

Physics 472 - 2020

Quantum Mechanics

Monday, Wednesday, Friday, 12:40 - 1:30 pm, 1420 BPS

Instructor: Mark Dykman, BPS 4244
e-mail: dykmanm@msu.edu
Office hours: 2:30 to 4:30 Tuesday

Grader: Tang, Tianxudong
Office hours: to be determined

Required Textbook: David J. Griffiths, *Introduction to Quantum Mechanics*,
Second Edition (Pearson Education)

Optional textbook: L.D. Landau and E.M. Lifshitz, *Quantum mechanics:
non-relativistic theory* (Pergamon, NY 1977).

Grading Scheme:

weekly problem sets	—	15%
weekly quizzes	—	25%
midterm exam	—	25%
final exam	—	35%.

Final grade will be calculated from the sum of the appropriately weighted percentage for each category.

Homework assignments will be given on Wednesdays and are due a week from the day they are given. There will be weekly 10 minute-long closed-book **one-problem quizzes** at the beginning of a class. At a quiz you will have to solve a problem that you would have seen before either in class or in a home assignment.

Midterm Exam: February 24.

Final exam: April 27, 12:45 - 2:45 pm, rm 1420 BPS. There will be an extended review on the weekend before the exam.

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This is a hard class. We will see how spatial symmetry and the symmetry with respect to interchanging particles are manifested in major features of quantum dynamics, how atoms are organized, how perturbation theory allows us to solve problems that cannot be solved exactly, including relativistic effects, how radiation is emitted and absorbed, and learn about topics of current interest that include quantum computing.

Tentative Schedule

Month	Day	Topic	Chapters
Jan	6 – 10	The angular momentum	4.3
Jan	13 – 24	Spin	4.4
Jan	27 – 31	Identical particles	5.1
Feb	3 – 7	Atoms	5.2
Feb	10 – 14	Nondegenerate perturbation theory	6.1
Feb	17 – 24	Review and Midterm Exam	
Feb	26 – 28	Degenerate perturbation theory	6.2
Mar	3 – 8	Spring break	
Mar	9 – 16	Spin-orbit coupling. The Zeeman effect	6.3.2, 6.4
Mar	18 – 23	Hyperfine splitting. The Stark effect	6.5
Mar	25 – 30	The variational principle. Tunneling	7.1, 7.2, 8.2
Apr	1 – 8	Time-dependent perturbation theory	9.1, 9.2
Apr	10 – 17	Scattering	11
Apr	20 – 24	The Berry Phase. Quantum computing	10.2
April	27	Final Exam	