Physics 3660:
Quantum Mechanics II

What: This course, Physics 3660 - Quantum Mechanics II, is a continuation of Quantum Mechanics I, PHYS 3650. The emphasis in the previous semester was formalism and tool development; here the emphasis will be on applications. Topics include identical particles and multiple particle systems, perturbation theory, the variational principle, the WKB approximation, scattering and partial wave analysis, and other select topics.

Prerequisite: PHYS 3650

Information on this course is accessible through the UVaCollab system from https://collab.itc.virginia.edu/portal - search for 'PHYS 3660' and you will find the course web site.

Why: The familiar physical world appears to obey classical laws of physics. This is not the entire picture though; subatomic systems in particular obey a completely different set of principles, many of which have unexpected consequences. The subatomic world is the realm of quantum mechanics, to which this course is designed as an introduction.

When and where: This class is comprised of three weekly lectures. Lectures are every Monday, Wednesday and Friday mornings, 11:00-11:50am, in 218 Physics.

Who: My name is Prof. Christopher Neu, and I will be your lecturer. Mx. xxxxxxxxxx xxx will be the grader for the class (TBA).

My contact information:

Prof. Christopher Neu
119 High Energy Physics Building
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434-243-8490
go: cneu34
AIM: chrisneu1234

Email is my preferred method of communication. I will hold office hours in 312B Physics every Monday and Wednesday immediately after lecture for an hour. Note that my actual daily office is in a different building than the one in which lecture and office hours take place. Keep that in mind when looking for me. Additional office hours can be made by appointment - just contact me via email.
I am often available through Google Chat and AIM. Green status means I am available to be asked questions. I cannot guarantee a rapid response but there is a good chance I will be able to give you some guidance. Office hours are really the best place to hash out deep questions.

The material of this class will be challenging. If you find yourself struggling come see me during office hours or contact me through some other means. I want to help you succeed in this class; seek me out if you are in need of help.

Other important notes:

Textbook: *Introduction to Quantum Mechanics*, 2nd Ed., by David Griffiths. Lectures will follow the material in the text closely, and most homework assignments will be assigned from the in-text exercises. Other texts are available in the Physics Library if you would like additional resources.

Grading:

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<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Homework</td>
<td>20%</td>
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<tr>
<td>Presentation + paper</td>
<td>10%</td>
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<tr>
<td>In-term Exams (2)</td>
<td>40%</td>
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<td>Final Exam</td>
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Homework: Weekly problem sets will be assigned through the course web site every Friday and will be due the following Friday in class. The homework will attempt to span the material that is covered that week in lecture, although I reserve the right to bounce around a bit.

You are allowed to work together with other members of this class. But the work you turn in must be your own. Copying verbatim or nearly verbatim others’ responses to homework problems constitutes cheating, see below.

A request for an extension of any homework deadline must be received at least a week before it is due and must be accompanied by a credible reason.

Presentation and paper: Each student is expected to prepare a paper and presentation for the class on a topic of their choosing. The topic must, obviously, be related to the material of this course.

Below are 28 topics. Each student will choose one of these topics; additional topics can be suggested but such a topic must be approved by me in advance and must not overlap with one of the ones already on the list.

- Quantum mechanics and black holes
- Quantum mechanics at work in our sun
- The problem(s) with theories of quantum gravity
- Aspect, Grangier and Roger’s tests of Bell’s inequality
As scientists, we need to be capable of understanding and analyzing the phenomena of the world around us. But we also need to be able to capably communicate that understanding to others. This is a chance for you to hone that skill.

If you need help choosing a topic, come see me. Topics must be chosen and submitted and approved by me by February 3.

For the paper, there is no minimum page number requirement. Papers will need to convey the main points of the topic you are covering, and you can determine what the necessary length is to accomplish that goal. To keep things manageable there is a maximum page length of 15 pages. Papers must be submitted in one of these electronic formats: .pdf, .doc, .ps. If these
formats are unfamiliar to you, come see me and we can discuss. No hard copies are necessary, in fact none will be accepted. Please use double spacing and standard page margin definitions. The presentation will be in class to me and your fellow students. A strict time limit for each talk will be enforced: 12 minutes + 3 minutes for questions. The talk should be prepared in electronic format (for example, PowerPoint, .ppt). If this software is unfamiliar to you, come see me and we can discuss.

Time will be available for student presentations every Friday starting February 5. A schedule is available from me. My recommendation is to schedule your presentation early in the semester rather than waiting until the end. That allows you to get it out of the way under less pressure. Scheduling must also be completed by February 3.

Submission of the paper and presentation files will be expected on the day of the presentation. You will be graded on the clarity, quality and accuracy of the presentation and paper. See the attached rubric for a guide to expectations on the paper and presentation. Additionally, extra consideration will be given to those who give thought to others’ presentations and ask questions to them in class. These projects are designed to be done by individuals, collaboration is not allowed here.

**Exams:** There will be two in-term exams and one final exam in this class:

- Exam I: Wednesday 24 February 2010
- Exam II: Wednesday 7 April 2010
- Final Exam: Saturday 8 May 2010 – 9:00am - noon

All exams will be held in our classroom, 218 Physics. Exam I and II will be during normal class meeting time. Requests to reschedule any exam must be made at least 2 weeks in advance and will only be granted in extreme circumstances.

**Honor code:** Do not cheat on homework, presentations and exams. It is quite easy to cheat in this class. Similarly it is often pretty easy for me and the grader to tell when you are cheating. Don’t do it. You might feel like it is a great benefit to you to copy someone else’s solution, or to obtain the solutions from some available source, or some other sort of scheme I may or may not be aware of. By cheating you are only shortchanging yourself and your education. An honest, earned B- is far better than a stolen, dishonest B+.

If I suspect or discover any of you are cheating the details of the Honor Code will be invoked and your future here at UVa will be in jeopardy.

Success in this course is possible for every single student through being diligent, working thoughtfully and seeking help when one needs it. Arriving at success through dishonest means will not be tolerated.