

## Course Syllabus

PC321: Quantum Mechanics I

Department of Physics and Computer Science, Faculty of Science, Waterloo  
Fall | 2018

### Instructor Information

Alexei Kaltchenko | N2077 (Science Building)

Contact Information: 519-884-0710 x2217, akaltchenko@wlu.ca

Weekly Office Hours: Wednesday, 4pm-5pm or By Appointment

### Course Information

PC321: Quantum Mechanics I

MW: 2:30pm – 3:50pm, N1059

Pre-requisites | PC242, MA205

### Course Overview and Approach

The objective of PC321 is to introduce students to the fundamental concepts of quantum mechanics. You will learn the formalism of quantum mechanics, the mathematical tools and techniques for solving realistic problems. After taking this course you will, among other things, be able to understand the fundamental theories that describe the dual particle-wave nature and interaction of matter and energy at the atomic scale and to apply your knowledge to solve real-life quantum mechanical systems.

### Topics covered:

- The Schroedinger equation
- Interpretation of the wave function
- Ehrenfest's theorem
- Stationary states and energy quantization
- Potential wells and potential barriers
- Dirac notation
- Scattering and tunneling
- The harmonic oscillator
- Schroedinger equation in three dimensions
- The hydrogen atom
- WKB approximation (time permitting).

## Course Tools and Learning Materials

- D. J. Griffiths, Introduction to Quantum Mechanics, 2d/3d edition
- [Library e-reserve website and access information](#)

**Note:** Audio and/or video recording and/or broadcasting of the lectures in this course is not permitted unless specific permission has been granted by the instructor.

### Assignments:

3-4 assignments will be given throughout the term. Assignments due dates/times will be announced in class. Late assignment submissions will not be accepted.

### Attendance

If a student misses a class without a legitimate documented reason, the material and information presented in the class will not be discussed (or otherwise communicated) afterwards. Attendance might be occasionally taken and used towards the final grade as a bonus.

### Student Evaluation

List each course assessment (assignments, tests, projects, exams)† with a weighting (percentage of final grade)† and the associated due date† in the table below.

| Assessment   | Weighting   | Date        |
|--------------|-------------|-------------|
| Assignments  | 35%         | TBA         |
| Midterm test | 30%         | October 24  |
| Final test   | 35%         | November 28 |
| <b>Total</b> | <b>100%</b> |             |

### University and Course Policies

1. **Special Needs:** Students with disabilities or special needs are advised to contact Laurier's Accessible Learning Centre for information regarding its services and resources.
2. **Plagiarism:** The University has approved the following wording for inclusion on all course syllabi about the use of the institutionally supported plagiarism software tool. "Wilfrid Laurier University uses software that can check for plagiarism. If requested to do so by the instructor, students are required to submit their written work in electronic form and have it checked for plagiarism." (Approved by Senate May 14, 2002) .

In addition to the statement above you may wish to add the following text about academic integrity.

3. **Academic Integrity:** Laurier is committed to a culture of integrity within and beyond the classroom. This culture values trustworthiness (i.e., honesty, integrity, reliability), fairness, caring, respect, responsibility and citizenship. Together, we have a shared responsibility to uphold this culture in our academic and nonacademic behaviour. The University has a defined policy with respect to academic misconduct. As a Laurier student you are responsible for familiarizing yourself with this policy and the accompanying penalty guidelines, some of which

may appear on your transcript if there is a finding of misconduct. The relevant policy can be found at Laurier's [academic integrity](#) website along with resources to educate and support you in upholding a culture of integrity. Ignorance is not a defense.

4. **Classroom Use of Electronic Devices:** State your classroom practice and any consequences for student failure to comply – see [Policy 9.3](#) (Approved by Senate March 8, 2012).
5. **Late Assignment Policy:** Specify any penalties that will be assessed when deadlines for the completion of course components are not met (Approved by Senate May 23, 2012). Refer to the Handbook on Undergraduate Course Management for more information.
6. **Final Examinations:** Students are strongly urged not to make any commitments (i.e., vacation) during the examination period. Students are required to be available for examinations during the examination periods of all terms in which they register. Refer to the Handbook on Undergraduate Course Management for more information.
7. **Foot Patrol, the Wellness Centre, and the Student Food Bank:** The University approved the inclusion of information about select wellness and safety services and supports on campus in the course information provided to students. (Approved by Senate November 28, 2011.) Specific language (by campus) is provided below.

**Multi-campus Resource:**

- Good2Talk is a postsecondary school helpline that provides free, professional and confidential counselling support for students in Ontario. Call 1-866-925-5454 or through 2-1-1. Available 24-7.

**Kitchener/Waterloo Resources:**

- [Waterloo Student Food Bank](#): All students are eligible to use this service to ensure they're eating healthy when overwhelmed, stressed or financially strained. Anonymously request a package online 24-7. All dietary restrictions accommodated.
- [Waterloo Foot Patrol](#): 519.886.FOOT (3668). A volunteer operated safe-walk program, available Fall and Winter daily from 6:30 pm to 3 am. Teams of two are assigned to escort students to and from campus by foot or by van.
- [Waterloo Student Wellness Centre](#): 519-884-0710, x3146. The Centre supports the physical, emotional, and mental health needs of students. Located on the 2<sup>nd</sup> floor of the Student Services Building, booked and same-day appointments are available Mondays and Wednesdays from 8:30 am to 7:30 pm, and Tuesdays, Thursdays and Fridays from 8:30 am to 4:15 pm. Contact the Centre at x3146, [wellness@wlu.ca](mailto:wellness@wlu.ca) or @LaurierWellness. After hours crisis support available 24/7. Call 1-844-437-3247 (HERE247).

**Brantford Resources:**

- [Brantford Student Food Bank](#): All students are eligible to use this service to ensure they're eating healthy when overwhelmed, stressed or financially strained. Anonymously request a package online 24-7. All dietary restrictions accommodated.
- [Brantford Foot Patrol](#): 519-751-PTRL (7875). A volunteer operated safe-walk program, available Fall and Winter, Monday through Thursday from 6:30 pm to 1 am; Friday through Sunday 6:30 pm to 11 pm. Teams of two are assigned to escort students to and from campus by foot or by van.
- [Brantford Wellness Centre](#): 519-756-8228, x5803. Students have access to support for all their physical, emotional, and mental health needs at the Wellness Centre. Location: Student Centre, 2nd floor. Hours: 8:30 am to 4:15 pm Monday through Friday. After hours crisis support available 24/7. Call 1-884-437-3247 (HERE247).