

Physics 1502B: Enriched Introductory Physics II

Calendar Entry: A calculus-based laboratory course for students intending to pursue further studies in science, particularly the physical sciences. Relativity, the electromagnetic interaction, the strong and weak interactions, oscillations and waves.

Antirequisite(s): [Physics 1021](#), [1029A/B](#), [1302A/B](#), [1402A/B](#).

Prerequisite(s): One of [Physics 1501A/B](#) (preferred) or [Physics 1301A/B](#) or [1401A/B](#), or a minimum mark of 80% in [Physics 1028A/B](#); [Calculus 1000A/B](#) or [1100A/B](#) or [1500A/B](#).

Corequisite(s): [Calculus 1501A/B](#) (preferred) or [Calculus 1301A/B](#), or [Applied Mathematics 1413](#).

Extra Information: 3 lecture hours, 3 laboratory/tutorial hours, 0.5 course.

Note: This course, together with [Physics 1501A/B](#), is a suitable prerequisite for all modules in the Faculty of Science, for modules offered by the basic medical science departments and for professional schools having a Physics requirement.

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.

Brief Course Outline (Topic. *Textbook sections*. Additional material may be provided online.)

1. Electric effects. *Chapters 21–26*.
2. Magnetic effects. *Chapters 27–30*.
3. Oscillations and waves. *Chapters 14–16*.
4. Relativity. *Chapter 37*.
5. Nuclear interactions and particles. *Chapter 44*.

(A detailed syllabus is posted on OWL.)

Course Learning Outcomes

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

- use mathematical language at the level of calculus to solve analytic and quantitative problems in the general topics of electricity & magnetism and oscillations & waves.
- extend and apply Newton's Laws of Motion and the principle of conservation of energy to electromagnetic and wave phenomena.
- develop a coherent microscopic description of electric and magnetic phenomena and use these to generate macroscopic laws.
- use periodic functions to quantify the displacement, velocity, acceleration, and energy in simple harmonic oscillations and waves.
- use the Lorentz transformations to quantify relativistic effects of objects traveling close to the speed of light.
- explain nuclear stability and nuclear processes including fission and fusion.
- use a step-by-step problem-solving strategy underpinned with conceptual understanding to logically work through complex problems.
- reason through conceptual physics problems using clear, concise writing and diagrams.

- perform appropriate experimental set-up, data collection and analysis to investigate a physical relationship.
- apply research skills such as measurement taking, uncertainty propagation, graphical analysis, and written discussion of results in the lab.
- continue in all physical science modules at the second year level with a solid background.

Instructor:

Professor Sarah Gallagher

Physics and Astronomy Building (PAB) Room 205

Office hours: Mondays, 10:30-11:30am; Thursdays, 9:30-10:30am, PAB 205

You can reach me via e-mail at sgalla4@uwo.ca or by phone at 519-661-2111 x86707. When contacting me by e-mail, please use your Western e-mail account. Other accounts (such as hotmail and yahoo) are often tagged as spam and may not reach me. I will miss several lectures during the semester because of travel. As noted in the syllabus, those lectures will be covered by my colleague, Prof. Olga Trichtchenko, who will also be sitting in on many of the lectures. She is not responsible for the course otherwise, and so contact me or the TAs with questions.

Lectures: MWF 9:30-10:30 pm in PAB 148. The first lecture will be on Monday, January 7, 2019 and the last possible lecture will be on Monday, April 8, 2019. I use the chalkboard, a document camera, and slide displays in class. I will do demonstrations most weeks; questions about the demos may appear on the exams. Slides will be posted prior to each class on OWL.

Teaching Assistants: Megan Tannock (mtannock@uwo.ca) and Sham Gamage (smahagam@uwo.ca) are the Teaching Assistants for this course. They will be running the tutorials and doing most of the marking. They will also hold additional office hours.

Textbook: The required textbook is Sears and Zemansky's University Physics with Modern Physics, 13th or 14th edition, by H. D. Young and R. A. Freedman (Addison-Wesley, 2014) available at the UWO Bookstore or elsewhere. The price for the book includes two years of web access to Mastering Physics, but this is not required. A used textbook will not come with access to Mastering Physics. You will also need to purchase the First-Year Laboratory Manual. There is also a solution manual available in the bookstore

Calculator: In contrast to some other first-year courses, there is no specific model of calculator that is required in Physics 1502B. You may use any standard scientific calculator. Note that you may not use a calculator app on a cell phone or other wireless device - only a standard scientific calculator. Please remember to bring it to exams – we don't have loaners.

Tutorials: Physics 1502B has tutorials hosted by the course's Teaching Assistants. They occur on the weeks between labs. The tutorials will be held on Monday afternoons from 3:30-5:30pm in PAB 148 (note the later start time than the labs!) on weeks when there is no laboratory. See the schedule below for more details. You are expected to attend tutorials.

Tutorial sessions are your opportunity to have questions answered and problems worked out by a course Teaching Assistant. Aren't sure how to draw the free-body diagram for a problem? Need some help with an integral? The TA is there to answer your questions. Problems pertaining to

current lecture material will be allocated by the instructor in advance of the tutorial session, and you will be expected to work through them in the session. You may ask the TA for help, and the TA will also solve sample problems for you.

Laboratories: Labs are held alternate Mondays, 2:30-5:30 pm in the Materials Science Addition (MSA) Building. Information about the lab is available on the OWL site: <http://owl.uwo.ca>. The Physics 1502B lab will be a single section. The Physics 1502B laboratory timetable will be posted at the lab OWL site. You must find your correct lab section, lab subsection, and the correct laboratory timetable before attending the first lab.

Direct all laboratory questions to the Laboratory Instructor, Dr. Shailesh Nene: <mailto:physlab1@uwo.ca>

Tutorial / Laboratory / Exam Schedule

<i>Week of</i>	
Jan. 7	free
Jan. 14	Tutorial 1
Jan. 21	Tutorial 2
Jan. 28	Lab: Circuits I
Feb. 4	Tutorial 3
Feb. 11	Tutorial 4: Midterm 1
Feb. 18	Reading Week – no classes, labs or tutorials
Feb. 25	Lab: Circuits II
Mar. 4	Tutorial 5
Mar. 11	Lab: Magnetic Forces
Mar. 18	Tutorial 6: Midterm 2
Mar. 25	Lab: Simple Harmonic Motion
Apr. 1	Tutorial 7
Apr. 8	Tutorial 8: Review for Final

Laboratory Course Materials: You must purchase the First Year Physics Lab Manual

Final Lab Mark: Physics 1502B students are required to complete **all four labs** scheduled for this course. The final lab mark will be the average of the four lab marks.

In order to pass the physics course, a student must obtain a passing grade in the laboratory. In addition, you are required to complete a **minimum of 3 labs** to pass the lab component, and therefore you may not miss more than one lab. Absences will be handled as explained below.

Absences from the Laboratory: A missed lab will be assigned a mark of zero unless it has been excused by an academic counsellor at the Dean's office of your home Faculty. Please submit documentation to the Dean's office within one week of your absence. Academic accommodation cannot be granted by the lab instructor, lab staff or the department.

Make-up labs will not be permitted for the first lab missed. We will simply excuse students who have missed one lab with academic accommodation approved by your Dean's office. For students who miss one lab without approved academic accommodation, a zero mark will be assigned for the missed lab. If you miss more than one lab, please contact the physics laboratory instructor (physlab1@uwo.ca) as soon as possible.

Assignments: You will receive lists of suggested problems during the semester. At times, I will require that you turn in specific problems as assignments; there will be several such assignments during the semester. Students will be allowed to discuss the material amongst themselves, 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 single (one=1) due date once during the semester, and hand in the late assignment on the following lecture day without incurring any penalty. Otherwise, for every 24 hour period or portion thereof for which they are late, assignments will automatically have a third of the maximum number of points subtracted from their total.

Mastering Physics: This online tutoring system will lead you step-by-step through learning material, making sure that you keep pace. An access code is included with your textbook, and you cannot use someone else's code. You should go to <http://www.masteringphysics.com>, choose Young & Freedman's University Physics 14th edition, and enroll in for the course (the course ID will be posted on OWL). The purpose of Mastering Physics is to help you learn, not to test you. Thus, by the time you complete a chapter in Mastering Physics, you should understand all the problems and, hopefully, the general methods that can be applied to any problems in that chapter. It is highly recommended that you use Mastering Physics, but it is optional and no grades will be based on its use.

Clarifications and Office Hours: If you have trouble understanding material, you can catch me after lectures to deal with simpler questions. For more complex questions, you may ask your TA or see me directly during office hours.

Mid-Term Tests: There will be two 1-hr term tests scheduled during tutorial time; the current dates are February 11 and March 18 (subject to change). Bring a calculator and a single 3x5 index card of formulae. The tests will consist of conceptual questions and 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 and to include units.

Final Exam: Three hours long, covers material of the entire course. Bring a calculator and a single 8.5"x11" sheet of paper with formulae. Date, time, and location are to be announced. It will be similar in format to the term tests.

Grading:

Assignments (including tutorial assessments) 18%

Laboratories 12% (Note: In order to pass the course, you must pass the laboratory component.)

Mid-Term Tests 30%

April Exam 40%

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

Course Policies

Electronic Devices: No electronic devices except standard scientific calculators will be allowed during tests and examinations. Calculators may be of any standard scientific type but may not be wireless-capable.

Missed midterm tests: Documentation must be provided to the instructor in order for you to receive permission to write a make-up. This process should be initiated by you bringing the documentation to your student counselling office. If you miss the make-up, again documentation must be provided, and your mark will be pro-rated. See 'Illness or other serious circumstances' below.

Missed final exam: Documentation must be provided to the academic counselors in your faculty in order for you to receive permission to write a make-up (usually scheduled the day following the end of the exam period: plan your travel accordingly!). If you miss the make-up, again documentation must be provided, and you will then write the exam at the next sitting of this course's final exam (typically one year later). See 'Illness or other serious circumstances' below.

Illness or other serious circumstances: 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 the medical section of the Academic Handbook. http://www.uwo.ca/univsec/handbook/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 Record's Release Form (located in the Dean's Office) for visits to Student Health Services. The form can be found at <http://www.uwo.ca/univsec/handbook/appeals/medicalform.pdf>

Students seeking academic accommodation on medical grounds for any missed tests, exams, participation components and/or assignments must apply to the Academic Counselling office of their home Faculty and provide documentation. Academic accommodation cannot be granted by the instructor or department.

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 given in the UWO calendar.

Accessibility Statement: 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 x82147 for any specific question regarding an accommodation.

Registrarial and Support Services: Student Support Services, Student Development Services and the Registrar are available on-line at <http://www.registrar.uwo.ca/> and/or at <http://westernusc.ca/services/>. 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.

Advice for successful performance: Some slides and notes are provided on the web but do not necessarily include everything that might be tested. Some explanations given in class might not appear in the class notes but are testable material. *Regular attendance and active participation in lectures, tutorials, and labs will give you the best learning experience. To do well in this course, you will need to do approximately two to three hours of study and preparation outside of the classroom for each hour of class time.*

Academic misconduct

Cheating: University policy states that cheating is a scholastic offence which can result in an academic penalty (which may include expulsion from the program). If you are caught cheating, there will be no second warning. Cheating includes having available any electronic devices other than a watch. You may not have a cell phone accessible during tests or exams, even to use it as a watch. Complete information on the University policies on academic offenses can be found at the following Web site:

http://www.uwo.ca/univsec/handbook/appeals/scholastic_discipline_undergrad.pdf Computer-marked multiple-choice tests and/or exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

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 the "Scholastic Offence Policy" in the Western Academic Calendar.

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 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>).

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