

**PHY 362**  
**Atomic and Molecular Physics**  
**Syllabus Fall 2014**

Tuesdays and Thursdays, 0920-1035 LL 514

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**Topics covered in this course.** This will be an introduction to the basic quantum mechanical description of particles. Specific cases that will be discussed are particles (such as electrons) subjected to different space-dependent potential energies, electrons in atoms, and molecules. We will develop and discuss the Schrödinger equation, wavefunctions, operators, eigenvalues and eigenfunctions, spin, angular momentum, and Pauli's principle. Hence, the course will teach the foundations and the most basic tools of quantum mechanics, and provide an understanding of how electrons and nuclei bind with each other to make atoms, and how atoms bind with each other to make molecules.

**Textbook.** Robert Eisberg, Robert Resnick, "Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles". Wiley 1985. ISBN: 978-0-471-87373-0. You must have access to this book. The course will discuss materials matching 7 of its chapters, and some of the homework problems will come from it. This course will mainly address the material in Chapters 5-10, and Chapter 12. You should already know the material in Chapters 1-4. If not, you must read these chapters as soon as possible.

**Reading Assignments** are given from one week to the next, and are necessary in order to be able to understand and make the most of the lecture that will follow, and to do quizzes or homeworks.

**Quizzes** are simple, 5-minute questions that you will answer in writing in class, from time to time. Quizzes will be graded from 0 (if you are not there or do not write anything) to 3 (if everything is perfect). Only the top 70% of the quizzes will contribute to the final grades. Quizzes will focus on basic understanding of the most essential concepts. Use them as your guide: if you notice that you don't do well in quizzes, then it means that you are falling behind and that you are missing something essential.

**Homework** is essential for the development of the material, not only to exercise what has been learned already. In addition, homework assignments are obviously very important because it is only by working on them that you will train with the new tools that you are learning. It is the same as athletics, or music, or anything else: practice is the key to performance.

The work you will do on the homework assignments must consist of two parts, with a focus on a written discussion of the material, not just algebraic or numerical calculations:

- 1) Your initial work on a given assignment.
- 2) Your discussion of the assignment in view of what you did and of my detailed solution that I will distribute later.

The second part is important because many homework assignments will be structured as a different way to learn the material, in addition to what I am presenting in class (they will not be similar to the standard problems in the textbook). Because of this it is important that you not only attempt to do the homework assignments alone, but that you also review the solution, discuss any differences between how you approached a problem, and how it was treated in the solution (both may be valid), and analyze any new material presented in a solution, asking questions in case of doubts.

Homework grading will be graded from 0 to 3, like for quizzes. There will be 1 point for handing in an initial solution, 1 point for a complete solution, and 1 point extra for quality work. I define quality work as a combination of a serious attempt at a solution, a well-presented treatment, or thoughtful questions or analysis that go beyond the strict topic of the homework.

**Grading** will be based on the *homework*, short *quizzes*, a *mid-term exam*, and a *final exam*. Exams will contribute at least 50% to the final grade, Quizzes will contribute 30%, and Homework will contribute 20%. Within the exam grade, the midterm grades will be averaged with the final grade (with the relative weight of a midterm being 50% of that of the final exam), but only if they *improve* the final grade.

**Accommodations for Students with Disabilities:** If you have a disability for which you are or may be requesting accommodations, please contact both your instructor and the Office of Academic Support Services, University Center C212 (610-758-4152) as early as possible in the semester. You must have documentation from the Academic Support Services office before accommodations can be granted.

**The Principles of Our Equitable Community:** Lehigh University endorses The Principles of Our Equitable Community (<http://www4.lehigh.edu/diversity/principles>). We expect each member of this class to acknowledge and practice these Principles. Respect for each other and for differing viewpoints is a vital component of the learning environment inside and outside the classroom.