

P423 - Quantum Mechanics II

Fall 2022

Professor: Rogério de Sousa

Lectures

Mon, Thur: 11:30am - 12:50pm, **in-person** at Clearihue Building A221.

Lectures will also be broadcast in zoom to accommodate special situations such as sickness and travel. However, videos of past lectures will not be made available except under special circumstances. This is being done because in-person attendance is strongly recommended for a challenging course like Quantum Mechanics II.

All lecture materials and assignments are available in the course's Brightspace:

<https://bright.uvic.ca/d2l/home/222546>

In particular, the lecture boards I used in class and my handwritten notes will be made available online. These can be found under "Lecture boards and handwritten notes" in the content link.

How to ask questions about content, assignments, etc

Use our [P423 Discussion Forum - Questions about the course, assignments, etc](#). It can also be accessed from this link:

<https://bright.uvic.ca/d2l/le/222546/discussions/List>

I will be giving up to 10% bonus to the final grade for students who actively participate in class and in the forum.

Each of the 8 assignments carries 1% bonus associated to forum participation (8% total). For each assignment, you can get:

- 0.25 % for each question you ask;
- 0.50 % for each question you answer correctly;
- 1.00 % for an answer that I judge to be exceptional for the class.

I will also give extra credit for class participation. This will amount to 2% on the final grade depending on whether I felt that you asked questions and interacted with me and the class during the lectures.

Whenever you have questions about the material taught, please send messages or questions using the UVic brightspace forum. That way all students will have access to our conversation.

If you wish to send me a private message, please send it to my UVic email:

rdesousa@uvic.ca.

Office hour

Wednesdays, 2:00-3:00 pm in-person at Elliott 117. Students can also attend virtually by entering my Zoom room:

<https://uvic.zoom.us/j/3056080360?pwd=OFJBS3VXY1J0bEVldnVjeHpSQ3J4QT09>

Textbook

"*Introduction to Quantum Mechanics*", David J. Griffiths, 3rd Ed.

Some sections of the course will closely follow this book, so I strongly recommend its purchase.

Other suggested books:

- "*Quantum Mechanics*", Vols. 1 and 2, by Claude Cohen-Tannoudji, Bernard Diu and Frank Lalöe
Very didactic presentation of the formalism and applications of QM, written by the French master.
Specially useful for people interested in AMO (atomic, molecular, and optical physics).
- "*Quantum Mechanics*", Franz Schwabl
My favourite book for the wave function (differential equations based) formalism.
- "*Modern Quantum Mechanics*", J.J. Sakurai
My favourite book for the operator formalism. Specially useful for people interested in particle physics and quantum field theory.

Topics to be covered

Review of the postulates of QM; motion of a charged particle in an electromagnetic field.
Approximation methods I: Time-independent perturbation theory, fine structure of the hydrogen atom, variational principle.
Identical particles: Bosons and Fermions, atoms, solids.
Approximation methods II: Time-dependent perturbation theory, Fermi's golden rule, interaction with the radiation field, spontaneous emission.
If time allows: Scattering theory: Partial waves, phase shifts, Born approximation.

Grading scheme

Assignments	20%
Midterm	30%
Final	50%

Assignments

There will be 8 assignments. All assignments are already posted on this website, with noted due dates on Friday at 6pm, e.g. [P423 - Assignment 1 \(A1\)](#) is due Sept. 16.

Assignment solutions will be available online a few days after the due date.

The assignments will be graded by the TA, Sanker Timsina. Any questions on grading should be addressed directly to him by email, at stimsina@uvic.ca.

Midterm exam

Oct. 20th (Thursday), in class 11:30 am - 12:50pm.

Notes on the exams

- On all examinations the only acceptable calculator is the sharp EL-510R. This calculator can be bought in the bookstore for about \$10.
- You are allowed one 8.5X11" handwritten formula/note sheet **NEW: You can only write on ONE side of the sheet: I am doing this because some people were copying assignment solutions to the formula sheet, a habit that should be discouraged.**
You will be responsible for the "usual" constants and equations that we have dealt with in class on a regular basis.

Final letter grade: UVic's percentage grading system

A+	90-100	Exceptional performance.
A	85-89	Outstanding performance.
A-	80-84	Excellent performance.
B+	77-79	Very good.
B	73-76	Good.
B-	70-72	Solid.
C+	65-69	Satisfactory.
C	60-64	Minimally satisfactory.
D	50-59	Marginal performance.
F	0-49	Unsatisfactory performance.

How to succeed

- Attend classes;
- Most important: **Attempt the assignments by yourself, without looking at solutions first.** If you can't solve a problem, talk to your classmates, or attend the office hour. However, it is extremely important that you attempt to solve the problem by yourself first. Experience shows that students who copy solutions from others usually perform very poorly in the exams and fail the course.
- Common mistake: Some students do not study/review the book/notes before attempting the assignments. Instead, they "pick" the notes trying to find the material needed to solve a particular problem. Such method does not work because it leads to fragmented knowledge; the student does not understand the connection between the topics. Moreover, studying that way does not prepare for the exam, because there will be no book or notes to "pick" during the exam.

- Suggestion on how to study: Do a subject review before attempting the assignment, by reading the book/notes.
Start by reading the assignment fully, and then attempt the problem that appears to be easier (it is okay to briefly go back to the book or notes during the assignment).
- Solve extra problems to practice for the exams.