PHYS 2210: Quantum Physics I

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This Spring 2020 4-credit course consists of 14 weeks of lectures (each lecture will last 110 minute) scheduled each Tuesday/Friday at 10 am (Room: J-Rowl 2C13). Final grades will be calculated as an average of grades from homework assignments, in-class assignments and exams, as explained below. Rensselaer integrity rules strictly apply to this course.

This course operates under a strict electronics free rule (with the sole exception of accessibility-related needs). Students who want to send texts, browse their favorite sites, or listen to music are expected to do so outside the classroom.

In the event that the campus is temporarily closed due to a covid-19 outbreak, course instruction will be held online. Lectures will be provided via Zoom or Skype. Assignments will be turned in electronically (using pdfs) and office hours will be hosted online via Zoom or Skype.

1 Office hours

3 office hours will be available each week.

- Instructor: Tuesdays at 1pm or by appointment (CII 4137)
- Teaching Assistant: Leaf Swordy (swordl@rpi.edu), office hours: HBH J-Rowl, Wednesday, 12-1pm
- Classroom Facilitators:
  - Zuzanna Jedlinska (jedliz@rpi.edu), office hours: Resnick's room J-Rowl, Wednesday, 2-3pm
  - Angela Mehta (mehtaa6@rpi.edu), office hours: HBH J-Rowl, Wednesday, 3:30-5:30 pm
- In the event lectures are held online, office hours will be held via Skype or Zoom. Details TBA.

2 Reference Materials

The course will closely follow Quantum Physics: A Fundamental Approach to Modern Physics by John S. Townsend, First Edition. University Science books. LMS will be the main means for information sharing (including all homework submission). Information will also be posted to https://github.com/phys2210-quantum/phys2210_spring2020.

3 Prerequisites

Required coursework: PHYS 1200 (Physics II) or PHYS 1250 (Honors Physics II). MATH 1020 (Calculus II). Please see me if you have concerns about this.

4 Assignments and Grading

Attendance: **Attending classes is required.**
In-class assignments: Students will use a loose leaf notebook to do the in-class assignments and hand them in after each class.
Exams: Three exams will be organized. Students will be tested on their ability to solve problems similar to the ones covered in class and in homework assignments. Students will be allowed to use a one-sided crib sheet.
Homework: No late homework. Homework must reflect the student's own ability and effort. Discussions with classmates and TAs are encouraged. Work copied from the solution book or similar resources will not be graded.

- Homework assignments: 10% (see schedule for due dates)
- In-class problems: 20% (due at the end of each class)
- Exam-1: 20% (03/06/2020, class time)
- Exam-2: 20% (03/31/2020, class time)
- Final exam: 30% (04/28/2020, class time)

5 Syllabus

A list of the topics to be covered is presented below. See the class schedule for details.

1. Math Background I
2. Math background II
3. Wave nature of light
4. Particle nature of light
5. Wave nature of matter
6. Schrodinger Equation
7. Wave packets
8. Expectation values
9. Particle in a box
10. Functional vector space
11. Energy eigenvalue problems
12. Simple harmonic oscillators
13. Finite potential wells
14. Scattering from stepped potentials
15. Quantum tunneling
16. Quantum postulates
17. Commutation relationships
18. 3D problems
19. Angular momentum
20. Spherical harmonics
21. Hydrogen atom
22. Zeeman effect
23. Intrinsic spins
24. More on quantum mechanics

6 Academic Integrity Policy

Students taking courses at Rensselaer have a right to expect that their work will be evaluated fairly with respect to other students. They have a right to expect that other students will not attempt to enhance their own grades or the grades of their friends by cheating. Professors have a right to expect that their students are honest and submit work reflecting their own efforts. In an atmosphere of academic integrity, students and professors are on the same team trying to achieve the same learning objectives. If you attempt to cheat, you are placing yourself in a position where you are at odds with your professors and the vast majority of your fellow students. Academic dishonesty is a serious offense and we will treat it accordingly.

Students are expected to actively participate in a collaborative group when working on the in-class activity. You can obtain help from other students in the class when you are working on your project. However, the final product must be your own. Turning in work that is not your own will result in an F for the course and a letter will be sent to the Dean of Students.

Cheating in any of the graded activities in this course will result in an F for the course.