PHY334 – Quantum Physics 2 Fall 2011

Course description

This course builds on the material learned in PHY234 with topics including:


- Most lectures will be delivered using chalk or whiteboard. Some additional material will be conveyed using Powerpoint. Problem sets, solutions, article templates, and some additional material will be made available through the UW ACE environment.

From the UW course calendar:
Prereq: PHYS 234 or CHEM 256/356; MATH 228 or AMATH 250; MATH 227 or 237 or 247.
Antireq: AMATH 373

Contact information

Instructor: Kevin Resch, Office: RAC 2102, email: kresch@uwaterloo.ca, phone: x38205. Office hours: Wed 4-5 in PHY211. I can be available outside of office hours upon request at the RAC building.

Teaching Assistant: TBA

Resources


Other good references: Quantum Physics, S. Gasiorowicz; Quantum mechanics volumes 1 and 2, C. Cohen-Tannoudji.

Students should also consider obtaining a copy of Maple (for computer algebra and solving integrals) and WinEdt (for writing using LaTeX).

Course topics

Topics covered:

1. Postulates of quantum mechanics, Review of Schroedinger Equation and some 1D problems
2. Review of linear algebra
3. Harmonic Oscillator with ladder operators
4. 2D harmonic oscillator and angular momentum
5. Time-independent perturbation theory
6. Degenerate perturbation theory
7. The variational principle
8. Schroedinger equation in 3D, central potentials
9. Hydrogenic atoms, 3D angular momentum
10. Spin, spin-1/2 in magnetic field
11. Addition of angular momentum, Clebsch-Gordon coefficients
12. Fine structure
13. Zeeman effect
14. Additional related topics

*Student assessment*

**Assessment**: Course grades will be determined as the greater of the following marking schemes:

Marking Scheme 1: Problem sets: 25%, Midterm test: 25%, Final exam: 50%
Marking Scheme 2: Problem sets: 25%, Midterm test: 0%, Final exam: 75%
Bonus (which can be applied to either scheme): Article: 5%

**Policy on Assignments**: Assignments are due at the beginning of class. Grades for late assignments can be handed in for up to 50% credit until the solutions are posted online. Solutions to problem sets will be posted no sooner than 1 week after the submission date.

**Policy on Articles**: Articles will be due at the beginning of class on December 2, 2011. No late articles will be accepted.

**Policy on missed Midterms or Exams**: Missed midterms or exams will result in a grade of 0%.

**Special cases**: Accommodations for missed exams or assignments will be considered only with verified Verification of Illness Forms (VIF).

**Article brief description**: Select an advanced topic in quantum mechanics not covered in PHY334 to serve as the topic for an article. Suitable topics can be found in high-level textbooks or through scientific journal articles. **All topic selections must be approved by the instructor**. Every article should have at least one equation and one figure. The article should aim to explain this topic to your colleagues, third year physics students halfway through a second course in quantum mechanics. Articles are to be four pages long in the Physical Review Letters style. The articles must be written using LaTeX using the template on the course website. MSWord, or other typesetting program, submissions or submissions not adhering to the template will not be accepted.

Tentative dates: Midterm: Wednesday October 26 in class, Final: TBA, Articles due Dec 2, 2011 in class.

For a more complete fall schedule, including drop dates, go to
http://www.quest.uwaterloo.ca/undergraduate/dates.html

**Statement for students with disabilities**

Note for students with disabilities: The Office for Persons with Disabilities (OPD), located in Needles Hall, Room 1132, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic
accommodations to lessen the impact of your disability, please register with the OPD at the beginning of each academic term.

**Statement regarding travel and the final examination period**

Student travel plans are not considered acceptable grounds for granting an alternative examination time. Start checking toward the end of October for the exam schedule.

**Expectation of Academic Integrity**

*Academic Integrity:* In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility.

*Note on avoidance of academic offences:* All students registered in the courses of the Faculty of Science are expected to know what constitutes academic integrity, to avoid committing academic offences, and to take responsibility for their actions. When the commission of an offence is established, disciplinary penalties will be imposed in accord with Policy #71 (Student Discipline). For information on categories of offences and types of penalties, students are directed to consult Policy #71 (http://wwwadm.uwaterloo.ca/infosec/Policies/policy71.htm). If you need help in learning what constitutes an academic offence; how to avoid offences such as plagiarism, cheating, and unauthorized resubmission of work; how to follow appropriate rules with respect to “group work” and collaboration; or if you need clarification of aspects of the discipline policy, ask your TA and/or your course instructor for guidance. Other resources regarding the discipline policy are your academic advisor and the Undergraduate Associate Dean.

Specific to PHY334: Students are encouraged to discuss assignment problems with their peers, but must write up their own solutions. Copying or reusing old assignment solutions constitute a breach of academic integrity.

**Plagiarism Detection Software**

Plagiarism detection software (Turnitin) will be used to screen assignments in this course. This is being done to verify that use of all materials and sources in assignments is documented. Students will be given an option if they do not want to have their assignment screened by Turnitin. In the first week of the term, details will be provided about arrangements and alternatives for the use of Turnitin in this course.

**Student Grievances**

Students who believe that they have been wrongfully or unjustly penalized have the right to grieve; refer to Policy #70, Student Petitions and Grievances, http://wwwadm.uwaterloo.ca/infosec/Policies/policy70.htm.”

**Student Appeals**

Concerning a decision made under Policy 33 (Ethical Behaviour), Policy 70 (Student Petitions and Grievances) or Policy 71 (Student Discipline), a student may appeal the finding, the penalty, or both. Students who believe that they have grounds for an appeal should refer to Policy 72 (Student Appeals) http://wwwadm.uwaterloo.ca/infosec/Policies/policy72.htm.