PHSX 462: Quantum Mechanics II Spring 2020

PROFESSOR:	Dr. Alex Bulmahn
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LECTURE:	MWF 12-12:50 pm, Charles H. Clapp Building 231
OFFICE HOURS:	M 10-11, T 10-12, W 10-11, F 11-12, and by appointment
TEXTBOOK:	*Introduction to Quantum Mechanics, 2nd Edition* David J. Griffiths
PREREQUISITE:	PHSX 461

Overview

This course will cover advanced topics in quantum mechanics, introducing approximate methods needed to analyze real systems. Topics include non-degenerate, degenerate, and time dependent perturbation theory, multi-particle systems, interactions of light with matter, and an introduction to relativistic quantum mechanics.

Learning Objectives

Upon completion of this course you should have gained and understanding of:

- the formalism of time independent perturbation theory and how it applies to physical systems such as the hydrogen atom.
- the formalism of time dependent perturbation theory and how it applies to physical situations such as the interaction of light with atoms.
- multi-particle systems such as atoms, solids, and degenerate stars.
- the usefulness of the variational principle as an approximation method.

Grading

Your grade for the course will be based on weekly homework assignments, two in-class midterm exams, and a final exam. **Homework is due at the end of the day on the due date and late homework will be penalized 10% per day late (not including weekends and holidays). Make up exams will only be given in extreme circumstances.** The grading for the course will be broken down as follows:

Homework:	30%
Midterm Exams:	20% each (40% total)
Final Exam:	30%

This course can only be taken with the traditional grading option. The letter grades in this course will be based on a curve, giving you the grade that you earn. The curve will be determined by the performance of the class as a whole, but I do not have a set number of A's, B's, etc. predetermined. *Note: the last day to drop the course via Cyberbear is February 3rd. The last day to drop the course without the Dean's signature is March 24th.*

Course Guidelines and Policies

Student Conduct Code

The Student Conduct Code at the University of Montana embodies and promotes honesty, integrity, accountability, rights, and responsibilities associated with constructive citizenship in our academic community. This Code describes expected standards of behavior for all students, including academic conduct and general conduct, and it outlines students' rights, responsibilities, and the campus processes for adjudicating alleged violations. Full student conduct code.
(http://www.umt.edu/vpsa/policies/student_conduct.php)

Disability Modifications

The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students. https://www.umt.edu/dss/default.php If you think you may have a disability adversely affecting your academic performance, and you have not already registered with Disability Services, please contact Disability Services in Lommasson Center 154 or call 406.243.2243. I will work with you and Disability Services to provide an appropriate modification.

Tentative Schedule

Week	Dates	Topic	Reading and Notes
1	1/13—17	Non-degenerate Perturbation Theory	7.1
2	1/20—24	Degenerate Perturbation Theory	7.2
3	1/27—31	Applications of Degenerate Perturbation Theory, The Stark Effect	7.2
4	2/3—7	Addition of Angular Momentum, The Real Hydrogen Atom	4.4.3, 7.3
5	2/10—14	Zeeman Effect, Hyperfine Splitting	7.4, 7.5
6	2/17—21	Two-Particle Systems	5.1 **Midterm Exam #1**
7	2/24—28	Atoms	5.2
8	3/2—6	Solids	5.3
9	3/9—13	Variational Principle and Helium	8.1, 8.2
10	3/16—20	**SPRING BREAK**	Relax and Recharge
11	3/23—27	Time Dependent Perturbation Theory	11.1
12	3/30—4/3	Time Dependent Perturbation Theory	11.1 **Midterm Exam #2**
13	4/6—10	Emission and Absorption	11.2
14	4/13—17	Spontaneous Emission, Lasers	11.3
15	4/20—24	TBA	
16	4/27—5/1	TBA	
17	5/4—8	**Finals Week** **Final Exam 10:10-12:10 pm, Tuesday 5/5**	