



## COURSE OUTLINE

### 1. **Course:** PHYS 397, Applied Physics Laboratory I - Fall 2019

Lecture 01: MW 15:00 - 15:50 in ST 126

Instructor	Email	Phone	Office	Hours
Dr. Anna Harlick	anna.harlick@ucalgary.ca	403 220-8648	SB 533	MWF 1:00 pm - 2:00 pm

LEC 1	MW 15:00 - 15:50	ST 126
LAB 1	T 9:00 - 11:50	ST 029
LAB 2	T 14:00 - 16:50	ST 029
LAB 3	R 9:00 - 11:50	ST 029
TUT 1	F 10:00 - 10:50	ST 029
TUT 2	F 11:00 - 11:50	ST 029
TUT 3	F 14:00 - 14:50	ST 029

#### Course Site:

D2L: PHYS 397 L01-(Fall 2019)-Applied Physics Laboratory I

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

Phys 397 is a course that covers introduction to experimental control, data collection and analysis, fundamentals of experimental uncertainty and error propagation, and scientific communication. The laboratories cover a range of topics, from oscillations and waves, through spectroscopy, basic electronic, and vacuum and other experimental systems.

### 2. **Requisites:**

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

#### Prerequisite(s):

Physics 227 and 229.

### 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	Weighting [%]	Comments
Laboratory Experiments and Reports	40	see: Laboratory Schedule
Laboratory Workbook	3	see: Laboratory Workbook
Assignments	12	see: Assignment Schedule
Writing Project	20	see: Writing Project
Laboratory Exam	10	scheduled during week of December 2nd during laboratory time
Peer Review	10	feedback on presentations (5%) and paper (5%)
Laboratory Preparation Exercises	3	
Peer Evaluations	2	see: Writing Project

There is no registrar scheduled final exam in this course.

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 %

Each element of work submitted by the student will be assigned a grade. The grade for each component listed above will be combined with the indicated weights (check proper sections for detail grade distribution) to produce an overall percentage for the course, which will be used to determine the course letter grade.

The marks for each component will be posted on D2L. Marks that appear on D2L will be used to determine the course grade. **Missing or incorrectly posted grades should be reported to the TA (Laboratory Reports/Laboratory Preparation Exercises) or to the course instructor within 10 business days** from either being notified about the grade or having the item returned in class/lab.

Note: The final weight of the Writing Project is determined according to the *Peer Evaluations*.

#### 4. Missed Components Of Term Work:

In the event that a student misses the midterm or any course work due to illness, supporting documentation, such as a medical note or a statutory declaration will be required (see [Section M.1](#); for more information regarding the use of statutory declaration/medical notes, see [FAQ](#)). Absences must be reported within 48 hrs.

The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in [Section 3.6](#). It is the student's responsibility to familiarize themselves with these regulations. See also [Section E.3](#) of the University Calendar.

Missed laboratories can be made up during the week of **November 25th, 2019** (during regular lab slots) and individual reports on those labs have to be submitted within 7 days of the make up laboratory date. Bearing extenuated circumstances only one experiment can be made up. In order to apply for a make up lab and e-mail to the course instructor, cc-ing the TA, needs to be submitted no later than **7** days prior to the make up session (so **before** November 19th for the Tuesday sections and **before** November 21st for the Thursday section).

Missed assignments can be submitted within **24 hours** from the due date, with 20% penalty. Assignments submitted after 24h mark will not be accepted.

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

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

#### 6. Course Materials:

Laboratory write-ups, with theoretical backgrounds, class notes, rubrics, assignments and all additional resources will be posted on D2L.

#### 7. Examination Policy:

**There is no registrar schedule exam in this course.**

**Laboratory Exam** is done **in pairs** with each person submitting their own notes and write ups.

**Laboratory Exam** is an open resources exam. Laboratory reports, notes, electronic devices, access to computers and internet, and consultation with lab exam partner are all allowed.

Pairing for the laboratory exam is done by request if **both parties requesting attended the "Laboratory Exam Preparation Session"** (last tutorial prior to the exam). Students missing the tutorial should be prepared to complete laboratory exam either alone or with a random partner who also didn't attend the tutorial (depending on the class numbers).

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.

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## 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 **10 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 immediately submit the Reappraisal of Graded Term work form to the department in which the course is offered. The department will arrange for a re-assessment of the work if, and only if, the student has sufficient academic grounds. 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 Center:** The Students Union Wellness Centre provides health and wellness support for students including information and counselling on physical health, mental health and nutrition. For more information, see [www.ucalgary.ca/wellnesscentre](http://www.ucalgary.ca/wellnesscentre) or call [403-210-9355](tel:403-210-9355).
- c. **Sexual Violence:** The University of Calgary is committed to fostering a safe, productive learning environment. The Sexual Violence Policy (<https://www.ucalgary.ca/policies/files/policies/sexual-violence-policy.pdf>) is a fundamental element in creating and sustaining a safer campus environment for all community members. We understand that sexual violence can undermine students' academic success and we encourage students who have experienced some form of sexual misconduct to talk to someone about their experience, so they can get the support they need. 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 ([svsa@ucalgary.ca](mailto:svsa@ucalgary.ca)) or phone at [403-220-2208](tel:403-220-2208).
- d. **Misconduct:** Academic misconduct (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under [Section K](#). Student Misconduct to inform yourself of definitions, processes and penalties. Examples of academic misconduct may include: submitting or presenting work as if it were the student's own work when it is not; submitting or presenting work in one course which has also been submitted in another course without the instructor's permission; collaborating in whole or in part without prior agreement of the instructor; borrowing experimental values from others without the instructor's approval; falsification/ fabrication of experimental values in a report. **These are only examples.**
- e. **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on [assembly points](#).

- f. **Academic Accommodation Policy:** Students needing an accommodation because of a disability or medical condition should contact Student Accessibility Services in accordance with the procedure for accommodations for students with disabilities available at [procedure-for-accommodations-for-students-with-disabilities.pdf](#).

Students needing an accommodation in relation to their coursework or to fulfill requirements for a graduate degree, based on a protected ground other than disability, should communicate this need, preferably in writing, to the Associate Head of the Department of Physics & Astronomy, Dr. David Feder by email phas.ahugrd@ucalgary.ca or phone 403-220-8127. Religious accommodation requests relating to class, test or exam scheduling or absences must be submitted no later than **14 days** prior to the date in question. See [Section E.4](#) of the University Calendar.

- g. **Safewalk:** Campus Security will escort individuals day or night (See the [Campus Safewalk](#) website). Call [403-220-5333](#) for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- h. **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.
- i. **Student Union Information:** [VP Academic](#), Phone: [403-220-3911](#) Email: [suvpaca@ucalgary.ca](mailto:suvpaca@ucalgary.ca). SU Faculty Rep., Phone: [403-220-3913](#) Email: [sciencerep@su.ucalgary.ca](mailto:sciencerep@su.ucalgary.ca). [Student Ombudsman](#), Email: [ombuds@ucalgary.ca](mailto:ombuds@ucalgary.ca).
- j. **Internet and Electronic Device Information:** Unless instructed otherwise, cell phones should be turned off during class. All communication with other individuals via laptop, tablet, smart phone or other device is prohibited during class unless specifically permitted by the instructor. Students that violate this policy may be asked to leave the classroom. Repeated violations may result in a charge of misconduct.
- k. **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.
- l. **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.

## Class Schedule

WEEK	LABORATORY EXPERIMENT	LECTURES [ST126]			ITEMS DUE [DROPBOX SUBMISSION]
	[ST029]	DATE	&		
TUTORIALS [ST 029]					
5 Sep - 7 Sep	---	F	6-Sep	Introduction to Measurement and Uncertainty	
9 Sep - 13 Sep	INTRODUCTORY LAB (PENDULUM I)	M	9-Sep	<b>MBTI in Academia - Dr. Jo-Anne Brown</b>	
		W	11-Sep	<b>Introduction/Uncertainty Propagation/ Lab Reports</b>	
		F	13-Sep	Creating Models and Forming Hypothesis	
16 Sep - 20 Sep	PENDULUM II	M	16-Sep	<b>Library Introduction, ROOM: TFDL 440D</b>	
		W	18-Sep	<b>Spectroscopy</b>	Assignment #1, 23:59
		F	20-Sep	Vacuum Components and Systems	
23 Sep		M	23-Sep	<b>Diversity - Dr. Laleh Bejah</b>	

- 27 Sep	VACUUM TECHNOLOGY	W	25-Sep	<b>X-Ray Diffraction</b>	
		F	27-Sep	<i>Interferometers</i>	
30 Sep - 4 Oct	SPECTROSCOPY	M	30-Sep	<b>Scientific Communication</b>	Assignment #2, <b>23:59</b>
		W	2-Oct	<b>Peer Review Process</b>	
		F	4-Oct	<i>X-Ray Spectrometer</i>	
7 Oct - 11 Oct	X-RAY DIFFRACTION	M	7-Oct	<b>Hall Effect and Magnetic Hysteresis</b>	
		W	9-Oct	<b>Ohm's Laws and Kirchoff's Rules</b>	
		F	11-Oct	<i>Multimeters and Wiring</i>	
14 Oct - 18 Oct	HALL EFFECT AND MAGNETIC HYSTERESIS	M	14-Oct	---	
		W	16-Oct	<b>Voltage Dividers and Thevenin's Equivalence</b>	Assignment #3, <b>23:59</b>
		F	18-Oct	<i>Resistors in Series and in Parallel</i>	
21 Oct - 25 Oct	VOLTAGE SOURCES AND VOLTAGE DIVIDERS	M	21-Oct	Phasors	
		W	23-Oct	Phasors	
		F	25-Oct	<i>Introduction to Oscilloscope</i>	
28 Oct - 1 Nov	AC MEASUREMENTS AND SOURCES	M	28-Oct	<b>Waves and Superposition</b>	
		W	30-Oct	<b>AC Circuit Analysis</b>	
		F	1-Nov	<i>Fourier Synthesiser</i>	Assignment #4, <b>23:59</b>
4 Nov - 8 Nov	TRAVELING WAVES OR RLC CIRCUIT	M	4-Nov	<b>RLC Resonance</b>	Peer Evaluation #1, <b>23:59</b>
		W	6-Nov	<b>Fourier Series</b>	
		F	8-Nov	<i>Consultations</i>	
11 Nov - 15 Nov	Reading Week - No lectures, laboratories or tutorials				
18 Nov - 22 Nov	FOURIER SERIES	M	18-Nov	<b>Scientific Communication</b>	First Draft, <b>20:59</b>
		W	20-Nov	<b>Presentations Workshop</b>	
		F	22-Nov	<i>Peer Review Practice</i>	Peer Evaluation #2, <b>23:59</b>
25 Nov - 29 Nov	MAKE UP LABORATORIES	M	25-Nov	<b>Scientific Communication</b>	Paper Peer Review, <b>23:59</b>
		W	27-Nov	<b>Presentations</b>	
		F	29-Nov	<i>Laboratory Exam Review</i>	
2 Dec - 6 Dec	LABORATORY EXAM	M	2-Dec	<b>Presentations</b>	
		W	4-Dec	<b>Presentations/Group Work</b>	Presentations Peer Review (5), <b>23:59</b>
		F	6-Dec	---	Final Paper + Letter to the Editor + Peer Evaluation #3, <b>23:59</b>

## Lab Write-ups

Lab write-ups are prepared by the Department of Physics and Astronomy and will be posted on Desire2Learn. Each student should bring either hard or digital copy of the write-up to the lab.

## Pre-labs

Pre-labs are to be completed and submitted individually in the beginning of the lab, prior to starting the experiment.

## Group Work

When you come to the first lab session, your lab section will be organized into groups of 2 or 3 (3 is preferred).

Your group will remain the same during the term. The group will work as a team, sharing tasks such as setting up apparatus, taking measurement data, and keeping a running record of the experiment. No group member should be an idle “third wheel” during the session. The intention is to finish the data taking in the 3-hour period, and also move ahead as much as possible with a **single write-up for the group**, clearly indicating everyone's contributions to the report. Keep in mind, that at the end you will have to take an individual laboratory exam, which will test your proficiency with the equipment and measurement techniques, so you have to ensure that you have a chance to learn. Three times during the semester (see schedule below) you will be asked to complete a peer assessment form.

### Laboratory Workbook

Each student is expected to keep a **Laboratory Workbook** (electronic or hard copy). The complete workbook, with all the data, discussion comments, iterations, and any information reflecting work in the lab is to be submitted at the end of semester for evaluation.

Prior to leaving the laboratory a copy of your results (excel/word file or a scan/picture of your notes, in .pdf format) are to be submitted to your group dropbox on D2L.

### Laboratory reports

Nine laboratory experiments will require submission of a laboratory report (experiments 1,2 and 4-10).

Laboratory reports are **due in the beginning of the next lab, one week after the date of lab completion**. Group members will meet during that week, perhaps electronically, to accomplish this. (It is possible for students to book group study space in the *TFDL* or *EEEL*, you can also use room ST 025 for meetings). Use a word processor you are comfortable with to write your lab report.

Each member of the group will receive the same mark. **A caution: Teamwork within a single lab group is expected. However, your group should work independently of other lab groups.** Unduly similar reports received from different groups could result in charges of academic misconduct against the students involved.

Results of the 3rd laboratory experiment (Vacuum Systems) will be presented in a form of an ignite style presentation at the end of the semester (details on D2L and during class).

### Laboratory grades

As your term work items accumulate, your marks will be posted on the Physics 397 grades website. Check this posting regularly. Missing or incorrectly posted term work scores should be reported to your TA not later than **10 business days** after they have been posted.

Assignment Schedule

Assignment #	[%] Value	Topic	Due Date
1	4	Uncertainty	on September 18th, 2019, 23:59
2	2	Bibliography	on September 30th, 2019, 23:59
3	4	Annotated Bibliography	on October 16th, 2019, 23:59
4	2	Paper Outline (digital)	on or <b>before</b> November 1st, 2019, 23:59

Assignments are to be submitted to appropriate dropboxes. Assignment #4 is a group assignment. If Assignment #4 is submitted prior to October 16th, students will get a chance to receive feedback and resubmit without any penalties.

### Writing Project

You will rewrite one of your laboratory reports (any of Laboratories 2 - 8) as a formal report resembling scientific paper. This paper should include 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 would provide reasonable critique. The instructor take a role of an editor, ensuring anonymity of the process.

The choice of the laboratory has to be communicated to the instructor by submitting the paper outline (Dropbox "Paper Outline") no later than **NOVEMBER 1st, 2019, 23:59**. NOTE: This outline is graded as one of the assignments. 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 submission of the paper will be due on **NOVEMBER 18th, 2019, 20:59**.

The papers with all the comments will be returned to students on **NOVEMBER 25th, 2019**.

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, 2019, 23:59**.

The paper is worth 20% of the final grade\*, with 5% being awarded for the first draft (one due on November 20th) and 15% awarded for the final product (10% for the final paper, 5% for the letter to the editor).

The peer reviewers' comments will not affect your grade. The reviewers comments, however, will be graded on their feedback under "Peer Review" section of the grading scheme.

\*Peer Evaluations are due after each milestone for the group project is submitted (see Schedule for detailed dates). They are submitted on the Peer Evaluation forms provided on D2L. Peer Evaluations are an important factor in assessing the weighting for the group project.

### **Laboratory Exam**

Laboratory exam will consist of three new experiments related to the experiments done during the semester. It is meant to test skills in designing simple experiments, setting up equipment and collecting data necessary for measurements. Details on the exam will be provided during the week of November 25th in class and during laboratory preparation sessions.

### **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;
- recognize and apply basic principles of electromagnetism;

### **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

Department Approval:

Electronically Approved

Date: 2019-08-28 19:18

Associate Dean's Approval for out of regular class-time activity:

Electronically Approved

Date: 2019-08-29 12:22