

## PHY 390: Introduction to Quantum Mechanics

Gustavus Adolphus College, Fall Semester 2016

**Instructor:** Dr. Daniel Young

**Office/Office Hours:** Olin Hall 212, T/W/R 1-3pm

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### Textbooks:

**Required** -- *A Modern Approach to Quantum Mechanics, Second Edition*, by John S. Townsend

**Highly Recommended** -- *Introduction to Quantum Mechanics, Second Edition*, by David J. Griffiths (for those who would like more of a conceptual explanation and more sample problems)

**Highly Recommended** -- *Modern Quantum Mechanics, Revised Edition*, by J.J. Sakurai (the graduate quantum text, for those who find the mathematical rigor of Townsend lacking)

Your homework problems will come from the required text (Townsend) although I may pick out an occasional problem or two from the recommended ones which I will write out fully for you.

### Course Policy and Evaluation:

1. **Course Goals and Expectations:** You will gain a working knowledge of Dirac notation and Hilbert spaces and will be able to use these mathematical tools to give quantum descriptions of standard single and multi-particle systems. This is a senior-level course and as such, I expect that you will have an understanding of requisite mathematical methods such as solving simple ordinary/partial differential equations, performing multi-variable integration, and manipulating linear algebraic matrices. We will develop other mathematical methods (such as Green's functions and complex integration) as the course permits.
2. **Class Meetings and Reading Assignments:** This class will meet five days a week from 9:00 to 9:50 in Olin Hall 220 for lecture, small-group problem solving, homework review, and exams. When reading assignments are made for a class session, the reading is expected to be completed **before** coming to class. As this is an accelerated course, we will cover approximately one chapter per week (skipping the chapter on path integrals) and will strive to finish with the chapter on identical particles and the helium atom. If we have extra days at the end, we will discuss some graduate topics such as time-dependent perturbation theory and quantizing the electromagnetic field.
3. **Moodle:** Everything we do in this course (lecture notes, assignments, solutions, and grades) I will post on Moodle. You are responsible for periodically checking your grades and informing me of any discrepancies.

4. **Homework:** Homework problems will be assigned according to chapters in the textbook and are due at the beginning of class on the date listed on the homework assignment. Homework will be assigned approximately weekly depending on the pace of lecture. Late homework may be accepted at the discretion of the instructor with a reduction in credit.

**Homework assignments MUST be turned in on paper that contains no “fringes” with your name, homework label, solution method, and answer clearly marked.** The choice of paper to use is up to you though I would highly encourage you to use standard, unlined printer paper. Most importantly, I must be able to clearly see your thought process when you are explaining your solutions as often more than one mechanism will be able to be used to solve a problem and I would like to highlight unique solutions in class.

Homework assignments will be tailored to the proficiency and efficacy of the class. Expect that if the entirety of the class is doing very well that you will begin to see a spattering of graduate level problems. Homework assignments will typically contain a “challenge problem” that will be worth 20/10 points and allow for a potential 110/100 score. These challenge problems will be more open ended and will ask you to think outside the box a bit more than the rote mathematical problems.

5. **Group Problems:** Frequently in class (usually every Friday, lecture permitting), students will work together in groups of 2-3 members to cooperatively solve problems. A group solution will be submitted with all group members receiving the same grade. Make-ups for group problems missed due to absence will be handled individually at the discretion of the instructor.
6. **Exams:** There will be three in-class hour exams (after approximately every three chapters) and two take-home exams (exam four and the final exam). Students must arrange in advance to take the in-class exams other than during the scheduled time and may do so only for a valid health or school-related reason (such as an athletic competition). Exams missed without pre-arrangement are entered as a zero and cannot be made up.
7. **Evaluation:**
  - a. Homework: 25%
  - b. Group Problems: 15%
  - c. Hour Exams: 10% each
  - d. Final Exam: 20%

Assignment of final letter grades will be based on the following subjective guidelines:

A = 94-100%	A- = 90-94%	
B+ = 86-90%	B = 82-86%	B- = 78-82%
C+ = 74-78%	C = 70-74%	C- = 66-70%
D+ = 62-66%	D = 58-62%	F = 0-58%

8. **Attendance:** Regular attendance at all class meetings is expected although not mandatory. Students will be held responsible for informing themselves of all announcements/assignments made in class.
9. **Incompletes:** A grade of incomplete will only be given for work not completed due to circumstances beyond the control of the student (this is the policy of the college).
10. **Academic Honesty:** Having signed and agreed to abide by the College's Honor Code, students thereby pledge that in all academic exercises, examinations, papers, and reports, they shall submit their own work. Footnotes or some other acceptable form of citation must accompany any use of another's words or ideas. In the context of this course, students are expected to collaborate and to discuss their out-of-class assignments. However, submitting under one's own name work that is merely copied from another (or from a solution set) is a violation of the Honor Code. The full text of the Gustavus Academic Honor Code Policy may be found at:

[http://gustavus.edu/general\\_catalog/current/acainfo](http://gustavus.edu/general_catalog/current/acainfo)

If the timing and situation permit, you may be offered an exam as a take-home exam. The Gustavus Honor Code Policy applies to these exams and you will sign a statement to that effect before submitting your solutions.

11. **Disability Services:** Gustavus Adolphus College is committed to ensuring the full participation of all students in its programs. If you have a documented disability (or you think you may have a disability of any nature) and, as a result, need reasonable academic accommodation to participate in class, take tests or benefit from the College's services, then you should speak with the Disability Services staff, for a confidential discussion of your needs and appropriate plans. Course requirements cannot be waived, but reasonable accommodations may be provided based on disability documentation and course outcomes. Accommodations cannot be made retroactively; therefore, to maximize your academic success at Gustavus, please contact Disability Services as early as possible. Disability Services ([www.gustavus.edu/advising/disability/](http://www.gustavus.edu/advising/disability/)) is located in the Academic Support Center.
12. **Help for Students Whose First Language is not English:** Support for English learners and multilingual students is available through the Academic Support Center's English Learning Specialist ([www.gustavus.edu/advising/](http://www.gustavus.edu/advising/)). The ELS can meet individually with students for tutoring in writing, consulting about academic tasks, and helping students connect with the College's support systems. When requested, the ELS can consult with faculty regarding effective classroom strategies for English learners and multilingual students. The ELS can provide students with a letter to a professor that explains and supports appropriate academic arrangements (e.g., additional time on tests, additional revisions for papers). Professors make decisions based on those recommendations at their own discretion. In addition, English learners and multilingual students can seek help from peer tutors in the Writing Center ([www.gustavus.edu/writingcenter/](http://www.gustavus.edu/writingcenter/)).