

Physics 2102B: Introduction to Modern Physics

Winter term 2017-2018

Lecturer:	Prof. Els Peeters
Lectures:	Monday, Wednesday, and Friday, from 10:30 am to 11:20 am.
Tutorial:	Friday, 11:30 am to 12:20 pm.
Location:	Physics and Astronomy Building, Room 148 (PAB 148).
Required text:	Modern Physics for Scientists and Engineers , 4th edition, S. T. Thornton and A. Rex, (Brooks/Cole, 2012).

Contact information:

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I can be reached in my office after class on Wednesdays where I will do my best to reserve time to answer your questions. I can also be reached during the week through e-mail for simple inquiries, or to make an appointment. I will try to reply to e-mails within two working days of reception. You can also get help from the course's TA.

The Teaching Assistants (TAs) for this course are Mitch Brocklebank (PAB317; [mbrockle \[at\] uwo.ca](mailto:mbrockle@uwo.ca)) and Viraja Khatu (PAB313; [vkhatu \[at\] uwo.ca](mailto:vkhatu@uwo.ca)).

Students should regularly check the course's WebCT OWL web site.

- Lectures:** I use chalk and a blackboard, and will post the complete lecture notes on WebCT OWL.
- Calculator:** May be required for quizzes, homework, and exams. You may use any standard scientific calculator, but programmable calculators, smartphones and smartwatches are **not** permissible for quizzes and exams.
- Tutorials:** Physics 2102B has tutorials on **Fridays from 11:30 am to 12:20 pm** in PAB 148 after the regular lecture on those days. These tutorials may be hosted by either myself or the course TA. You are expected to attend

tutorials. It is very important to try at least some of the suggested problems before coming to the tutorial, and to bring with you any questions about the problems, about lecture material, and about your reading of the textbook.

Assignments: You will receive lists of suggested problems during the semester. At times, I will request that you turn in specific problems as assignments; there will probably be three such assignments during the semester. Students will be allowed to discuss the material among them, *but each student will have to turn in her/his own copy of the assignment*. Assignments must be turned in at the requested date. However, a student may miss a due date *once* during the semester, and hand in the late assignment on the following lecture day without incurring any penalty. Otherwise, for *every day* for which they are late, assignments will automatically have a third of the maximum number of points subtracted from their total.

Term Tests: There will be three in-class term tests, *tentatively* planned for the following dates: **Friday, February 2, Friday, March 2, and Wednesday, March 28**. The first two exams last 1h50 minutes, and thus include the tutorial time at these days. The last exam lasts 50 minutes. These term tests are non-cumulative, which means that no question will specifically aim to test your knowledge of a topic from before the previous test, but basic material could also be needed to solve the problems on any test. Bring your calculator (see the note above); a formula sheet will be supplied. The tests will consist of problems to be worked out. This means that you must start from fundamental principles to develop the formulae that describe the mathematical model of the physical situation, explaining your reasoning as you go. At the end you may or may not be required to obtain numerical answers; if you are, you will be required to maintain control of numerical accuracy to three significant digits and to include units. There will likely be only two problems on each term test. **You must pass the Term Tests component to pass the course.**

Final Exam: Three hours long, covers material of the entire course. Bring a calculator; a formula sheet will be supplied with exam. Date, time, and location are to be announced. It will be similar in format to the term tests, most likely with five problems. **You must pass the Final Exam to pass the course.**

Grading:

Assignments	15%
Term Tests (15+15+15)	45%
Final Exam	40%

Please note: **You must pass both the Term Tests and the Final Exam components to pass this course. Unless you achieve this criterion, your maximum grade in this course will be 40%.**

Any errors, or appeals to your scores, must be reported to your instructor in writing, within two weeks of their initial posting.

Also, the Department of Physics and Astronomy may, in rare cases, adjust the final course marks in order to conform to Departmental policy.

Calendar Description

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

Prerequisite(s): 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.

Extra Information: 3 lecture hours, 1 tutorial hour, 0.5 course.

Course Content

The course content is outlined in the following table. Note that this is a provisional list and includes more topics than we will have time to cover; the course outline and website will be updated as necessary.

Chapter	Topic
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 Schrodinger Equation
7	The Hydrogen Atom
8	Atomic Physics
9	(Statistical Physics)

10	(Molecules, Lasers, and Solids)
11	(Semiconductor Theory and Devices)
12–13	The Atomic Nucleus
14	(Particle Physics)
16	(Cosmology and Modern Astrophysics)

Topics in parentheses may not be covered.

Course Objectives:

As a result of taking 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.

University Policies:

Accessibility: Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.

Medical accommodation:

- If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to the Dean's office as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from the Dean's Office immediately. For further information please see:
http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf
- A student requiring academic accommodation due to illness should use the Student Medical Certificate when visiting an off-campus medical facility or

request a Records Release Form (located in the Dean's Office) for visits to Student Health Services. The form can be found here:

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

- Students who are in emotional/mental distress should refer to Mental Health@Western <http://www.uwo.ca/uwocom/mentalhealth/> for a complete list of options about how to obtain help.

Religious holidays: A student who, due to unavoidable conflicts with religious holidays which (a) require an absence from the University or (b) prohibit or require certain activities (*i.e.*, activities that would make it impossible for the student to satisfy the academic requirements scheduled on the day(s) involved), is unable to write examinations and term tests on a Sabbath or Holy Day in a particular term shall give notice of this fact in writing to his or her Dean as early as possible but not later than November 15th for mid-year examinations and March 1st for final examinations, *i.e.*, approximately two weeks after the posting of the mid-year and final examination schedule respectively. In the case of mid-term tests, such notification is to be given in writing to the instructor within 48 hours of the announcement of the date of the mid-term test. The instructor(s) in the case of mid-term tests and the Dean in the case of mid-year and spring final examinations will arrange for special examination(s) to be written at another time. In the case of mid-year and spring final examinations, the accommodation must occur no later than one month after the end of the examination period involved. It is mandatory that students seeking accommodations under this policy give notification before the deadlines, and that the Faculty accommodate these requests. The list of approved dates is updated annually and is available at Departmental, Dean and Faculty advising offices.

Academic misconduct:

- **Cheating:** University policy states that cheating is a scholastic offence that can result in an academic penalty (which may include expulsion from the program). If you are caught cheating, there will be no second warning. Complete information on the University policies on academic offenses can be found at http://www.westerncalendar.uwo.ca/2016/print_pg113.html
- **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. For more details, see http://www.westerncalendar.uwo.ca/2016/print_pg113.html
- Plagiarism or cheating will not be tolerated. Penalties will vary depending on the seriousness of the offence. They can range from a grade of zero on an assignment or essay, to failure of a course, to expulsion from the University.
- If you have any questions at all on this issue, please consult with your instructor.