

Syllabus

Physics 568 - Quantum Mechanics II

Fall 2010

Overview: Quantum mechanics is a testament to the power of the scientific method and one of its crowning achievements. It was developed to account for physical phenomena at unimaginably small scales, where certain principles of our classical intuition appear not to apply. Since its inception, it has been applied repeatedly, and tested successfully, in an ever-growing experimental domain - from fundamental particles, atoms and molecules to 'exotic' states of matter, superconducting circuits and even mechanical structures. And it has enabled technologies that have changed the face of our planet - from atomic clocks and lasers to integrated circuits and medical diagnostic techniques. Remarkably, despite all its success, there remain deep unanswered philosophical questions about the theory.

In PHY568, we will pick up where you left off in PHY567 and delve further into this remarkable and fascinating subject. The course will be based primarily on Chapters 6-12 of D.J. Griffith's textbook "Introduction to Quantum Mechanics, 2nd Ed., with a brief review of the essentials from Chapters 1-5 presented at the beginning of the semester. Course content will focus largely on approximation techniques that are essential for tackling real-life problems and are necessary for more advanced study of the subject. These include both time-independent and time-dependent perturbation theory, the W.K.B. approximation, and techniques for the analysis of scattering. If time permits, at the end of the semester, we will also begin to explore topics that are at the heart of much of modern quantum research, including quantum measurement, entanglement, and the quantum-classical 'divide'.

Instructor: Professor Matt LaHaye
Physics Building, Rm. 209
Phone: x2564
E-mail: mlahaye@syr.edu

**Days, Time
& Location:** TTH 9:30-10:50a
Rm. 105A

Office Hours: MW 4:00-5:00p
Or contact me via e-mail to arrange for meeting at other times.

Required Text: D.J. Griffiths "Introduction to Quantum Mechanics", 2nd Edition.

Recommended Supplementary Texts (On Reserve in the Library):

J. Townsend "A Modern Approach to Quantum Mechanics".

J.J. Sakurai "Modern Quantum Mechanics".

C. Cohen-Tannoudji, B. Diu & F. Laloe "Quantum Mechanics (Vols. I & II)"

F. Schwabl, "Quantum Mechanics".

General Reading

For some perspective on the history and development of the theory during the 20th century, I recommend:

"Quantum Generations: A History of Physics in the Twentieth Century", by Helman Kragh.

"The Making of the Atomic Bomb", by Richard Rhodes.

Grading:

There will be two exams: A midterm (**Date T.B.D.**) and a final (**17 Dec. 2010, 5:15-7:15p, Rm. 105**). There will also be regular homework, which you will be expected to complete before class. A portion of class time will be dedicated to discussing the assigned problems, so you should be prepared to explain your work to the class. Your final grade will be based upon your exam performance and your classroom participation.