

# Introduction to Quantum Mechanics I

*171.303 Fall 2005*

**Course Description:** This is the first of a rigorous two semester introduction to Quantum Mechanics. It may be one of the most important courses you take as the subject forms the core of our understanding of the physical world. Thoroughly proven through a wide range of experiments, quantum mechanics has a beautiful logical structure that you will learn and enjoy by using it to solve problems. So while it may be true as Richard Feynmann famously claimed that “nobody understands quantum mechanics”, you will learn to use it to explore a fascinating realm that classical intuition has not prepared you for.

**Professor:** Collin Broholm (<http://www.pha.jhu.edu/~broholm/homepage>). Office hours Monday 2-4 pm in room 345 and by appointment. Questions are also answered by email ([broholm@jhu.edu](mailto:broholm@jhu.edu)) or phone (410) 516 7840.

**Teaching Assistant:** Andrew Blechman. Office hours TBA in room 465 and by appointment. Email [blechman@pha.jhu.edu](mailto:blechman@pha.jhu.edu) ; phone (410) 516 0461.

**Text Books:** “A Modern Approach to Quantum Mechanics” by John S. Townsend (A JHU graduate!). We will cover Chapters 1-6 during the fall semester. “Introduction to Quantum Mechanics” by David J. Griffiths will be used as a supplementary text book.

**Lectures:** MTW 9-9:50 pm in room 278. I am open to moving the lectures to a later time on those days if agreement can be reached. I will introduce new concepts and provide examples that help you understand how quantum mechanics works. Where possible I will use demonstration experiments to show you that the predictions are right even if surprising and unfamiliar. Read the assigned text in advance of the lecture and then again afterwards for optimal comprehension. Your active participation during lectures with questions and comments is strongly encouraged.

**Conference:** Th. 1-1:50 pm in room 361. Conferences focus on improving your problem solving skills. Participation is highly recommended and attendance will be taken. Andrew has been a TA in this course for several years so he is well aware of the challenges you face and will be an excellent resource for you.

**Homework:** Solving problems is how you will learn quantum mechanics. Problem sets will be assigned on Mondays, to be due Wednesday of the following week. Assignments and solutions will be posted on the course web page, which is accessible from <http://www.pha.jhu.edu/courses/> . The direct link is [http://www.pha.jhu.edu/~c171\\_303/](http://www.pha.jhu.edu/~c171_303/).

**Academic Ethics:** The strength of the university depends on academic and personal integrity. In this course, you must be honest and truthful. Ethical violations include cheating on exams, plagiarism, reuse of assignments, improper use of the Internet and

electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition. Heated discussions and intense collaborations gave birth to quantum mechanics. So you are strongly encouraged to discuss the material and the problems with your friends. However, ultimately you must solve the homework problems yourself. Please report any violations you witness to the instructor. You may consult the associate dean of students and/or the chairman of the Ethics Board beforehand. See the guide on "Academic Ethics for Undergraduates" and the Ethics Board web site (<http://ethics.jhu.edu>) for more information.

## Fall 2005 Syllabus

<b>Dates</b>	<b>Topic</b>	<b>Reading</b>
Sep. 12-14	The Stern-Gerlach experiment	T 1.1-1.6
Sep. 19-21	Rotations and Operators	T 2.1-2.3 & G 3.1
Sep. 26-28	Representations	T 2.4-2.8
Oct. 3-5	Angular Momentum	T 3.1-3.5
Oct. 10-12	The Schrödinger Equation	T 3.6-4.1
Oct. 18-19	Dynamics of two-state systems	T 4.2-4.6
Oct. 24-26	Combining angular momenta	T 5.1-5.6+Article
Oct. 31 & Nov. 1-2	Position and momentum	T 6.1-6.5
Nov. 3 1-1:50	<b>Midterm Exam Covering T 1-5 (Bloomberg 361)</b>	
Nov. 7-9	Pulses and the step potential	T 6.6-6.8 & G 2.4
Nov. 14-16	Tunneling and the infinite square well	T 6.10 and G 2.2
Nov. 21-23	Delta potential and the finite well	G 2.5-2.6
Nov. 28-30	Scattering and the Harmonic Oscillator	G 2.7
Dec. 5-7	Scattering Neutrons from Phonons	Handout
Dec. 12	Course Review	all of the above

**Final exam Tuesday December 20 covering all assigned reading material**

**Exam Rules:** No books are allowed.

<b>Grading:</b>	Final Exam	50%
	Midterm Exam	25%
	Homework	25%

**Acronyms:**

T: J. S. Townsend "A modern approach to quantum mechanics"

G: D. J. Griffiths "Introduction to quantum mechanics"