

PHYS 225 A, Winter 2017: Introduction To Quantum Mechanics

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MWF 9:30-10:30, PAA A118

Instructor: [Jason Detwiler](#) (<http://faculty.washington.edu/jasondet>) (jasondet@uw.edu) (<mailto:jasondet@uw.edu>)

Office: PAB B444

Office hours: Mondays 12:00-1:30, PAB B444

TAs: [Stephen French](mailto:steve9@uw.edu) (<mailto:steve9@uw.edu>), [Josh Kahn](mailto:jmk47@uw.edu) (<mailto:jmk47@uw.edu>), [Dianqi Li](mailto:dianqili@uw.edu) (<mailto:dianqili@uw.edu>), [Francis Walsh](mailto:fwalsh2@uw.edu) (<mailto:fwalsh2@uw.edu>), [Tong Wan](mailto:tongwan@uw.edu) (<mailto:tongwan@uw.edu>), [Dake Zhou](mailto:zdk@uw.edu) (<mailto:zdk@uw.edu>)

Office hours:

Tuesdays 1:30-2:30, PAB B205 (Josh Kahn)

Wednesdays 2:30-3:30, PAB B231 (Dake Zhou)

Thursdays 1:30-2:30, PAB B149 (Francis Walsh)

This course is an introduction to quantum mechanics. It will focus primarily on two-state systems because they are the simplest quantum systems that exhibit the quantum behavior that distinguishes quantum mechanics from classical mechanics.

Course goals:

- Introduce you to the main features and calculations of quantum mechanics.
- Prepare you for PHYS 324 (and to a lesser extent for PHYS 226).
- Improve your ability to understand current physics in the news by laying a conceptual and mathematical foundation for understanding quantum behavior.

Textbook:

The textbook for this course is a special UW paperback set of selected chapters from David McIntyre's Quantum Physics, Pearson, 2012. Additional materials, including additional pages from McIntyre, will be posted as needed.

Learning Catalytics:

In-class questions (clickers) will use the [Learning Catalytics](https://learningcatalytics.com) (<https://learningcatalytics.com>) web-based system, so please purchase access if you don't already have it. Access codes for each lecture's Learning Catalytics session will be given during lecture. You will need to bring to class a smartphone, tablet, or laptop with web access. If you do not have such a device, you may borrow one from student services, contact Professor Detwiler for more information.

Grading:

Your course grade will be computed from the following elements:





















- Two midterm exams: 22% each
- Final exam: 28%
- Six homework assignments: 12%
- Pre-lecture quizzes, surveys, and other online assignments: 8%
- In-class assignments (such as clicker questions and worksheets): 8%























For the last two items (In Class and Online) 80% of your score is based on completeness / participation, while the remaining 20% is based on correctness.














Homework Policy:

Homework is due at the start of class on the assigned due date. You may turn it in at the end of that class period with a 25% penalty. Except for HW2, you may turn in your homework by the end of the following lecture with a 50% penalty, at which time solutions will be posted, so no further extensions are possible. HW2 solutions need to be posted on the HW2 due date for use as a study guide for Exam 1 so no extensions are possible for HW2. You may turn your homework in early to Prof. Detwiler's department mailbox at any time up to 15 minutes before the start of the lecture during which it is due.

Course Summary:

Date	Details	
Wed Jan 4, 2017	 Lecture 1: Classical Spin (Worksheet 1) (https://canvas.uw.edu/calendar?event_id=969431&include_contexts=course_1102295)	9:30am to 10:20am
Fri Jan 6, 2017	 Lecture 2: The Stern-Gerlach Experiment and Theory (https://canvas.uw.edu/calendar?event_id=969442&include_contexts=course_1102295)	9:30am to 10:20am
	 Office Hours Survey (https://canvas.uw.edu/courses/1102295/assignments/3558064)	due by 9:30am
	 Pre-Lecture 1: Stern-Gerlach Simulation (https://canvas.uw.edu/courses/1102295/assignments/3562162)	due by 9:30am
Mon Jan 9, 2017	 Lecture 3: Dirac Notation (Worksheet 2) (https://canvas.uw.edu/calendar?event_id=969453&include_contexts=course_1102295)	9:30am to 10:20am
	 Pre-Lecture 2: Vectors (https://canvas.uw.edu/courses/1102295/assignments/3562163)	due by 9:30am
Wed Jan 11, 2017	 Lecture 4: Quantum States (https://canvas.uw.edu/calendar?event_id=969432&include_contexts=course_1102295)	9:30am to 10:20am
	 Pre-lecture 3: quantum state vectors (https://canvas.uw.edu/courses/1102295/assignments/3572488)	due by 9:30am
Fri Jan 13, 2017	 Lecture 5: Quantum States, Continued (https://canvas.uw.edu/calendar?event_id=969455&include_contexts=course_1102295)	9:30am to 10:20am
	 Pre-lecture 4 (https://canvas.uw.edu/courses/1102295/assignments/3576422)	due by 9:30am
Wed Jan 18, 2017	 Lecture 6: Quantum Measurement (https://canvas.uw.edu/calendar?event_id=969443&include_contexts=course_1102295)	9:30am to 10:20am
	 Homework 1 (https://canvas.uw.edu/courses/1102295/assignments/3554147)	due by 9:30am
	 Pre-Lecture 5: Operators, Matrices, Eigenvalues, and Eigenvectors (https://canvas.uw.edu/courses/1102295/assignments/3580645)	due by 9:30am
Fri Jan 20, 2017	 Lecture 7: Expectation Values and Uncertainty (https://canvas.uw.edu/calendar?event_id=969433&include_contexts=course_1102295)	9:30am to 10:20am
	 Pre-Lecture 6: Expectation Values and Uncertainty (https://canvas.uw.edu/courses/1102295/assignments/3582338)	due by 9:30am
Mon Jan 23, 2017	 Lecture 8: Higher Spin; Review (https://canvas.uw.edu/calendar?event_id=969444&include_contexts=course_1102295)	9:30am to 10:20am
	 Homework 2 (https://canvas.uw.edu/courses/1102295/assignments/3554168)	due by 9:30am
	 Pre-Lecture 7 (https://canvas.uw.edu/courses/1102295/assignments/3584221)	due by 9:30am
Wed Jan 25, 2017	 Midterm Exam 1 (https://canvas.uw.edu/calendar?event_id=969434&include_contexts=course_1102295)	9:30am to 10:20am
Fri Jan 27, 2017	 Lecture 9: Quantum Computing (https://canvas.uw.edu/calendar?event_id=969445&include_contexts=course_1102295)	9:30am to 10:20am

Date	Details
	 Pre-Lecture for Lecture 9: Quantum Computing (https://canvas.uw.edu/courses/1102295/assignments/3589683) due by 9:30am
Mon Jan 30, 2017	 Lecture 10: Quantum Teleportation (https://canvas.uw.edu/calendar?event_id=969456&include_contexts=course_1102295) 9:30am to 10:20am
Wed Feb 1, 2017	 Lecture 11: Quantum Cryptography (https://canvas.uw.edu/calendar?event_id=969435&include_contexts=course_1102295) 12:30pm to 1:20pm
Fri Feb 3, 2017	 Lecture 12: Quantum Interference (Worksheet 3) (https://canvas.uw.edu/calendar?event_id=969460&include_contexts=course_1102295) 9:30am to 10:20am  Homework 3 (https://canvas.uw.edu/courses/1102295/assignments/3554172) due by 9:30am
Wed Feb 8, 2017	 Lecture 13: Quantum Cryptography; The EPR Paradox (https://canvas.uw.edu/calendar?event_id=969439&include_contexts=course_1102295) 6:30am to 7:20am  Pre-Lecture for Lecture 13: EPR Paradox (https://canvas.uw.edu/courses/1102295/assignments/3598223) due by 9:30am
Fri Feb 10, 2017	 Lecture 14: Time Evolution (https://canvas.uw.edu/calendar?event_id=969446&include_contexts=course_1102295) 9:30am to 10:20am
Mon Feb 13, 2017	 Lecture 15: Spin Precession and Time Evolution (Worksheet 4) (https://canvas.uw.edu/calendar?event_id=969457&include_contexts=course_1102295) 9:30am to 10:20am  Pre-lecture for lecture 15 (https://canvas.uw.edu/courses/1102295/assignments/3604019) due by 9:30am
Wed Feb 15, 2017	 Lecture 16: Review (https://canvas.uw.edu/calendar?event_id=969447&include_contexts=course_1102295) 9:30am to 10:20am  Homework 4 (https://canvas.uw.edu/courses/1102295/assignments/3554252) due by 9:30am  Pre-lecture for lecture 16 (do not publish) (https://canvas.uw.edu/courses/1102295/assignments/3604325) due by 9:30am
Fri Feb 17, 2017	 Midterm Exam 2 (https://canvas.uw.edu/calendar?event_id=969458&include_contexts=course_1102295) 9:30am to 10:20am
Wed Feb 22, 2017	 Lecture 17: Neutrino Oscillation (https://canvas.uw.edu/calendar?event_id=969436&include_contexts=course_1102295) 9:30am to 10:20am
Fri Feb 24, 2017	 Lecture 18: Ehrenfest's theorem; Position and Momentum Space (https://canvas.uw.edu/calendar?event_id=969437&include_contexts=course_1102295) 9:30am to 10:20am  Pre-Lecture Assignment for Lecture 18: Ehrenfest's Theorem; Position and Momentum Space (https://canvas.uw.edu/courses/1102295/assignments/3613479) due by 9:30am
Mon Feb 27, 2017	 Lecture 19: Wavefunctions (https://canvas.uw.edu/calendar?event_id=969448&include_contexts=course_1102295) 9:30am to 10:20am  Pre-Lecture Assignment for Lecture 19: Wavefuctions (https://canvas.uw.edu/courses/1102295/assignments/3616844) due by 9:30am
Wed Mar 1, 2017	 Lecture 20: Infinite Square Well (https://canvas.uw.edu/calendar?event_id=969438&include_contexts=course_1102295) 9:30am to 10:20am  Pre-lecture for lecture 20 (https://canvas.uw.edu/courses/1102295/assignments/3617009) due by 9:30am
Fri Mar 3, 2017	 Lecture 21: Finite Square Well (https://canvas.uw.edu/calendar?event_id=969450&include_contexts=course_1102295) 9:30am to 10:20am

Date	Details	
	 Homework 5 (https://canvas.uw.edu/courses/1102295/assignments/3554253)	due by 9:30am
	 Pre-lecture for lecture 21 (https://canvas.uw.edu/courses/1102295/assignments/3617048)	due by 9:30am
Mon Mar 6, 2017	 Lecture 22: Superpositions and Mixed States (Worksheet 5) (https://canvas.uw.edu/calendar?event_id=969449&include_contexts=course_1102295)	9:30am to 10:20am
	 Pre-lecture for lecture 22 (https://canvas.uw.edu/courses/1102295/assignments/3617071)	due by 9:30am
Wed Mar 8, 2017	 Lecture 23: Free Particles (https://canvas.uw.edu/calendar?event_id=969461&include_contexts=course_1102295)	9:30am to 10:20am
Fri Mar 10, 2017	 Lecture 24: Review (https://canvas.uw.edu/calendar?event_id=969440&include_contexts=course_1102295)	9:30am to 10:20am
	 Homework 6 (https://canvas.uw.edu/courses/1102295/assignments/3554254)	due by 9:30am
Wed Mar 15, 2017	 Final Exam (https://canvas.uw.edu/calendar?event_id=972537&include_contexts=course_1102295)	8:30am to 10:20am
Fri Mar 17, 2017	 Course Evaluation (https://canvas.uw.edu/courses/1102295/assignments/3631035)	due by 11:59pm
	 Final Exam (https://canvas.uw.edu/courses/1102295/assignments/3562190)	
	 Midterm Exam 1 (https://canvas.uw.edu/courses/1102295/assignments/3562186)	
	 Midterm Exam 2 (https://canvas.uw.edu/courses/1102295/assignments/3562188)	
	 Score from Learning Catalytics (https://canvas.uw.edu/courses/1102295/assignments/3562192)	