (Sept. 8)	Free particle, Delta-Function Potential	Chapter 2: 2.4, 2.5
Week 5 (Sept. 15)	Finite Square Well	Chapter 2: 2.6
Week 6	<b>Test 1</b>	<b>Chapter 1-2</b>
Week 7 (Sep. 29)	Mathematical Introduction, Hilbert Space, Observables	Chapter 3: 3.1, 3.2
Week 8 (Oct 7)	Eigenfunctions, Statistical Interpretation	Chapter 3: 3.3 3.4
Week 9 (Oct 13)	Uncertainty Principle, Dirac Notation	Chapter 3: 3.5, 3.6
Week 10 (Oct 20)	Quantum Mechanics in 3 Dimension	Chapter 4: 4.1
Week 11 (Oct 27)	The Hydrogen Atom	Chapter 4: 4.2
Week 12 (Nov 3)	Angular Momentum, Spin	Chapter 4: 4.3, 4.4
Week 13	<b>Test 2</b>	<b>Chapter 3-4</b>
Week 14 (Nov 17)	Identical Particles	Chapter 5: 5.1
Week 15 (Nov 24)	Atoms	Chapter 5: 5.2
Week 16 (Dec 1)	Solids	Chapter 5: 5.3
Dec 10	Final exam (3:00pm-6:00pm)	<b>Chapter 1-5</b>

This schedule is subject to change.