Syllabus: Quantum Physics I (PHYC 3640)

Department of Physics and Atmospheric Science

Fall 2026

Dalhousie University operates in the unceded territories of the Mi'kmaw, Wolastoqey, and Peskotomuhkati Peoples. These sovereign nations hold inherent rights as the original peoples of these lands, and we each carry collective obligations under the Peace and Friendship Treaties. Section 35 of the Constitution Act, 1982, recognizes and affirms Aboriginal and Treaty rights in Canada.

We recognize that African Nova Scotians are a distinct people whose histories, legacies, and contributions have enriched the part of Mi'kma'ki known as Nova Scotia for over 400 years.

Course Instructor(s)

Name	Email	Office Hours
Jesse Maassen (Instructor)	jmaassen@dal.ca	Thursdays, 1:30-3:30pm, Dunn 234
Eleanor Young (TA)	fv930001@dal.ca	**TBD**, Dunn 243

Course Description

This course introduces the formal structure of quantum mechanics as well as quantum mechanical calculations. The emphasis is on problem solving. The course starts with quantum measurement, then considers particles in a box and the quantum harmonic oscillator. The course starts with one-dimensional quantum mechanics and ends with higher dimensional problems. The course introduces quantum mechanical operators, time-evolution, quantum angular momentum, and the solution of the hydrogen atom.

Course Prerequisites

PHYC 2515 ("*Modern Physics*")
PHYC 2140 ("*Physics Tools: Theory*") or PHYC 2060 ("*Oscillations and Waves*")
MATH 1030 ("*Matrix Theory and Linear Algebra I*")
MATH 2120 ("*Methods for Ordinary Differential Equations*")

Course Exclusions

None.

Student Resources

Office hours will be held weekly on Thursdays 1:30-3:30pm in Dunn 234 (instructor's office), as well as on **TBD** in Dunn 243 (TA's office). Students are encouraged to email or visit the instructor or TA if they have any questions.

Course Structure

Course Delivery

The course will be delivered in-person (and not recorded).

Lectures

Wednesdays and Fridays, 8:35-9:55am, Dunn 302.

Laboratories

None.

Tutorials

None.

Course Materials

Textbook

- "*Introduction to Quantum Mechanics*" by D.J. Griffiths and D.F. Schroeter (Cambridge University Press, 3nd edition, 2018). We will follow this textbook closely; every student should get a copy of the textbook, which is available at the Dalhousie Bookstore.

Other supplementary references

- "*Quantum Mechanics*" by C. Cohen-Tannoudji, B. Diu, and F. Laloë (Wiley-VCH, 1st edition, 1991).
- "*Quantum Mechanics: An Accessible Introduction*" by Robert Scherrer (Pearson, 1st edition, 2006).

Course resources, such as the syllabus and the assignments, will be made available through the course Brightspace page.

Learning Objectives

- Understand and interpret the wave function
- Solve the time-independent Schrödinger equation
- Construct time-dependent solutions of the Schrödinger equation from stationary states
- Impose correct physical boundary conditions on the wave function
- Understand properties of Hermitian operators
- Compute the possible values, and associated probabilities, of observable quantities of a quantum particle
- Predict average result from a series of measurements
- Understand and apply Dirac notation

Assessment

There will be **5 assignments**, a **2 mid-term exams**, and a **final exam**. Assignments will be posted roughly every 2.5 weeks, with one week's time to complete and submit the work.

Assessment	**Weight (% of final grade)**	**Due date**
Assignments (5)	25% (5% each)	Sept. 23, Oct. 7, Oct. 28, Nov. 20, Dec. 4
Mid-term exam #1	25%	Oct. 9 (during regular lecture period)
Mid-term exam #2	25%	Nov. 6 (during regular lecture period)
Final exam	25%	To be scheduled during the exam period.

Conversion of numerical grades to final letter grades follows the undergraduate Dalhousie Grade Scale:

A+ (90-100)	B+ (77-79)	C+ (65-69)	D (50-54)
A (85-89)	B (73-76)	C (60-64)	F (0-49)
A- (80-84)	B- (70-72)	C- (55-59)	

Course Policies on Missed or Late Academic Requirements

Late assignments will have 10% deducted per day after the due date, with a maximum of 50% marks removed for lateness. In the case of illness, students must submit a Student Declaration of Absence (SDA) via email to the instructor for a missed exam or to request an extension (up to 3 days) on the due date of an assignment. For a justified missed exam, the weight of the missed exam will be added equally to the other exams.

Course Policies related to Academic Integrity & Artificial Intelligence

Regarding the assignments, discussions among students is permitted but the submitted work must present your own calculations and be written in your own words. The use of generative AI and large language models (e.g., ChatGPT) is not permitted for any assessment in this course.

Course Accessibility

Dalhousie is committed to providing an accessible educational environment. Please refer to the Student Accommodation Policy. Students who require academic accommodations should contact the Student Accessibility Centre.

Students are also eligible for accommodations based on protected characteristics, such as religion. If a religious, cultural, or community-significant observance conflicts with a course requirement, please contact me as early as possible so that we can arrange an appropriate alternative.

Course Content

- The wave function: Meaning of the wave function, mathematics refresher on probabilities and complex numbers, normalization, momentum, uncertainty principle
- Time-independent Schrödinger equation (1D): Stationary states, infinite square well, harmonic oscillator, free particle, delta function potential, finite square well
- Formalism: Hilbert space, observables, eigenstates of a Hermitian operator, generalized statistical interpretation, generalized uncertainty principle, vectors and operators
- Time-independent Schrödinger equation (3D): Schrödinger equation in rectangular coordinates, Schrödinger equation in spherical coordinates, solution of the hydrogen atom, angular momentum

Syllabus Appendix

For information on student supports, university statements, policies, and guidelines, please see:

Syllabus Appendix: Student Supports & University Statements, Policies, and Guidelines