

Physics 568 - Quantum Mechanics II – Syllabus – Fall Semester 2011

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, variational methods and techniques for the analysis of scattering. If time permits, at the end of the semester, we will begin to explore topics that are at the heart of much of modern quantum research, including quantum measurement, entanglement, and the quantum-classical 'divide'. Throughout the semester we will also take the time to read about and discuss current topics at the frontiers of quantum research, including mechanical structures in the quantum regime, cavity quantum electrodynamics, and quantum computing.

Instructor:

Professor Matt LaHaye
Physics Building, Rm. 209
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Days, Time & Location

The first day of class, we will meet in Physics Building Rm 105 as stated in the course catalog. However, afterwards, we will meet once a week in Physics Building Rm. 209, at a time and on a day of which we will decide during the first day of class.

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 Science and Technology Library):

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

Call #: QC174.12 .T69 2000.

P.A.M. Dirac "The Principles of Quantum Mechanics".

Call #: QC174.3 .D5 1967.

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

Call #: QC174.12 .C6313.

F. Schwabl, "Quantum Mechanics".

Call #: QC174.12 .S38713 2002.

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:

The structure of the class will be a bit different than in previous years. We will meet once a week, for two hours. During this time, we will discuss the weekly reading assignments and homework set. **Important:** You are expected to complete these assignments before the meeting period and come to class prepared to ask questions as well as discuss the topics and your homework solutions. I will then collect the homework solutions at the end of the meeting period for grading. As in previous years, there will be a final exam (**Friday 16 Dec. 2011, 5:15-7:15p, Rm. 105**). However, in lieu of a mid-term, you will be asked to write a term paper on a

topic related to modern quantum research (as the semester progresses, additional information will be provided on the term paper, including a list of suitable topics). Your final grade will be calculated as follows: **Homework and class participation 50%; Term Paper 25%; Final 25%.**

Disability accommodation

Students who are in need of disability-related academic accommodations must register with the Office of Disability Services (ODS), 804 University Avenue, Room 309, 315-443-4498. Students with authorized disability-related accommodations should provide a current Accommodation Authorization Letter from ODS to the instructor and review those accommodations with the instructor. Accommodations, such as exam administration, are not provided retroactively; therefore, planning for accommodations as early as possible is necessary. For further information, see the ODS website, Office of Disability Services <http://disabilityservices.syr.edu/>

Academic integrity

The Syracuse University Academic Integrity Policy holds students accountable for the integrity of the work they submit. Students should be familiar with the Policy and know that it is their responsibility to learn about instructor and general academic expectations with regard to proper citation of sources in written work. The policy also governs the integrity of work submitted in exams and assignments as well as the veracity of signatures on attendance sheets and other verifications of participation in class activities. Serious sanctions can result from academic dishonesty of any sort. For more information and the complete policy, see <http://academicintegrity.syr.edu>.

Religious Observance Policy

SU's religious observances policy recognizes the diversity of faiths represented among the campus community and protects the rights of students, faculty, and staff to observe religious holy days according to their tradition. Under the policy, students are provided an opportunity to make up any examination, study, or work requirements that may be missed due to a religious observance provided they notify their instructors before the end of the second week of classes. For fall and spring semesters, an online notification process is available through MySlice/Student Services/Enrollment/My Religious Observances from the first day of class until the end of the second week of class. For more information on SU's religious observance policy, please see http://supolicies.syr.edu/emp_ben/religious_observance.htm.