



COURSE OUTLINE

1. **Course:** PHYS 397, Applied Physics Laboratory I - Fall 2021

Lecture 01: MW 15:00 - 15:50 in ES 443

Instructor	Email	Phone	Office	Hours
Dr Timothy Friesen	timothy.friesen@ucalgary.ca	403 220-6123	SB 513	W 10:30 - 11:30 (via Zoom)

In Person Delivery Details:

PHYS 397 will be offered entirely in-person. Details on each of the course components can be found below.

Office hours will be online via Zoom. In-person appointments can be arranged when needed.

Re-Entry Protocol for Labs and Classrooms:

To limit the spread of COVID-19 on campus, the University of Calgary has implemented safety measures to ensure the campus is a safe and welcoming space for students, faculty and staff. The most current safety information for campus can be found [here](#).

Course Site:

D2L: PHYS 397 L01-(Fall 2021)-Applied Physics Laboratory I

Please use the D2L discussion boards for all questions on course content or logistics.

Note: Students must use their U of C account for all course correspondence.

2. **Requisites:**

See section [3.5.C](#) in the Faculty of Science section of the online Calendar.

Prerequisite(s):

3 units from Physics 211, 221 or 227; and Physics 229 or 325.

3. **Grading:**

The University policy on grading and related matters is described in [F.1](#) and [F.2](#) of the online University Calendar.

In determining the overall grade in the course the following weights will be used:

Component(s)	Weighting %
Laboratory experiments	40
Laboratory notebook	3
Writing project*	30
Lab exam (week of Nov. 29th)	10
Peer review	10
Peer evaluations	2
Presentations	5

*The writing project grade is broken down into the following components:

Literature review - 3%

Annotated literature review - 3%

Paper outline - 4%

First draft - 5%

Final paper - 10%

Letter to the editor 5%

Each piece of work (reports, assignments, quizzes, midterm exam(s) or final examination) submitted by the student will be assigned a grade. The student's grade for each component listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade.

The conversion between a percentage grade and letter grade is as follows.

	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
Minimum % Required	95 %	90 %	85 %	80%	75%	70 %	65 %	60%	55%	50 %	45 %

The University of Calgary offers a [flexible grade option](#), Credit Granted (CG) to support student's breadth of learning and student wellness. Faculty units may have additional requirements or restrictions for the use of the CG grade at the faculty, degree or program level. To see the full list of Faculty of Science courses where CG is not eligible, please visit the following website: <https://science.ucalgary.ca/current-students/undergraduate/program-advising/flexible-grading-option-cg-grade>

4. Missed Components Of Term Work:

The university has suspended the requirement for students to provide evidence for absences. Please do not attend medical clinics for medical notes or Commissioners for Oaths for statutory declarations.

In the event that a student legitimately fails to submit any online assessment on time (e.g. due to illness etc...), please contact the course coordinator, or the course instructor if this course does not have a coordinator to arrange for a re-adjustment of a submission date. Absences not reported within 48 hours will not be accommodated. If an excused absence is approved, one possible arrangement is that the percentage weight of the legitimately missed assignment could also be pro-rated among the components of the course. This option is at the discretion of the coordinator and may not be a viable option based on the design of this course.

If you feel sick, or think you might be sick, DO NOT come to the lecture/tutorial/laboratory. Please contact the instructor and your TA as soon as possible to inform them that you will not be able to attend your lab. You will not be penalized for missing a lab due to illness and arrangements will be made on a case-by-case basis. You should also inform your group of the situation as soon as you can.

Missed Laboratory

If you expect you will miss a scheduled laboratory session please email your assigned TA and CC the course instructor as soon as possible. It is imperative to inform your group and your TA as soon as possible so that alternative arrangements can be made.

If you unexpectedly miss your scheduled laboratory session, please email your TA and CC the course instructor within 48 hours after the date of the missed lab. Students are NOT allowed to attend a lab section different than their own without prior approval.

5. **Scheduled Out-of-Class Activities:**

There are no scheduled out of class activities for this course.

6. **Course Materials:**

Assignments, laboratory documents, and supporting lecture material will be posted on the course D2L website.

In order to successfully engage in their learning experiences at the University of Calgary, students taking online, remote and blended courses are required to have reliable access to the following technology:

- A computer with a supported operating system, as well as the latest security, and malware updates;
- A current and updated web browser;
- Webcam/Camera (built-in or external);
- Microphone and speaker (built-in or external), or headset with microphone;
- Current antivirus and/or firewall software enabled;
- Stable internet connection.

For more information please refer to the UofC [ELearning](#) online website.

7. **Examination Policy:**

There is no registrar scheduled final exam in this course.

The laboratory exam will be an individual in-person evaluation of lab skills and knowledge.

Students should also read the Calendar, [Section G](#), on Examinations.

8. **Approved Mandatory And Optional Course Supplemental Fees:**

There are no mandatory or optional course supplemental fees for this course.

9. **Writing Across The Curriculum Statement:**

For all components of the course, in any written work, the quality of the student's writing (language, spelling, grammar, presentation etc.) can be a factor in the evaluation of the work. See also [Section E.2](#) of the University Calendar.

10. **Human Studies Statement:**

Students will not participate as subjects or researchers in human studies.

See also [Section E.5](#) of the University Calendar.

11. **Reappraisal Of Grades:**

A student wishing a reappraisal, should first attempt to review the graded work with the Course coordinator/instructor or department offering the course. Students with sufficient academic grounds may request a reappraisal. Non-academic grounds are not relevant for grade reappraisals. Students should be aware that the grade being reappraised may be raised, lowered or remain the same. See [Section I.3](#) of the University Calendar.

- a. **Term Work:** The student should present their rationale as effectively and as fully as possible to the Course coordinator/instructor within **ten business days** of either being notified about the mark, or of the item's return to the class. If the student is not satisfied with the outcome, the student shall submit the Reappraisal of Graded Term work form to the department in which the course is offered within 2 business days of receiving the decision from the instructor. The Department will arrange for a reappraisal of the work within the next ten business days. The reappraisal will only be considered if the student provides a detailed rationale that outlines where and for what reason an error is suspected. See sections [I.1](#) and [I.2](#) of the University Calendar
- b. **Final Exam:** The student shall submit the request to Enrolment Services. See [Section I.3](#) of the University Calendar.

12. **Other Important Information For Students:**

- a. **Mental Health** The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness and academic success, and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when

needed. We encourage you to explore the mental health resources available throughout the university community, such as counselling, self-help resources, peer support or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre, [Mental Health Services Website](#)) and the Campus Mental Health Strategy website ([Mental Health](#)).

- b. **SU Wellness Services:** For more information, see www.ucalgary.ca/wellnesscentre or call [403-210-9355](tel:403-210-9355).
- c. **Sexual Violence:** The Sexual Violence Support Advocate, Carla Bertsch, can provide confidential support and information regarding sexual violence to all members of the university community. Carla can be reached by email (syva@ucalgary.ca) or phone at [403-220-2208](tel:403-220-2208). The complete University of Calgary policy on sexual violence can be viewed at (<https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Sexual-and-Gender-Based-Violence-Policy.pdf>)
- d. **Misconduct:** Academic integrity is the foundation of the development and acquisition of knowledge and is based on values of honesty, trust, responsibility, and respect. We expect members of our community to act with integrity. Research integrity, ethics, and principles of conduct are key to academic integrity. Members of our campus community are required to abide by our institutional [Code of Conduct](#) and promote academic integrity in upholding the University of Calgary's reputation of excellence. Some examples of academic misconduct include but are not limited to: posting course material to online platforms or file sharing without the course instructor's consent; submitting or presenting work as if it were the student's own work; submitting or presenting work in one course which has also been submitted in another course without the instructor's permission; borrowing experimental values from others without the instructor's approval; falsification/fabrication of experimental values in a report. Please read the following to inform yourself more on academic integrity:

[Student Handbook on Academic Integrity](#)
[Student Academic Misconduct Policy](#) and [Procedure](#)
[Research Integrity Policy](#)

Additional information is available on the [Student Success Centre Academic Integrity page](#)

e. **Academic Accommodation Policy:**

It is the student's responsibility to request academic accommodations according to the University policies and procedures listed below. The student accommodation policy can be found at: <https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Student-Accommodation-Policy.pdf>

Students needing an accommodation because of a disability or medical condition should communicate this need to Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities: <https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Accommodation-for-Students-with-Disabilities-Procedure.pdf>.

Students needing an accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, by filling out the [Request for Academic Accommodation Form](#) and sending it to Dr. David Feder by email phas.ahugrd@ucalgary.ca preferably 10 business days before the due date of an assessment or scheduled absence.

- f. **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). Students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information, see [Legal Services](#) website.
- g. **Student Union Information:** [VP Academic](#), Phone: [403-220-3911](tel:403-220-3911) Email: suvpaca@ucalgary.ca. SU Faculty Rep., Phone: [403-220-3913](tel:403-220-3913) Email: sciencerep@su.ucalgary.ca. [Student Ombudsman](#), Email: ombuds@ucalgary.ca.
- h. **Surveys:** At the University of Calgary, feedback through the Universal Student Ratings of Instruction ([USRI](#)) survey and the Faculty of Science Teaching Feedback form provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses. Your responses make a difference - please participate in these surveys.
- i. **Copyright of Course Materials:** All course materials (including those posted on the course D2L site, a course website, or used in any teaching activity such as (but not limited to) examinations, quizzes, assignments, laboratory manuals, lecture slides or lecture materials and other course notes) are protected by law. These materials are for the sole use of students registered in this course and must not be redistributed. Sharing these materials with anyone else would be a breach of the terms and conditions

governing student access to D2L, as well as a violation of the copyright in these materials, and may be pursued as a case of student academic or [non-academic misconduct](#), in addition to any other remedies available at law.

Additional Information

Course description

The goal of this course is to develop experimental physics skills including experimental control, data collection and analysis, experimental uncertainty, and scientific communication. Laboratory experiments cover a range of topics including oscillations and waves, basic electronics, spectroscopy, and vacuum systems.

Lectures

Monday and Wednesday lectures will be used to cover physics topics needed for the labs as well as report writing and scientific communication skills. See the schedule below for an overview of the topics each week.

Tutorials

Friday Tutorial sessions will give you a first introduction to the apparatus for the following week's lab. A TA will be present to answer questions and provide clarifications about the following week's lab and ensure you are prepared. You will be expected to be fully prepared and be familiar with the apparatus before starting each laboratory experiment.

Laboratory Experiments and Reports

Laboratory experiments and reports will be completed in groups of 2 or 3. These groups will stay the same throughout the term unless adjustments are required. Laboratory reports are due **1 week from the start of the lab**. Reports are completed as a group with equal contributions from each group member.

Laboratory manuals will be available on D2L. Each individual student must read over the laboratory exercise, understand the concepts, procedure, and how to use the apparatus before their lab. Each laboratory exercise is accompanied by Pre-lab Questions that each student must complete individually and submit to D2L before the start of their lab.

Laboratory notebook

Each student is expected to keep a laboratory notebook (electronic or hard copy). Prior to leaving each laboratory a **pdf** copy of your notes must be submitted to the relevant notebook folder on D2L. These notes must be in pdf format, either converted from another digital format (eg. Excel or Word) or as a scan/picture of your notes.

Taking detailed notes is a critical element of experimental physics. These notes should include a detailed record of the steps performed (in this case anything not clearly laid out in the lab manual), important parameters, observations, challenges encountered, or anything else that may be relevant. All data should be kept, even if it is believed to be taken with errors. You never know what data may be useful or what parameters you may need to refer to in your report.

Writing Project

Your group will rewrite one of your laboratory reports as a formal report resembling scientific paper. This paper should include a proper introduction, theoretical background, results, analysis, and citations. In addition to being evaluated by a TA, the paper will be assigned anonymous peer reviewers in class who will provide a reasonable critique. The instructor will take the role of an editor, ensuring the anonymity of the process.

The DC Circuits 2 and Vacuum Technology labs will not be included in the pool of options and Pendulum I and II will be considered as one lab for the purposes of the report.

The first step of the writing project will be to conduct a literature review and produce a list of references/bibliography due on **October 4th at 21:59**. Your choice of laboratory experiment does not have to be finalized at this stage and you may include references relating to multiple labs as you explore your options. The second step will be to produce an annotated literature review, due **October 18th at 21:59**, that includes a concise summary of each reference and explains its value or relevance (or lack there-of).

The final choice of the laboratory for your write-up must be communicated to the instructor by submitting the paper outline (Dropbox "Paper Outline") no later than **November 1st at 21:59**. Not everyone can write a report on the same laboratory and the topic choice is granted on the first-come, first-serve basis.

The first draft of the paper will be due on **November 15th at 21:59**. The papers with all the comments will be returned to students on **November 22nd**. The final paper, accompanied by the letter to the editor that includes responses to reviewers' comments and justification of the choices whether or not to include them is due on **December 6th at 21:59**. The paper is worth 20% of the final grade, with 5% being awarded for the first draft (due on November 15th) and 15% awarded for the final product (10% for the final paper, 5% for the letter to the editor).

Peer review

The editor/instructor will assign each student a writing project draft for peer review. This process will be anonymous with all communication going through the editor/instructor. Details on how to act as a peer reviewer will be discussed during lectures. The peer reviewers' comments will not affect your writing project grade. The reviewers' comments, however, will be graded on their feedback under "Peer Review" section of the grading scheme.

Presentations

At the end of the term, each group will choose a recent* published physics experiment to present to the class. The presentations can be an overview of the experiment or on one particular experimental detail or technique.

*recent is defined as having been published within the lifetime of the youngest group member.

Peer evaluation

Experimental physics is almost never done alone and working effectively together in a group is a key skill (as it is outside the lab!). The majority of the grade components in PHYS 397 are from group work but each of those grades will be weighted by a peer evaluation from your group members. Three times during the term you will fill in a peer evaluation of each of your group members as well as a self-evaluation. Completion of all peer evaluations throughout the term will be worth 2% of your final grade.

These evaluations will then be used to weigh your final Laboratory Experiments and Writing Project grades.

Lab exam

The laboratory exam will consist of a set of lab skill and content questions. These exams will be conducted in your laboratory time slot during the week of Nov. 29th in your regular lab room. Further details on the exam will be provided following Reading week and there will be a review tutorial session on the Friday preceding the Lab exams.

Course Schedule

Week starting	Laboratory experiment	Lecture Content (Monday + Wednesday)	Friday Tutorial	Writing Project Deadlines (due Monday at 21:59)
9/6/2021	No labs	Intro (Wed. Sept. 8th)	Uncertainty and the Pendulum	
9/13/2021	Pendulum I	Measurement uncertainty, report writing	Creating Models and Forming Hypothesis	
9/20/2021	Pendulum II	Writing project discussion, DC circuits		
9/27/2021	No labs	DC circuits, library introduction	DC circuits	
10/4/2021	DC circuits 1	AC waveforms and phase	Oscilloscope	Literature Review
10/11/2021	Oscilloscope	Oscilloscope and AC circuits	AC circuits	
10/18/2021	AC Circuits	Waves, impedance, reflection	Travelling Waves	Annotated Literature Review
10/25/2021	Travelling waves	Atomic spectra, interferometry	Spectroscopy	
11/1/2021	Spectroscopy	Writing project discussion	DC circuits 2	Paper outline
11/8/2021	Reading Week			
11/15/2021	DC Circuits 2	Peer review discussion, vacuum systems	Vacuum systems	First Draft
11/22/2021	Vacuum Technology	Presentation discussion, CERN antimatter factory virtual tour	Lab exam review	Peer reviews
11/29/2021	Lab exams	Presentations		
12/6/2021	Make-up labs	Presentations		Final paper + Letter to Editor

Course Incomes:

Students coming into PHYS 397 will be expected to:

- apply calculus, trigonometry, and algebra to solve problems
- make physically motivated approximations
- catalogue and discuss fundamental interactions between systems

- state and apply principles of momentum and energy conservation
- explain how interactions between systems affect motion

Course Outcomes:

- Operate a voltmeter, ammeter, and oscilloscope to measure current, voltage, resistance and phase in simple AC/DC circuits
- Explain how measurement devices function including voltmeters, ammeters, and oscilloscopes
- Characterize and construct simple passive DC and AC circuits including voltage dividers, high, low, bandpass, and notch filters
- Explain the operation of laboratory instrumentation used in physics research
- Collaborate in a group to execute laboratory experiments.
- Demonstrate proper laboratory techniques including data acquisition, analysis of data and uncertainty, and safe operation of equipment
- Clearly and accurately communicate concepts and arguments in writing

Electronically Approved - Aug 31 2021 16:18

Department Approval

Electronically Approved - Sep 01 2021 17:35

Associate Dean's Approval