

Physics 336: Quantum Mechanics
TR 4:15 pm - 5:30 pm in room BBH 237
College of Arts & Sciences Syllabus

COURSE INFORMATION

Credit Hours: 3.000

Course Description: This course provides an introduction to Quantum Mechanics and is intended for physics majors/minors, and math or chemistry majors. The knowledge base covered is an essential foundation for students seeking to understand physical phenomenon at a microscopic level where particles are governed by the laws of quantum physics. The statistical formulation of quantum mechanics is introduced and the Schrodinger equation applied to problems in quantum mechanics including the hydrogen atom and many-particle systems.

Course Prerequisites: Undergraduate level PHYS 215 Minimum Grade of C

FACULTY INFORMATION

Instructor: Dr. Orin Harris

Office Location: BBH 217B

Office Hours: TR 10:45 am - 1:30 pm, or by appointment

Phone Extension: 5561

Email: O-Harris1@neiu.edu

COURSE MATERIALS

Required Text: *Introduction to Quantum Mechanics* by David J. Griffiths and Darrell F. Schroeter, 3rd Edition (Cambridge University Press 2018). ISBN-13: 978-1-107-18963-8
The 2nd edition of the text is also acceptable.

COURSE OBJECTIVES / STUDENT LEARNING OUTCOMES

This course will cover the 1st half of the text (Part I), covering the basic theory of quantum mechanics: the Schrödinger wave equation and Hilbert space formalism, applications to the square well, simple harmonic oscillator, electron spin, the hydrogen atom, and systems of identical particles. We will not cover the second half (Part II) of the book (typically taught in a second semester), which focuses on practical approximation methods of solving more complex problems, including scattering. This course will prepare you to find solutions to the Schrödinger equation, use those solutions to

find probabilities and expectation values of measurement outcomes as a function of time, to work with states in an abstract vector space and find eigenfunctions of hermitian operators, and to apply these concepts to atoms.

STUDENT TASKS / ASSIGNMENTS / REQUIREMENTS:

Assignments: Homework will be assigned each week on D2L and collected the same day the following week unless otherwise specified. Late homework will not be accepted. I cannot stop you from finding homework solutions online, but note that the purpose of the homework is good-natured: to help to you learn the material and prepare you for the exams. Credit for homework problems will only be given if you show your work, as well as draw illustrative diagrams when necessary to understand what the symbols you have written refer to. Further, units must be specified when giving numerical results, and points will be deducted for incorrect use of significant figures.

Grading Policies and Formulae:

Homework	25% of the total grade
Mid-term 1	25% of the total grade
Mid-term 2	25% of the total grade
Final Exam	25% of the total grade

Any student who achieves a percentile score of above 90%, 80%, 70%, 60% is guaranteed to receive an A, B, C, or D respectively. These percentile scores may be adjusted downwards based on a class curve and other considerations.

Tentative Course Schedule and weekly readings:

Week of Aug 26	... Review, history, the Schrödinger equation, and $\Psi(x, t)$	... Read 1.1-1.4
Week of Sep 2	..... Momentum, uncertainty	..... Read 1.5-1.6
Week of Sep 9	..... Stationary states, infinite square well	..... Read 2.1-2.2
Week of Sep 16	..... Harmonic Oscillator Schrödinger equation	..... Read 2.3
Week of Sep 23	..... Free particle, δ -functions, barriers and finite wells	..... Read 2.4-2.6
Week of Sep 30	..... Linear Algebra	..... Read Appendix
Week of Oct 7	..... Loose ends	..... Midterm 1
Week of Oct 14	..... Formalism, Hilbert space	..... Read 3.1-3.3
Week of Oct 21	..... Operators, observables, Dirac notation	..... Read 3.4-3.6
Week of Oct 28	..... QM in 3-D, separation of variables, angular equation	..... Read 4.1
Week of Nov 4	..... Loose ends	..... Midterm 2
Week of Nov 11	..... Hydrogen atom, radial equation	..... Read 4.2
Week of Nov 18	..... Angular Momentum	..... Read 4.3
Week of Nov 25	Spin and addition of angular momentum, Thanksgiving holiday	Read 4.4
Week of Dec 2	... Identicle Particles, multi-electron atoms, band structure	... Read 5.1-5.3
Week of Dec 9	.....	Final exam

COURSE POLICIES AND STATEMENTS

Reading: Reading assignments to be completed before each class will be posted on D2L. I expect you to have finished each reading assignment before lecture. The lecture is meant to be a supplement to the text, not a substitution for it.

Course communication: All pertinent class communications between the instructor and students is conducted exclusively through NEIU e-mail. Thus it is the responsibility of students to check their NEIU e-mail account for all significant information and updates on class cancellations in the event of threatening weather conditions.

I will send information weekly to D2L with updated reading assignments, homework, and associated due dates, and/or exam times.

Absence Policy: Lecture attendance will not be enforced but there will sometimes be graded in-class assignments, and we will sometimes cover material not in the textbook that will be covered in the exams.

Academic Integrity Policy: By enrolling in this course, you are bound by the NEIU Student Code of Conduct: <http://www.neiu.edu/university-life/student-rights-and-responsibilities/student-code-conduct> You will be informed by your instructor of any additional policy specific to your course regarding plagiarism, class disruptions, etc.: Plagiarism is forbidden. No headphones, cell phones being used, or other distractions in class.

ADA Statement: Northeastern Illinois University (NEIU) complies with the Americans with Disabilities Act (ADA) in making reasonable accommodations for qualified students with disabilities. To request accommodations, students with special needs should make arrangements with the Student Disability Services (SDS) office, located on the main campus in room D104. Contact SDS via (773) 442-4595 or <http://www.neiu.edu/university-life/student-disability-services>.

Campus Safety: Emergency Procedures and Safety Information can be found on NEIUport on the MyNEIU tab or as follows: http://homepages.neiu.edu/neiutemp/Emergency_Procedures/MainCampus/.

Incomplete Grade Policy: An Incomplete (“I”) grade is temporary and exceptional, and can be given only to students whose completed coursework has been qualitatively satisfactory but who have been unable to complete all course requirements because of illness or other circumstances beyond their control. An “I” grade is not to be awarded in place of a failing grade or when the student is expected to attend additional class meetings or to re-register to complete the course requirements. Additionally, an “I” grade is not a means for the student to raise his/her grade by doing additional work.

A request for an “I” grade must be made by the student to the faculty member before the last official day of the semester or term. The faculty member retains the right to make the final decision on granting a student’s request for an “I” providing the student meets the provisions above, even though the student may meet the eligibility requirements for this grade. Students have up to one semester, excluding summer, to complete the work.

It is the responsibility of the student to complete and submit the remaining coursework before the assigned deadline. The faculty member will submit a grade change converting the “I” to a letter grade by or before the last day of the semester in which the outstanding coursework is to be completed. If the student does not meet the deadline, the “I” will be converted automatically to a final grade of an “F.” Since the “I” grade is temporary, faculty may not issue a terminal “I” grade.

Upon receipt of the grade change, the Registrar Services Office will post the grade to the student’s record and recalculate the GPA. Although students have up to one semester, excluding summer, to complete the work to change the grade of Incomplete, the student’s academic standing will be reassessed only if the grade change is received by the Friday of the first full week of the semester immediately following the one in which the “I” grade was assigned.

Students will not be allowed to graduate with “I” grades on their records.