



Land Acknowledgement

We respectfully acknowledge the Syilx Okanagan Nation and their peoples, in whose traditional, ancestral, unceded territory UBC Okanagan is situated.

PHYS 122: Introductory Physics for the Life Sciences II

Faculty: Irving K. Barber Faculty of Science

Department: Computer Science, Mathematics, Physics, and Statistics

Instructor(s): Dr. John Hopkinson

Instructor(s) Email: john.hopkinson@ubc.ca

Duration: Term 2 Winter 2022

Delivery Modality: In-Person

Course Location: FIP 204

Course Days: Mon/Wed/Fri

Class Hours: 5:00 PM - 6:00 PM

Office hours: Thursdays 10:30 am - 12:30 pm in SCI 258

Other Instructional Staff

| | |
|---|---|
| 1 | Tutorial Leader: Alejandra Fuentes Nunes T0A, T0B, T0C, T0G, T0H (Message through Canvas) |
| 2 | Tutorial Leader: Sandra Popescu T0D, T0E, T0F (Message through Canvas) |
| 3 | Lab Manager: Hiroko Nakahara Physics.Labs@ubc.ca |

Course Description

Introduction to physics primarily for students majoring in the life sciences. Basic concepts of simple harmonic motion, sound, physical and wave optics, electricity, electric circuits, and magnetism with biological applications. Experimental laboratory investigations in electricity, magnetism, waves and optics. Credit will be granted for only one of PHYS 102, PHYS 121 and PHYS 122. Students with PHYS 12 may apply for a tutorial exemption. [3-3-1]

Prerequisite: One of MATH 100, MATH 116 and one of PHYS 111, PHYS 112.

Corequisite: One of MATH 101, MATH 103.

Course Format

This course will have in-person lectures with in-person office hours. The instructor will attempt to record and broadcast the in-person lectures on Zoom and encourages any students who do not feel healthy to stay home and participate virtually. If at any time the instructor does not feel healthy, lectures will transition to online. All tests and the final exam will be in-person unless the University is forced to go online again. All components of this course including labs, lectures, tutorials, tests, homework and final exam will be completed in-person, unless the University goes online again. A student survey will be held online on Jan. 13 and Apr. 5 during class time to encourage participation. The lecture content for Jan. 13, Mar. 3 and Apr. 5 will be covered in online video lectures (with quizzes) posted under assignments on the Canvas web site. The class will not meet in person on these three days.

Video Lectures: Video lectures will be posted on Jan. 13, Mar. 3 and Apr. 5 to the main course shell (Phys 122 101

2022W2) in Canvas. Each short lecture will contain at least one in-video quiz. There will be several short videos each of these days. The goal of these quizzes is to help you stay engaged with the material as you watch the video. You may choose to discuss the questions with classmates prior to submitting a response. It is important to ensure that the final response submitted is your own. To ensure they are counted for credit, in-video quiz questions should be answered the week they are posted. Video lectures are meant to be viewed within platform in which they are posted. These videos are not to be captured, downloaded, or ripped to another format. Distribution of this material to a third party is forbidden.

Course Overview, Content and Objectives

List of Topics:

Oscillations: Simple harmonic motion, pendulae, damped and driven (2 wks) (ch 15, 5, 6, 11)

Waves: mechanical, light, sound, superposition, reflection, standing waves (2 wks) (ch 16, 17)

Wave optics: why light bends, diffraction, thin film interference (2 wks) (ch 18, 20, 28, 29)

Electrostatics: electric charges and the force between them, electric field (1 wk) (ch 21)

Electric potential: potential, potential energy, capacitors (2 wks) (ch 22, 23)

Circuits: DC (AC) circuits, currents, Kirchhoff's laws, resistance, resistors (2 wks) (ch 24, 25)

Magnetic fields: magnetic fields, forces on currents, forces on charges, Ampere's law (1 wk) (ch 26)

Electromagnetic induction: Faraday's law, inducing electric fields in circuits (1 wk) (ch 27)

The number of weeks devoted to a particular topic are approximate. If time permits, we may treat topics with a *.

During lecture, I will try to present material in a clear and logical way, however you must take responsibility for your own learning. Please ensure you are prepared, do the assigned readings. Come to office hours or use the muddiest points and ask questions, ask for clarification and contribute to discussions. The more active you are in the classroom, the more you will benefit from the lectures.

Required reading: A tentative schedule of topics covered by week is posted on main course shell (PHYS 122 101 2022W2) in Canvas. This includes chapters to be covered, suggested readings, homework topics (including when they open and close), tutorial topics (added as we go along) and lab topics with dates listed by week. This will be periodically updated throughout the term. You should consult this schedule and read the suggested chapter readings corresponding to the date in question. In the event we are ahead of, or behind, the tentative schedule you should read the material corresponding to the material that we just covered. You are advised to view this list as required reading that will prepare you for lecture or add depth to the lecture you have participated in. When you read, do not read to try to absorb the knowledge, but read to understand the material, you should continually ask the question, "why is this true?"

Learning Outcomes

Upon successful completion of this course, students will be able to...

1. Understand the conceptual framework of waves, electricity and magnetism.
2. Demonstrate the power and simplicity of effective model building.
3. Make use of developed skills: proportional reasoning, dimensional analysis, physical reasoning, pictorial representations (field lines, vector addition and multiplication), reading for understanding (asking why is this true?), order of magnitude estimation that are critical for every upper year science course.
4. Apply advanced problem-solving, written and verbal communication skills.
5. Apply developed graphical approaches to an understanding areas and slopes.
6. Understand and appreciate the crucial role that experiment plays in the scientific method.
7. Be prepared for any second year physics course.
8. Recognize that physics is everywhere, and see its relevance to their area of study and life!

Assessments of Learning

| | For students in Tutorials: | For students not in tutorials: |
|----------------------------------|----------------------------|--------------------------------|
| Laboratory component: | | |
| Laboratory Experiments | 20% | 22% |
| Lecture component: | | |
| Survey Participation | 1% | 1% |
| Clicker/Quiz Questions | 3% (+ up to 2% bonus) | 5% (+ up to 2% bonus) |
| Muddiest Point | 1% (bonus) | 1% (bonus) |
| Assignments | 10% | 12% |
| Tutorial assignments | 6% | N/A |
| First term indiv. test (Feb. 8) | 8.5% | 8.5% |
| First group test (Feb. 8) | 1.5% | 1.5% |
| Second term indiv. test (Mar. 8) | 8.5% | 8.5% |
| Second group test (Mar. 8) | 1.5% | 1.5% |
| Examination component | | |
| Final Exam: (TBA) | 40% | 40% |

To pass this course you must achieve at least 50% in the laboratory component, and receive a score of at least 40% on the final exam. You cannot receive more than 100% (i.e. 40/40 or 38/38) on the Lecture Component. The final exam period this year will take place from April 17 through Apr. 28 this year, including Saturdays and Sundays. Note: Any requests for changes to final exam times must be sent to the office of the Associate Dean of students (fos.reception.ubco@ubc.ca). Final grades will be based on the evaluations listed above and the final grade will be assigned according to the standardized grading system outlined in the UBC Okanagan Calendar.

Learning Activities

Labs: The lab is your chance to test the ideas that we discuss in class. These in-person labs were developed to bring them closer in content and philosophy to the lecture material, and have been shortened for this year. Detailed information about the grading of the lab marks is given on the Canvas lab shell for Phys 122. Labs start the week of Jan. 23 with an orientation to in-person labs, and each week's lab will be published about a week prior to the scheduled labs. You are expected to read each week's lab and complete the prelab prior to attending your session of the laboratory. Failure to complete the prelab or unexcused lateness prior to entry into your lab session may result in denial of entry. Any students with prior lab credit (i.e. if you passed the lab component of the course previously with a grade of 60% or higher) must fill in an XMT Lab exemption found at <https://cmps.ok.ubc.ca/undergraduate/student-resources/forms/> by Jan. 17 to ensure that they do not need to retake the lab. The lab manual contains a lab syllabus (e.g. what to do if you miss a lab for a valid medical reason, penalties for late submission of work) and a detailed schedule of when labs are due. You must pass the lab to pass the course.

i>Clicker Cloud/Video Quizzes:

We will use the i>Clicker Cloud system during every in-person and online lecture. A maximum of 5% (Tutorial) or 7% (No Tutorial) can be earned through participation in clicker and/or video quiz questions over the course of the term. To earn clicker marks you must set up your i>Clicker through Canvas (<https://lthub.ubc.ca/guides/iclicker-cloud-student-guide/>). You need to sync your i>Clicker Cloud account with our course. Please do this as early as possible! You should frequently check that your i>Clicker scores are non-zero in Canvas (Grades) to ensure that you are correctly operating your i>Clicker Cloud system.

The use of clickers is one way that we encourage your active participation. Educational research has repeatedly demonstrated that active learners are more effective learners. I will also use clickers to motivate some of our discussion topics. I want to hear what you are thinking about material as we cover it, and sometimes to demonstrate that it's expected that you enter first year physics with some core beliefs that seem to explain the phenomena that you encounter on a daily basis, but might not be fully consistent. In this spirit, I will raise some common misconceptions to show how prevalent they are. The clickers will also let me (and you) know in real time if I have gone too quickly over a difficult concept and helps us to focus on how we address these difficulties.

You will gain clicker points for participation on all questions, and additional points for correct answers on most problems for which we have covered the relevant material. I generally encourage you to discuss clicker questions in groups or through chat prior to submitting your answers, unless I specifically ask for individual work. Under no

circumstances should you be clicking for another person in the class, this is a form of academic misconduct that will not be tolerated.

Video Quizzes can be completed during the viewing of the videos. A maximum of 5% (Tutorial) or 7% (No Tutorial) can be earned through participation in clicker and/or video quiz questions over the course of the term. You will gain points for correct answers on most problems. This term we will hopefully only need to use video quizzes as a supplement to live lectures replacing the content of Jan. 13, Mar. 3 and Apr. 5.

Muddiest point: Each Friday following lecture you'll be invited to fill out a survey asking you to describe in one sentence what you found to be the most confusing (or muddiest point) from the past week's lectures, and what you found to be the most interesting point. The survey will be open for 48 hours, and will close Sunday at 15:30. This is a metacognitive activity, presenting you with an opportunity for you to reflect on which concepts you understand and which concepts you have not yet fully grasped. Such activities can help you to become a more effective self-regulated learner in any discipline according to education research. Each week I may show you a few common comments from each side during the synchronous meetings. I'll use this as a starting point for discussions, clarifications and explanatory group problem solving clicker questions. To earn one percent on your grade you are asked to fill out the muddiest point survey for at least three different weeks.

Assignments: This year we will be using Prairie Learn as an online homework system at no cost to you. Most of the problems we'll use have been written by me for use in this course. You will access this system through Canvas. You are encouraged to discuss concepts and approaches to assignment problems with your classmates, as this will benefit both you and the people you have discussions with. However, all work that you submit for grading must be your own. Copying answers to assignment questions from online solution manuals or paid solution services, or providing such solutions to other students is a misrepresentation of your own work and falls under the category of academic misconduct and will be dealt with following the policy on Academic Integrity shown later in this syllabus. For the online assignments you are strongly recommended to sketch answers to each homework question on a sheet of paper, keeping your answers in terms of variables until the last moment. Don't try to solve the problems in your head or using only a calculator, you will learn and retain far more by writing out your solutions in detail. Keep your written solutions as a study reference, and they can also aid in the discussion with me of any unresolved questions you have.

Tutorial Assignments: If you have not previously completed Gr. 12 physics or its equivalent, you must sign up for and attend a weekly tutorial section. All students registered in tutorials will have 6% of their grade determined by their tutorial score. Tutorials are low stakes problem solving sessions where you are invited to actively discuss and come to consensus with group members on how to approach the problems of the week, giving you practice extracting useful information from a word problem and putting into practice problem solving strategies.

All work that you submit for grading must be in your own words (not your group's nor the solutions'). At the end of each in-person tutorials you will be expected to hand in your work to your TA. At the beginning of each tutorial session (except the first one) you will be given a marking rubric and will be given 10 minutes to grade your peer's paper from the previous week, with a marking rubric from which you will grade your peer's paper. You will receive marks for both the work on your own tutorial (90%), and the fair grading of your peer's work (10%). It is not acceptable behaviour to copy solutions from other students. It is not acceptable behaviour to upload tutorial questions to internet question and answer paid tutorial systems like Chegg. It is not acceptable behaviour to search the internet for solutions to answers to tutorial questions, nor to copy any parts of such solutions and represent it as your own work. Such behaviour is an example of academic misconduct (see the section on Academic Integrity below) and violators of this policy will have their names submitted to the Dean's office following a meeting with me. If you miss your tutorial session, you may attend a different tutorial session for that week. Tutorial work submitted after the completion of all tutorials for the week may not be graded. No work submitted after the next week's tutorials have begun will be considered. Students with Gr. 12 physics who register for XM2 designation will still be able to download and work through the weekly problem sets for practice, but will not receive credit for them.

Term tests: Individual tests will be scheduled during our in-person lecture time (5:00-5:30 pm) on Feb. 8 and Mar. 8 in FIP 204. We will use two-stage testing during our tests. In two-stage testing you are given an individual test for 30 minutes followed by a group test for the remaining class time (5:30-5:50 pm) once the individual tests have been collected on the same day. This encourages you to actively think about challenging questions, and come to a group consensus on the correct answer. Once the individual tests have been collected you will quickly form into a group of 3-4 students, and raise your hand for a group test paper. A scientific calculator will be permitted. While you are encouraged to prepare for exams by studying with fellow students, no form of communication between students will be allowed during the individual exam period, and multiple versions of tests may be used to discourage copying. A formula sheet will be provided for all tests and exams.

Course schedule

A tentative course schedule by day is posted on Canvas.

Late policy

Late tutorial assignment sheets will not be accepted for any reason. If you miss your tutorial but can attend a different tutorial that week, please do. If you are ill, please do not attend your tutorial while ill, but submit a UBC declaration of absence due to illness or injury, (https://students.cms.ok.ubc.ca/wp-content/uploads/sites/90/2019/06/student_declaration_of_absence_due_to_illness_201861804.pdf), and your tutorial score for that week will be dropped.

Late assignments are not accepted by Prairie Learn. If you feel that you have a legitimate reason for missing ONE assignment deadline, send me an email prior to the deadline, and I will look into whether it is possible within this new system to extend your attempt time period.

Missed exam policy

Students who miss a final exam must contact the Office of the Dean (fos.students.ubco@ubc.ca) as soon as possible with supporting documentation. Forms for an Out-of-time-exam and a Request for Deferred Standing are found at: <https://science.ok.ubc.ca/student-resources/undergrad/student-forms/>.

Missed Activity Policy:

If you miss a midterm for a legitimate reason, email me with documentation that explains your absence (a doctor's note or a UBC declaration of absence due to illness or injury (https://students.cms.ok.ubc.ca/wp-content/uploads/sites/90/2019/06/student_declaration_of_absence_due_to_illness_201861804.pdf), explaining that illness or injury prevented you from completing the midterm for example). In this event, your missing midterm score will be replaced with an average of your scores on your other midterms and your score on the final exam. Please do not attend any midterm if you are ill.

Passing/Grading Criteria

To pass this course you must achieve at least 50% in the laboratory component, and receive a score of at least 40% on the final exam.

Learning Materials

An e-Text of this textbook (University Physics for the Life Sciences first edition, ISBN 9780135821343) for this course can be purchased from the bookstore (<https://bookstore.ubc.ca/textbooks>) and should cost \$59.14 for the term if you do not still have access from purchasing it in your first semester. Note that you should buy it from the bookstore rather than directly from Pearson because it is cheaper at the bookstore. If you took Phys 112 in first term this year you likely do not need to buy another textbook for this course. If you took Phys 112 last year and still have an active access code, you can register for this term's course at: <https://mlm.pearson.com/enrollment/hopkinson15237>. Note that we are not using Mastering Physics this year. If you contact Pearson Support, give them the course ID: hopkinson15237.

If you would like a physical copy of an earlier version of this text, "University Physics for the Life Sciences Update Edition", Knight, Jones and Field, (ISBN 9781323807903), the Green Text (the used bookstore UNC 103) may be selling these, or possibly physical copies of the full first edition textbook.

All students must purchase a lab manual by the first day of the lab (the week of Jan. 23) at the Used Bookstore (GreenText and More, UNC 103). If the lab manuals are sold out, then you must talk to the used bookstore, who will print the lab manuals for you.

Learning Resources

Some previous tests and final exams with solutions are posted on our Canvas website. If you are looking for another perspective on a physics concept you could also try looking at algebra-based texts available in our library: “College Physics”, by Eugenia Etkina, Michael Gentile and Alan Van Heuvelen, 1st edition, Pearson Education, 2014, QC21.3 .E85 2014, which has nice discussions on how to read physics texts, how the scientific process works, and clear demonstrations with QR codes; or “College Physics” by R. A. Freedman, T. G. Ruskell, P. R. Kesten and D. L. Tauck, 2014, QC21.3 .F745 2014, which does a good job of relating physics concepts to biological applications and of discussing common first term misconceptions. Another potentially useful free resource is “College Physics”, by P. Urone, R. Hinrichs, K. Dirks and M. Sharma, OpenStax College, 21 June 2012. This is an open source text that is of reasonably high quality on many topics. Free electronic copies (pdf) of this text can be downloaded from the openstax website (openstax.org). You could also look at Knight’s physical sciences (calculus-based) text: Physics for scientists and Engineers: a strategic approach: with modern physics, QC23.2 .K654 2008 or QC23.2 .K65 2013.

Other Course Policies

Academic Integrity

The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work. Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise and harsh sanctions are imposed. **For example, incidences of plagiarism or cheating usually result in a failing grade or mark of zero on the assignment or in the course.** Careful records are kept to monitor and prevent recidivism.

A more detailed description of academic integrity, including the University’s policies and procedures, may be found in the Academic Calendar at: <http://www.calendar.ubc.ca/okanagan/index.cfm?tree=3,54,111,0>

Final Examinations

You can find the [Senate-approved term and examination dates here](#). Except in the case of examination clashes and hardships (three or more formal examinations scheduled within a 27-hour period) or unforeseen events, students will be permitted to apply for out-of-time final examinations only if they are representing the University, the province, or the country in a competition or performance; serving in the Canadian military; observing a religious rite; working to support themselves or their family; or caring for a family member. Unforeseen events include (but may not be limited to) the following: ill health or other personal challenges that arise during a term and changes in the requirements of an ongoing job.

Further information on Academic Concession can be found under Policies and Regulation in the Okanagan Academic Calendar <http://www.calendar.ubc.ca/okanagan/index.cfm?tree=3,48,0,0>

Grading Practices

Faculties, departments, and schools reserve the right to scale grades in order to maintain equity among sections and conformity to University, faculty, department, or school norms. Students should therefore note that an unofficial grade given by an instructor might be changed by the faculty, department, or school. Grades are not official until they appear on a student’s academic record.

<http://www.calendar.ubc.ca/okanagan/index.cfm?tree=3,41,90,1014>

Resources to Support Student Success:

UBC Okanagan Disability Resource Centre

The DRC facilitates disability-related accommodations and programming initiatives to remove barriers for students with disabilities and ongoing medical conditions. If you require academic accommodations to achieve the objectives of a course please contact the DRC at:

UNC 215 250.807.8053

Email: drc.questions@ubc.ca

Web: www.students.ok.ubc.ca/drc

UBC Okanagan Equity and Inclusion Office

Through leadership, vision, and collaborative action, the Equity & Inclusion Office (EIO) develops action strategies in support of efforts to embed equity and inclusion in the daily operations across the campus. The EIO provides education and training from cultivating respectful, inclusive spaces and communities to understanding unconscious/implicit bias and its operation within campus environments. UBC Policy 3 prohibits discrimination and harassment on the basis of BC's Human Rights Code. If you require assistance related to an issue of equity, educational programs, discrimination or harassment please contact the EIO.

UNC 325H 250.807.9291

Email: equity.ubco@ubc.ca

Web: www.equity.ok.ubc.ca

Student Wellness

At UBC Okanagan health services to students are provided by Student Wellness. Nurses, physicians and counsellors provide health care and counselling related to physical health, emotional/mental health and sexual/reproductive health concerns. As well, health promotion, education and research activities are provided to the campus community. If you require assistance with your health, please contact Student Wellness for more information or to book an appointment.

UNC 337 250.807.9270

Email: healthwellness.okanagan@ubc.ca

Web: www.students.ok.ubc.ca/health-wellness

Office of the Ombudperson

The Office of the Ombudperson for Students is an independent, confidential and impartial resource to ensure students are treated fairly. The Ombuds Office helps students navigate campus-related fairness concerns. They work with UBC community members individually and at the systemic level to ensure students are treated fairly and can learn, work and live in a fair, equitable and respectful environment. Ombuds helps students gain clarity on UBC policies and procedures, explore options, identify next steps, recommend resources, plan strategies and receive objective feedback to promote constructive problem solving. If you require assistance, please feel free to reach out for more information or to arrange an appointment.

UNC 328 250.807.9818

Email: ombuds.office.ok@ubc.ca

Web: www.ombudsoffice.ubc.ca

Student Learning Hub

The Student Learning Hub is your go-to resource for free math, science, writing, and language learning support. The Hub welcomes undergraduate students from all disciplines and year levels to access a range of supports that include **tutoring in math, sciences, languages, and writing, as well as help with study skills and learning strategies**. Students are encouraged to visit often and early to build the skills, strategies and behaviors that are essential to being a confident and independent learner. For more information, please visit the Hub's website.

LIB 237 250.807.8491

Email: learning.hub@ubc.ca

Web: www.students.ok.ubc.ca/slh

The Global Engagement Office

The Global Engagement Office provides advising and resources to assist International students in navigating immigration, health insurance, and settlement matters, as well as opportunities for intercultural learning, and resources for Go Global experiences available to all UBC Okanagan students, and more.

Come and see us – we are here to help! You may also contact geo.ubco@ubc.ca

Safewalk

*Don't want to walk alone at night? Not too sure how to get somewhere on campus? Call Safewalk at **250-807-8076**.*

For more information, see: www.security.ok.ubc.ca

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