University of Maryland
Department of Physics

Spring 2009 Prof. Steven Anlage Physics 402

Title:
Physics 402: Quantum Physics II: Quantum states as vectors; spin and spectroscopy, multiparticle systems, the periodic table, perturbation theory, band structure, etc. The second semester of the two-term sequence on introduction to quantum physics for physics majors. This is a 4-credit course.

Prerequisite:
PHYS 401, and PHYS 374, and MATH 240. Credit will be granted for only one of the following: PHYS 402 or former PHYS 422.

Instructor:
Prof. Steven Anlage, Room 1363 (Physics/CNAM). You can find the CNAM either by 1) going through the blue door labeled "Center for Nanophysics and Advanced Materials" in the basement of the physics building, or 2) entering from the plaza between the Math and Physics buildings.
Phone: 5-7321, e-mail: anlage@umd.edu, World-Wide-Web: http://www.cnam.umd.edu/anlage/AnlageHome.htm

Schedule:
Three lectures weekly,
MWF..... 9:00am- 9:50am (PHY 1201)
And a 1 hour lecture/discussion W.....10:00am-10:50am (PHY 1201)

Required Text:
David Griffiths, Introduction to Quantum Mechanics 2nd Edition (ISBN: 0-13-111892-7). Recommended for background reading: Kenneth Krane, Modern Physics, 2nd Edition (ISBN: 0-471-82872-6).

Lectures:
You will be responsible for material presented in lecture that is not in the book. If you miss a lecture you are responsible for finding out from a classmate what we did in class.

Homework:
The homework assignments will be given on the class website. The assignment will be due at the beginning of class on Fridays. Please staple papers and show your name, assignment number and date due. Two homework problems will be graded quantitatively (0-10) and the rest will be graded qualitatively (0-2).

Doing the homework is a very important part of this course! Homework will be returned by the following week. Late homework will not be accepted. As compensation, the lowest homework grade from the semester will be dropped.

Exams:
There will be two "mid-term" exams and a final exam. All exams will be counted towards your final grade. Make-up exams (for any of the exams) must be requested well in advance of the exam; the reason for the absence must be documented and in accord with University policy (see p. 33 of http://www.umd.edu/catalog/0607/chapter4.pdf). If an exam is unexpectedly canceled (due to inclement weather, etc.) it is automatically rescheduled for the next class period.

In grading, we are looking more at the reasoning that you use, rather than the final number you arrive at. So remember to carefully set up the problem on paper, even if you cannot see the way through to the solution.

The final exam is Monday, May 18 from 8 to 10 AM.

Computers
Developing a working knowledge of computers in the context of physics problem solving is an important skill. You are encouraged to solve problems using programs such as Mathematica, and you are also encouraged to visualize the solutions using spreadsheet programs. Note that

a student version of Mathematica 7 is available for home use for $10 from OIT: http://www.oit.umd.edu/slic/products/wolfram/mathematica6.html

Dropping the Course:
Note: the last day to drop with a "W" is April 10.

Final Grade:
Based approximately on homework (~25%), mid-terms (~50%), and final (~25%).

Academic Dishonesty (cheating):
Academic dishonesty is a serious offense that may result in suspension or expulsion from the university. In addition to any other action taken, the normal sanction is a grade of "XF", denoting "failure due to academic dishonesty," and will normally be recorded on the transcript of the offending student.

Office Hours
You are strongly encouraged to attend office hours to ask questions, discuss the homework problems, and talk about physics in general. The office hours will be held 3:00-4:30 PM on Thursdays, just before the homework is due. My office is right next to Prof. Lobb's in the Center for Nanophysics and Advanced Materials.

Class Web Site:
http://www.physics.umd.edu/courses/Phys402/AnlageSpring09/index.html

Tips For Doing Well In This Course:

1) Read the assignment in the book *before* and *after* the material is covered in lecture.

2) Freely ask questions in lecture, after lecture, and during office hours. Also discuss problems with your friends and classmates.

3) Work all of the homework questions and problems. You are allowed and encouraged to discuss homework with anyone you wish. However, in order to really learn, don't just copy solutions from somewhere or someone else; rather, work through them in detail yourself. Afterwards, make use of the solution sets, your TA's office hours, and me to make certain you understand all of the solutions. The exams will sometimes involve homework problems.

4) Seek help immediately if you do not understand the material or can't solve the problems. Help is available from your TA, and from me. Don't wait until just before the exams! If you are experiencing difficulties in keeping up with the academic demands of this course, contact the Learning Assistance Service, 2201 Shoemaker Building, 314-7693. Their educational counselors can help with time management, reading, note-taking and exam preparation skills.

5) Remember that you are responsible for material discussed in class, even if it does not appear in the textbook.

What Should You Learn in this Class?

Physics 401 has given you the background about why we need quantum mechanics, and a few basic tools to work with. Physics 402 uses these tools to solve problems that befuddled classical physicists for years (i.e. just about every interesting problem in physics). In this course, you should learn how to "think quantum". Specifics covered will include the hydrogen atom, atomic and molecular structure, radiation from atoms, time dependent and time independent perturbation theory, identical quantum particles, quantum statistical mechanics, elementary condensed matter physics (including superfluid He and superconductivity), and some treatment of nuclear physics.

Physics GRE
There is an emphasis on both historical aspects of quantum physics, as well as many general concepts from one-dimensional quantum mechanics on the Physics GRE exam. The textbook by Krane will be of great help in preparing for the historical aspects, while Griffiths is ideal for the analytical part of the exam. The more practice you have solving problems in quantum mechanics, the better you will do on the Physics GRE.