
Applications of Quantum Mechanics

Department of Physics and Astronomy

University of British Columbia

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- **Textbook**

“Introduction to Quantum Mechanics”, by D. J. Griffiths, (*Prentice Hall* 1995). The course will cover chapters 6-11 and additional material presented in lectures.

- **Other useful texts**

“Quantum Physics”, by S. Gasiorowicz, (*Wiley* 1996)

“Quantum Mechanics”, by C. Cohen-Tannoudji, B. Diu, and F. Laloe, (*Wiley* 1977).

- **Course Description**

This course is essentially a continuation of the Physics 304 (Intro to Quantum Mechanics) and will cover some of the most important applications of the quantum mechanics to problems in atomic, condensed matter and elementary particle physics. Much of the course will be devoted to the further development of the formalism of QM with the particular emphasis on the approximate methods of calculation of the physical observables. These include stationary and time-dependent perturbation theory, variational method, quasi-classical WKB approximation, and the adiabatic approximation. Mastery of these tools will then allow us to tackle such problems as the spectrum of the hydrogen atom in external electric and magnetic fields, ground state of the helium atom, absorption and emission of radiation by matter, and scattering problems.

Extensive use of mathematics is unavoidable when studying the subject of quantum mechanics, especially its applications to real world physical systems. Although we shall not need any truly complicated math, working knowledge of basic calculus, differential equations, and linear algebra will be expected and demanded.

- **Lectures**

Lectures are held 9:00 Tue & Th in HEBB 13 and 14:00 Fri in HEBB 10.

- **Course webpage**

www.physics.ubc.ca/~franz/phy402.html

Please check frequently for homework assignments, practice problem sets, and other important course announcements.

- **Office Hours**

Tue & Th, 10:00-11:00, and by appointment. Additional office hours will be posted before the exams.

- **Homework**

You learn QM by working out problems, not by memorizing books or notes. Problem sets will be assigned on approximately biweekly basis in the class and will be in addition posted on the course webpage, along with solutions (posted after the due date). You are encouraged to discuss the homework problems with fellow students but you must turn in your own work.

- **Practice problems**

A list of additional useful problems will be given to help you further sharpen your understanding of the subject and your problem solving skills. You are not required to do these problems, although you may find it useful to do so.

- **Exams and Grades**

Homework	20%
Midterms	40%
Final Exam	40%

- The exam dates and scope will be announced in class. Two midterms are tentatively planned for early February and early March and will cover chapters 6-7 and 8-9 respectively. The final covers all chapters.
- The exams are closed book, closed notes. You may bring a one page formula sheet to the exam. Calculators are permitted but not essential.
- Exams should be written in non-erasable black or blue *pen*. Otherwise, they will not be considered for re-grade.
- We are generally *unable* to give make-up exams. If you have to miss an exam because of an absolutely unavoidable and legitimate cause (e.g. medically certified illness, officially confirmed fire, flood, revolution, act of war or international terrorism), arrangements will be made on the case-by-case basis.