Physics 2102B: Introduction to Modern Physics
Winter term 2019-2020

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 Mondays and 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 Assistant (TA) for this course is Chris Wyenberg (PAB311; cwyenber [at] uwo.ca).

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

Lectures: I use the white board and will post the complete lecture notes on WebCT OWL. You will receive lists of suggested problems during the semester.

Calculator: Is required for quizzes 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 are 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: There will be three assignments, planned for Wednesday January 22, Friday February 14, and Friday March 27. 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 electronically. A student may miss a due date *once* during the semester, and hand in the late assignment before the start of the following class without incurring any penalty. No submissions will be accepted after this late submission date.

Term Tests: There will be three in-class term tests, tentatively planned for the following Fridays: January 31, February 28, and March 13. The tests will be during class *and* tutorial time. 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.

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.

Grading:

Assignments	15%
Term Tests	45%
Final Exam	40%

Please note: In order to pass this course, you must obtain (1) a grade of at least 50% over all course components combined AND (2) a grade of at least 50% based solely on the weighted-average of the tests and final exam.
If you fail to obtain a grade of 50% on the weighted average of the tests and final exam, your *maximum* grade in this course will be 48% (i.e. if your final grade is higher than 48%, it will be lowered to 48%).

Final grades will be rounded to the nearest integer, and grades ending in 9 (eg. 69) are *not* automatically "bumped up" by 1 mark.

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

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

Course Calendar/Schedule:

Assignments: January 22, February 14, and March 27

Tests: January 31, February 28, and March 13

Final exam: during the exam period. Details to be announced

Make-up Final Exam: May 2, 9am, WSC55

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.

Unless you have either the requisites 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.

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:

Accommodation and Accessibility:
If you are unable to meet any of the course requirements (including assignments) due to illness or other serious circumstances, you must seek approval for the absence as soon as possible. Approval can be granted either through a self-reporting of absence or via the Dean's Office/Academic Counselling unit of your Home Faculty. If you are a Science

student, the Academic Counselling Office of the Faculty of Science is located in NCB 280, and can be contacted at scibmsac@uwo.ca.

For further information, please consult the university's policy on academic consideration for student absences:
https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Consideration_for_absences.pdf.

If you have received academic accommodation, absences are handled as follows. In case of assignments, no make-up assignments will be provided. The assignments are re-weighted over the remaining assignments. In case of tests, no make-up tests will be provided. In case of one missed test, the weight of the missed test will be distributed over the remaining two tests and in case of two missed tests, the weight will be distributed over the remaining test (+15%) and the final exam (+15%).

If you miss the Final Exam, please contact your faculty's Academic Counselling Office as soon as you are able to do so. They will assess your eligibility to write the Special Exam (the name given by the university to a makeup Final Exam).

You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (see http://www.registrar.uwo.ca/examinations/exam_schedule.html).

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.

This course may use Gradescope, an online collaborative grading and analytic platform. For information on their privacy policy, please visit their website https://www.gradescope.com/privacy.

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.

Support Services:
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 661-2147 if you have any questions regarding accommodations.

The policy on Accommodation for Students with Disabilities can be found here: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_disabilities.pdf

The policy on Accommodation for Religious Holidays can be found here: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf

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.