

Physics 2102B Introduction to Modern Physics 2020-2021

Calendar description:

Introduction to quantum mechanics, wave-particle duality, atomic physics, nuclear physics, particle physics and the origins of the universe.

List of Prerequisites:

Physics 1301A/B or 1401A/B or 1501A/B with a minimum mark of 60% or Physics 1028A/B with a minimum mark of 80%; Physics 1302A/B or 1402A/B or 1502A/B with a minimum mark of 60% or Physics 1029A/B with a minimum mark of 80%, or a minimum mark of 60% in the former Physics 1020 or 1024 or 1026; a minimum mark of 60% in each of (Calculus 1000A/B or 1100A/B or 1500A/B) and (Calculus 1301A/B or 1501A/B), or in Applied Mathematics 1413.

Unless you have either the prerequisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

Instructor:

Professor Els Peeters
epeeters@uwo.ca

Office hours:

Online (Zoom), Wednesdays 11:30AM-12:30PM or by appointment

Teaching assistants:

Cole Gregg: cgregg2@uwo.ca
Colin Metrow: cmetrow@uwo.ca

Format:

Online course

- The University timetable specifies a time for lectures, **Wednesdays 10:30-11:30AM** and **Fridays 10:30-11:30AM** (Eastern time), and a time for tutorials, **Fridays 11:30AM-12.30PM**. Please keep this time free in your schedule: we will connect via Zoom during this time. Attendance to this synchronous class and tutorial time is highly recommended.
- Students must use their Western (@uwo.ca) email addresses when contacting their instructors.

- You can contact the instructor or TAs by email or during the synchronous class or tutorial time (for example by 'private' chat in zoom). We will try to respond to your email inquiry within two working days of reception.
- Students should check OWL (<http://owl.uwo.ca>) on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the class. Students are responsible for checking OWL on a regular basis.
- All course material will be posted to OWL: <http://owl.uwo.ca>.
- If students need assistance, they can seek support on the OWL Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Professionalism and netiquette:

It is expected that students will display the same standard of behaviour in all online interactions as they would in the regular classroom. Video interactions will be done in respectful language, in a quiet environment, in appropriate clothing, etc. Failure to abide with these requirements may result in the barring of the student from such interactions and the loss of any associated marks. For a refresher on netiquette see <https://www.rasmussen.edu/student-experience/college-life/netiquette-guidelines-every-online-student-needs-to-know/>

The integrity of the course and the privacy of its participants is expected to be preserved. It is illegal to distribute, share in any public domain, or sell any course materials without prior written consent of the instructor.

Technical Requirements:

Participation in some activities requires a webcam/microphone and/or a stable internet connection. You are expected to attend the synchronous class and tutorial times, but if internet or other issues prevent you from logging in at the designated time, you can access the recordings of the general portion of the session (work done in break-out rooms will not be recorded). Completion of this course will require you to have a reliable internet connection, webcam, microphone, and a device that meets the system requirements for Zoom (see below).

Course Goals:

By the end of this course, students should be able to:

- Explain how quantum physics evolved from a classical description as new evidence came to light and as laws and theories were tested and subsequently restricted, revised, or replaced.
- Explain the fundamental postulates and principles of special relativity and quantum physics.
- Mathematically describe and derive the basic laws in special relativity and quantum physics.
- Apply the principles of quantum mechanics to predict the results of measurements in simple systems such as e.g. a particle in a box and the hydrogen atom.
- Use a step-by-step problem-solving strategy underpinned with conceptual understanding to logically work through complex problems.

Outline of topics to be covered:

1. The birth of modern physics
2. Special theory of relativity
3. The experimental basis of quantum physics
4. Structure of the atom
5. Wave properties of matter and quantum mechanics
6. The Schrödinger equation
7. The hydrogen atom
8. Atomic physics

Course content may vary.

Recommended textbook:

Modern Physics for Scientists and Engineers, 4th edition, S. T. Thornton and A. Rex, (Brooks/Cole, 2012).

Calculator:

A basic scientific calculator (e.g. the Sharp EL-510RB calculator used for first year physics courses) is allowed during the midterm and the final exam.

Perusall:

A portion of the class marks will be assigned for performing the readings, for posing and answering questions, engaging with other students and making well-thought out comments on the Perusall website on a weekly basis. This is done via the Perusal tool which will be accessible from the course OWL site. Students do not have to create a separate Perusall account.

Zoom:

Virtual class and tutorial time will be held synchronously, that is, students and instructor will all log in at the same time, via zoom. You can access Zoom from the course OWL site.

Gradescope:

Some assignments will be submitted to Gradescope, accessible from the course OWL site. Gradescope accepts pdfs, scans or photos of handwritten assignment pages. Marks and feedback on these assignments will be returned to the student via Gradescope.

Remote Proctoring Software:

Tests and examinations in this course will be conducted using Zoom. You will be required to keep your camera and audio on for the entire session, hold up your student card for identification purposes, and share your screen with the invigilator if asked to do so at any time during the exam. The exam session will not be recorded.*

More information about the use of Zoom for exam invigilation is available in the Online Proctoring Guidelines at the following link:

<https://www.uwo.ca/univsec/pdf/onlineproctorguidelines.pdf>

Completion of this course will require you to have a reliable internet connection and a device that meets the system requirements for Zoom. Information about the system requirements is available at the following link: <https://support.zoom.us/hc/en-us>

* Please note that Zoom servers are located outside Canada. If you would prefer to use only your first name or a nickname to login to Zoom, please discuss this with your instructor in advance of the test or examination.

Grading:

The overall course grade will be calculated as listed below:

Quiz 1	0%
Reading Assignments (10; due by Sundays 10:00 PM)	20%
Conceptual Questions (8; due by Sundays 10:00 PM)	10%
Assignments (8; due by Sundays 10:00 PM)	20%
Midterm Exam (date TBD, Registrar's Office)	20%
Final Exam (date TBD, Registrar's Office)	30%

In order to pass this course, you must obtain (1) a grade of at least 50% for the course grade (based on the weight distribution given) AND (2) a grade of at least 50% on the weighted average of the midterm and the final exam. If you fail to obtain a grade of 50% on either one, this failing grade will be adopted as your final course grade.

Please note: The Department of Physics and Astronomy may, in exceptional cases, adjust the final course marks in order to conform to Departmental policy.

Accommodated Evaluations

Quizzes: Quiz 1 is accessible for multiple days and has no deadline. You will need to obtain 100% on the quiz in order to access the course materials beyond week 1.

Reading Assignments: Eleven reading assignments are scheduled weekly. Assignments will be posted on OWL/Perusall on Mondays at 1 AM and must be completed (on Perusall) by the following Sunday at 10:00 PM. Late submissions are not accepted. You can miss one reading assignment without penalty. If you complete all eleven reading assignments, your lowest grade will be dropped. Missed reading assignments cannot be made up at a later date for any reason. Marking will be done based on software available in Perusall (see OWL, week 1 for details).

Conceptual Questions: Eleven conceptual questions are scheduled weekly. They will be posted on OWL on Mondays at 1 AM and must be completed (on OWL) by the following Sunday at 10:00 PM. You can miss three conceptual questions without penalty (i.e. you need to complete a total of eight conceptual questions). If you complete all eleven conceptual questions, your lowest three grades will be dropped. Missed conceptual questions cannot be made up at a later date for any reason.

Assignments: Eleven assignments (problems) are scheduled weekly. They will be posted on OWL on Mondays at 1 AM and must be completed (on OWL) by the following Sunday at 10:00 PM. You can miss three assignments without penalty (i.e. you need to complete a total of

eight assignments). If you complete all eleven assignments, your lowest three grades will be dropped. Missed assignments cannot be made up at a later date for any reason.

Make-up Midterm and final exam: See Academic Consideration for Student Absence to receive permission to write a make-up. Note that if you fail to write a scheduled Special Examination, permission to write another Special Examination will be granted only with the permission of the Dean in exceptional circumstances and with appropriate supporting documents. In such a case, the date of this Special Examination of a final exam normally will be the scheduled date for the final exam the next time the course is offered.

If you received permission for absence to the midterm, the missed midterm must be made up at a later date (TBD, Registrar's Office). If you received permission for absence for both the midterm and the make-up of the midterm, the weight of the midterm will be added to the weight of the final exam.

Accommodation Policies:

Students with disabilities work with Accessible Education (formerly SSD) which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The Academic Accommodation for Students with Disabilities policy can be found at:

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

Academic Consideration for Student Absence:

Students will have up to two (2) opportunities during the regular academic year to use an on-line portal to self-report an absence during the semester, provided the following conditions are met: the absence is no more than 48 hours in duration, and the assessment for which consideration is being sought is worth 30% or less of the student's final grade. *Students are expected to contact their instructors within 24 hours of the end of the period of the self-reported absence*, unless noted on the syllabus. Students are not able to use the self-reporting option in the following circumstances:

- for exams scheduled by the Office of the Registrar (e.g., December and April exams)
- absence of a duration greater than 48 hours,
- assessments worth more than 30% of the student's final grade,
- if a student has already used the self-reporting portal twice during the academic year

If the conditions for a Self-Reported Absence are *not* met, students will need to provide a Student Medical Certificate if the absence is medical, or provide appropriate documentation if there are compassionate grounds for the absence in question. Students are encouraged to contact their Faculty academic counselling office to obtain more information about the relevant documentation.

Students should also note that individual instructors are not permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons. **All documentation required for absences that are not covered by the Self-Reported Absence Policy must be submitted to the Academic Counselling office of a student's Home Faculty.**

For policy on Academic Consideration for Student Absences - Undergraduate Students in First Entry Programs, see:

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

and for the Student Medical Certificate (SMC), see:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf

Religious Accommodation:

Students should consult the University's list of recognized religious holidays, and should give reasonable notice in writing, prior to the holiday, to the Instructor and an Academic Counsellor if their course requirements will be affected by a religious observance. Additional information is given in the Western Multicultural Calendar:

<https://multiculturalcalendar.com/ecal/index.php?s=c-univwo>

Academic Policies:

The website for Registrarial Services is <http://www.registrar.uwo.ca>.

In accordance with policy, <http://www.uwo.ca/its/identity/activatenonstudent.html>, the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner.

Recording:

Some of the synchronous learning sessions for this course will be recorded. The data captured during these recordings may include your image, voice recordings, chat logs and personal identifiers (name displayed on the screen). The recordings will be used for educational purposes related to this course, including evaluations. The recordings may be disclosed to other individuals participating in the course for their private or group study purposes. Please contact the instructor if you have any concerns related to session recordings.

Participants in this course are not permitted to record the sessions, except where recording is an approved accommodation, or the participant has the prior written permission of the instructor.

Scholastic offences:

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf.

Plagiarism: Students must write their essays and assignments in their own words. Whenever students take an idea or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing (such as footnotes or citations). Plagiarism is a major academic offence.

Note that working on problems in a group and discussing solution approaches is not a form of plagiarism. However, each student must submit solutions in his or her own words. Identical assignments will be treated as a case of plagiarism.

Any submission for this course 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 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/>

Support services:

Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on add/drop courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: <https://www.uwo.ca/sci/counselling/>

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Student Accessibility Services (SAS) at (519) 661-2147 if you have any questions regarding accommodations.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: <https://www.uwo.ca/se/digital/>.

Learning-skills counsellors at the Student Development Centre (<http://www.sdc.uwo.ca>) are ready to help you improve your learning skills. They offer presentations on 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.

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

Additional student-run support services are offered by the USC, <http://westernusc.ca/services>.