

Quantum Mechanics II: Phys 4251A

Fall 2026

Course Outline

Class time/location: 10:30-11:30 MWF in PAB-34.

Prerequisite Requirements: *The prerequisite for this class is Physics 3200A/B. It would be advantageous but not essential to take AM3815 (or NMM2276/2277) - Partial Differential Equations prior-to taking this course.*

Unless students have either the prerequisites for this course or written special permission from the Department of Physics & Astronomy to enroll in it, they may be removed and withdrawn from this course in accordance with university policy. This may be done after the add/drop deadline of the academic term, and the course will be marked as withdrawn (WDN) on their academic record. This decision may not be appealed.

Instructor Information: Prof. Colin Denniston, cdennist@uwo.ca, office: PAB230. If you wish to contact your instructor privately, please send an email **using your Western email address** and include Phys4251 in the subject line.

TA/grader: TBA, tba@uwo.ca.

Office Hours: Fridays 11:30-12:30 in PAB230.

Course Description

Neils Bohr once said, “Those who are not shocked when they first come across quantum theory cannot possibly have understood it.” In this course we hope to be shocked and amazed by quantum theory but to gain and deepen our understanding by applying it to concrete examples.

Learning Outcomes: *i) To work with and apply the Dirac formalism of Quantum Mechanics to problems involving particle spin, angular momentum, and their time evolution.*

ii) Solve for the time dependence for single particle systems in multiple dimensions using either wave mechanics or matrix mechanics.

iii) To solve simple perturbation theory problems and understand the basics of systems of identical particles in quantum mechanics.

Anticipated Topics: Lecture topics are centered on the key objectives of the course. The topic coverage shown below is approximate and may change depending on lecture progress.

1. REVIEW OF: STERN-GERLACH EXPERIMENTS; ROTATIONS AND MATRIX MECHANICS; ANGULAR MOMENTUM; and TIME EVOLUTION
2. SYSTEM OF TWO SPIN-1/2 PARTICLES, EPR PARADOX, BELL INEQUALITIES, ENTANGLEMENT
3. WAVE MECHANICS AND HARMONIC OSCILLATOR IN 1D (REVIEW)
4. TRANSLATIONAL AND ROTATIONAL SYMMETRY IN THE TWO-BODY PROBLEM
5. BOUND STATES OF CENTRAL POTENTIALS
6. TIME-INDEPENDENT PERTURBATIONS
7. IDENTICAL PARTICLES
8. SCATTERING

Key Dates:

First Lecture Class: September 9, 2026
Fall Reading Week: October 10 – 18, 2026
Last Lecture Class: December 9, 2026
Exam period: December 11 – 22, 2026.

Course Materials

Text: The required textbook is *A Modern Approach to Quantum Mechanics*, 2nd edition, by John S. Townsend. This is the same text as Physics 3200 so you should already have a copy. The hardcopy is available from Amazon.ca for \$171. You can also get an electronic copy for **\$90 (US) from:** <https://www.vitalsource.com/products/a-modern-approach-to-quantum-mechanics-townsend-john-s-v9781891389788> There is also a 180 day rental for \$68US.

Website: Assignments, supplemental information, and references will be posted on the course website. Students are responsible for checking the course OWL Brightspace site (western.brightspace.com) regularly for news and updates. This is the primary method by which information will be disseminated to all students in the class. Missing critical information due to your failure to check OWL cannot be used as a basis for appeal.

If students need assistance with the course OWL Brightspace site, they can seek support on the [OWL Brightspace Help](#) page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Course Evaluation: Your grade will be based on:

- 15% (Best 5 out of 6) Assignments,
- 45% (Best 4 out of 5) Quizzes,
- 40% Final Exam (cumulative).

The Department of Physics and Astronomy may, in *exceptional* circumstances, adjust the final course marks to conform to Departmental policy.

Assignments: There will be six assignments of similar weight (about one every 2 weeks). However, they are due very shortly after the relevant material has finished being covered in lectures so you should work on the assignments as we go along. To get you into the habit of working on the assignments as we go along. Anticipated due **dates are A1 on 18 Sept; A2 on 2 Oct; A3 on 23 Oct; A4 on 6 Nov; A5 on 20 Nov; A6 on 7 Dec.** You will need to turn-in the assignments electronically. The written part of an assignment needs to be scanned and turned in as a **single pdf file (NOT a separate file for every page)**. You can use a printer/scanner to pdf or a phone app like MS OneDrive to do this. You need to **make sure the file is clearly readable with nothing cut-off**. The TA will grade whatever is turned in and marks will be deducted if they cannot read the whole page.

Quizzes: There will be 5 quizzes.

Anticipated dates for **quizzes are 25 Sept, 9 Oct, 30 Oct, 13 Nov, 27 Nov.** Quizzes will be written in-person in the regular lecture classroom. There are no makeups for quizzes. However, if you have a university-sanctioned schedule conflict or religious accommodation you **MUST** notify the instructor in writing no later than one week prior to the test (earlier if possible). In this situation an earlier siting of the quiz will usually be arranged.

Final: At this point we plan to have an in-person written final exam.

Information about Missed Coursework

Students must familiarize themselves with the *University Policy on Academic Consideration – Undergraduate Students in First Entry Programs*, posted on the Academic Calendar:

https://uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration_Sep24.pdf,

This policy does not apply to requests for Academic Consideration submitted for **attempted or completed work**, whether online or in person. The policy also does not apply to students experiencing longer-term impacts on their academic responsibilities. These students should consult [Accessible Education](#).

For procedures on how to submit Academic Consideration requests, please see the information posted on the Office of the Registrar's webpage: https://registrar.uwo.ca/academics/academic_considerations/. All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline.

Assignments

This course has 6 assignments. Students are expected to complete five of six to receive full credit for this component. If they miss up to one of these six assignments, they do not need to request Academic Consideration; the missing item(s) will not count against them, and their grade for this component will be calculated from their best five submissions.

If a student completes fewer than **five** of the total, the missing items will be recorded as a zero and included in their grade for this component. They are encouraged to submit all work, even if incomplete, since a partial mark is always better than a zero. If their final exam grade is higher than their grade on this component, their final exam grade will replace it.

Quizzes

This course has five quizzes. Students are expected to complete four of five to receive full credit for this component. If they miss up to one of these five quizzes, they do not need to request Academic Consideration; the missing item(s) will not count against them, and their grade for this component will be calculated from their best four submissions.

If a student completes fewer than four of the total, the missing items will be recorded as a zero and included in their grade for this component. Students are encouraged to write quizzes even when they are not at their best, since a partial mark is always better than a zero. If their final exam grade is higher than their grade on this component, their final exam grade will replace it.

Deadlines: The 48-Hour No-Late-Penalty Period

All take-home assignments, quizzes, and labs with a stated due date include an automatic 48-hour period after the deadline during which students may still submit without a late penalty. For example, if an assignment is due on November 5, they may submit it until November 7 without penalty. After this 48-hour period, no further submissions will be accepted, and students do not need to request Academic Consideration for a missed deadline; their grade for this component will be calculated as described above.

Special Examination

Per university policy, Academic Consideration requests with supporting documentation are required for the final examinations scheduled during official examination periods by the Registrar's Office. Academic Consideration requests must be submitted via the Student Absence Portal (SAP).

If the student has been approved by the Academic Advising Office to write a Special Examination (SPC) and the final exam is their only outstanding course component, an SPC will be assigned to them and scheduled by the instructor per university policy.

If the student misses their SPC exam and is approved for Academic Consideration, they will be withdrawn from the course without academic penalty. If they experienced extenuating circumstances such as prolonged illness, they may appeal to the Associate Dean (Academic), on a case-by-case basis, for the opportunity to write the final exam the next time the course is offered. An outstanding SPC will reduce their course load for the term in which the exam is deferred, as outlined in the [Definitions of Types of Examinations](#) policy.

If the student misses their SPC exam and Academic Consideration is not approved, or was not requested, they will receive a grade of zero on the exam.

6. Additional Statements

6.1 Religious Accommodation

When a recognized religious holiday either requires a student to be absent from the University, or requires or prohibits an activity that makes it impossible for them to complete an academic requirement scheduled that day, they are entitled to accommodation. No student will be penalized for an absence for religious reasons, and an alternative means of satisfying the requirement will be arranged. This accommodation is provided in accordance with the University's policy on Accommodation for Religious Holidays:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf

The student should submit their requests through the Student Absence Portal (SAP), identifying the conflict and the specific course component(s) affected (e.g., test, midterm, exam).

Quizzes: If a religious observance conflicts with a quiz, they must submit their request no later than **one week** before the quiz. Their instructor will arrange an early sitting of the quiz. As set out above, no makeup quiz is offered for any other reason; this early sitting is available specifically for this accommodation.

Final Examinations: If a religious observance conflicts with the final exam, the student must submit their request no later than **two weeks** before the exam. Their instructor will arrange a Special Examination to take place no later than one month after the end of the examination period.

Students are responsible for finding out what was covered in any class they miss due to a religious observance, and for taking the appropriate steps to keep up with the course.

If a suitable arrangement cannot be reached between a student and their instructor, they should consult the Undergraduate Chair of the department offering the course, and if necessary, the Associate Dean (Academic) of the Faculty of Science.

For a list of recognized religious observances, please visit the calendars posted on the Equity, Diversity & Inclusion website - <https://www.edi.uwo.ca> (About Us – Resources – Additional Resources – Calendars).

6.2 Academic Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, which provides

recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf.

6.3 General Academic Policies

The website for Registrar Services is <https://www.registrar.uwo.ca/>.

Use of @uwo.ca email: In accordance with policy, https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf, the centrally administered e-mail account provided to students will be considered the individual's official university email address. It is the responsibility of the account holder to ensure that emails received from the University at their official university address are attended to in a timely manner.

Requests for Relief (formally known as “appeals”)

Policy on Request for Relief from Academic Decision:

https://uwo.ca/univsec/pdf/academic_policies/appeals/requests_for_relief_from_academic_decisions.pdf

Procedures on Request for Relief from Academic Decision (Undergraduate):

https://uwo.ca/univsec/pdf/academic_policies/appeals/undergrad_requests_for_relief_procedure.pdf

6.4 Scholastic Offences

Policy on Scholastic Offences:

https://uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_offences.pdf

Procedures on Scholastic Offences (Undergraduate):

https://uwo.ca/univsec/pdf/academic_policies/appeals/undergrad_scholastic_offence_procedure.pdf

Procedures on Scholastic Offences (Graduate):

https://uwo.ca/univsec/pdf/academic_policies/appeals/graduate_scholastic_offence_procedure.pdf

Use of Electronic Devices During Assessments

In courses offered by the Faculty of Science, the **possession** of unauthorized electronic devices during any in-person assessment (such as tests, midterms, and final examinations) is strictly prohibited. This includes, but is not limited to: mobile phones, smart watches, smart glasses, hidden cameras and wireless earbuds.

Unless explicitly stated otherwise in advance by the instructor, the presence of any such device at a student's desk, on their person, or within reach during an assessment will be treated as a scholastic offence, **even if the device is not in use**.

Effective September 2026, the typical penalty for this offence is a failing grade in the course AND a 12-month prohibition on retaking the course.

Only devices expressly permitted by the instructor (e.g., non-programmable calculators) may be brought into the assessment room. It is their responsibility to review and comply with these expectations.

Use of Generative AI Tools

Unless otherwise stated, the use of generative AI tools (e.g., ChatGPT, Microsoft Copilot, Google Gemini, or similar platforms) is **not permitted** in the completion of any course assessments, including but not limited to: assignments, quizzes, and final examinations.

Using such tools for content generation, code writing, problem solving, translation, or summarization—when not explicitly allowed—will be treated as a **scholastic offence**.

If the use of generative AI is permitted for a particular assessment, the conditions of use will be specified by the instructor in advance. If no such permission is granted, students must assume that use is prohibited. It is the student's responsibility to seek clarification before using any AI tools in academic work.

Use of Software for Assessments

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

Computer-marked multiple-choice tests and exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

6.5 Support Services

Academic Advising. Please visit the Science & Basic Medical Sciences Academic Advising webpage for information on adding/dropping courses, academic considerations for absences, requests for relief, exam conflicts, and many other academic-related matters: <https://www.uwo.ca/sci/advising/>.

Mental Health Support. Students who are in emotional/mental distress should refer to Mental Health@Western (<https://uwo.ca/health/>) for a complete list of options about how to obtain help.

Gender-Based and Sexual Violence. Western is committed to reducing incidents of gender-based and sexual violence (GBSV) and providing compassionate support to anyone who has gone through these traumatic events. If a student has experienced GBSV (either recently or in the past), they can find information about support services for survivors, including emergency contacts, at:

https://www.uwo.ca/health/student_support/survivor_support/get-help.html.

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Accessibility for Coursework. A student may contact the course instructor if they require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to them. If they have any questions regarding accommodations, they may also contact Accessible Education at http://academicsupport.uwo.ca/accessible_education/index.html

Learning Development and Success. Learning-skills counsellors at Learning Development and Success (<https://learning.uwo.ca>) are ready to help students improve their learning skills. The facility offers strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Student Councils. Student-run support services are offered by the University Students' Council (<https://westernusc.ca>) and the Science Students' Council (<https://www.westernssc.ca>).