

Physics 456, Quantum Mechanics II
Winter Quarter, 2018

Location: CF 314, **Time:** Mon-Wed-Fri 2:00-2:50

Instructor: Armin Rahmani

Office: CF 361, phone: (360) 650-3823, email: Armin.Rahmani@wwu.edu

Office Hours: Wednesday and Friday, 3:00-4:00 or by appointment

Required Text: David J. Griffiths, Introduction to Quantum Mechanics, 2nd ed.

Optional Texts: R. Shankar, Principles of Quantum Mechanics, 2nd ed.

C. Cohen-Tannoudji, B. Diu, and F. Laloe, Quantum Mechanics, Volume 2.

Outline:

Topic	Griffiths	Shankar
Identical Particles	Chap. 5.1	Chap. 10
Time-Independent Perturbation Theory	Chap. 6	Chap. 17
Time-Dependent Perturbation Theory	Chap. 9	Chap. 18
Variational and WKB Approximations	Chaps. 7 and 8	Chap. 16
The Adiabatic Theorem and Berry Phase	Chap. 10	—
Symmetry in Quantum Mechanics	—	Chap. 10
Select Modern Topics	Chap. 12	—
Final Projects		

Structure of class:

We will have both lectures and classes dedicated to problem solving and discussions. Both lectures and discussion sections are expected to be highly interactive. We will incorporate student-centered activities such as group discussions and worksheets into the lectures. Quantum mechanics is both counterintuitive and technically challenging. It is almost impossible to develop a deep conceptual understanding and creative problem-solving skills without sharing your confusion and misconceptions with others. I am committed to maintaining an inclusive and respectful environment where all students can comfortably express themselves. So ask lots of questions! Chances are your questions will help the learning of your peers as well.

Homework:

Assignments and due dates will be posted on Canvas. There will be 5 assignments during the

course. Wrestling with the problem sets is essential for learning the subject. You can work on the homework in groups. While discussions and collaborations are encouraged, the final write-up must represent your own work (for more information on academic integrity, see Western's Academic Integrity Website <http://www.wvu.edu/integrity/>).

Assessment of learning:

Homework: 40%
Midterm Exam I: 15%
Midterm Exam II: 20%
Final Presentation: 25%

Grading scale:

94 - 100%	A	74 - 76%	C
90 - 93%	A-	70 - 73%	C-
87 - 89%	B+	67 - 69%	D+
84 - 86%	B	64 - 66%	D
80 - 83%	B-	60 - 63%	D-
77 - 79%	C+	0 - 59%	F

Learning objectives:

1) Gain a working knowledge of approximation methods in quantum mechanics, including time-independent (degenerate and nondegenerate) and time-dependent perturbation theory, variational principle and the WKB approximation 2) Learn about the adiabatic dynamics and the Berry phase. 3) Learn about the role of symmetry in quantum mechanics. 4) Perform (original or library) research on a modern topic in quantum mechanics and present the results in a short Powerpoint talk.

Term Project:

The final project is intended to help you learn important skills of scientific research and communication. It also provides broad exposure to several topics of current research. A list of possible topics will be posted on Canvas, but you are free to choose your own topic. You must research the topic and put together a clear, concise, and informative Powerpoint presentation, which introduces the topic to the rest of the class (including the instructor). It is important to start on the project from the very beginning of the quarter. We will dedicate the last week of the course to student presentations. Each talk should take no more than 12 minutes (including questions). Many conferences have strict time limits and preparing a concise and clear presentation is an important skill. Assessment is based on presenting a deeply researched topic, as well as the organization, logical structure, and the clarity of your talk.

Reasonable accommodation:

Western is committed to equal opportunity and nondiscrimination in all programs and activities. Requests for accommodation or assistance should be directed to Disability Resources for Students located in Old Main 120; additional information is available at: <http://www.wvu.edu/depts/drs/> Telephone: 650-3083 / Email: drs@wvu.edu