



COURSE OUTLINE

1. **Course:** PHYS 397, Applied Physics Laboratory I - Fall 2020

Lecture 01: MW 15:00 - 15:50 - Online

Instructor	Email	Phone	Office	Hours
Dr. Anna Harlick	anna.harlick@ucalgary.ca	403 220-8648	SB 533	MW 10:00 - 11:00 (general), Friday 10:00 - 11:00 (PHYS 397)

In Person Delivery Details:

Laboratories are delivered in person and require the students presence on campus during the appropriate laboratory section.

LAB 01 : Tuesday, 9:00 - 11:59

LAB 02: Tuesday, 14:00 - 16:59

LAB 03: Thursday, 9:00 - 11:59

Laboratory experiments will be placed in three different rooms (ST 029, ST 030, ST 032), with students rotating between the rooms. The maximum occupancy of a laboratory room is **8** people. The students are required to **only** be present in the rooms they are assigned according to the schedule presented in Table 1.1.

All students, instructors, and teaching assistants are required to wear masks during the laboratories. Hand and equipment sanitizing products will be available in the laboratory rooms.

The students will be asked to wipe all surfaces (desks and chairs) before and after the experiments. A member of the instructional team will be responsible for sanitizing the equipment after each laboratory session.

Failure to comply with the health and safety rules of the University of Calgary, Faculty of Science, and the Laboratory will result in a request to leave the laboratory and a grade of zero for the experiment.

All experiments will be performed individually. The students will be divided into working groups within their rooms and will be asked to submit **one laboratory report** per group. Laboratory reports are due at the beginning of the next lab, one week after the date of the experiment. Group members will meet online to accomplish the task. Use a word processor you are comfortable with to write your lab report.

Each member of the group will receive the same mark for the laboratory report. **Teamwork within a single lab group is expected, however, each group should work independently of other lab groups.**

Table 1.1 PHYS 397 Rotating Laboratory Schedule

		ST 029	ST 030	ST 032
Week 01	07-Sep	T01 Pendulum I	T02 Oscilloscope	T03 Pendulum I
	08-Sep			
	09-Sep	R01 Pendulum I	R02 Oscilloscope	R03 Pendulum I
	10-Sep			
	11-Sep			
Week 02	14-Sep	T03 Pendulum II	T01 Oscilloscope	T02 Pendulum I
	15-Sep			
	16-Sep	R03 Pendulum II	R01 Oscilloscope	R02 Pendulum I
	17-Sep			
	18-Sep			
Week 03	21-Sep	T02 Pendulum II	T03 Oscilloscope	T01 Pendulum II
	22-Sep			
	23-Sep	R02 Pendulum II	R03 Oscilloscope	R01 Pendulum II
	24-Sep			
	25-Sep			
Week 04	28-Sep	T03 Spectroscopy	T01 Traveling Waves	T02 X-Rays
	29-Sep			
	30-Sep	R03 Spectroscopy	R01 Traveling Waves	R02 X-Rays
	01-Oct			
	02-Oct			

Week 05	05-Oct	T02 Spectroscopy	T03 Traveling Waves	T01 X-Rays
	06-Oct			
	07-Oct			
	08-Oct	R02 Spectroscopy	R03 Traveling Waves	R01 X-Rays
09-Oct				
Week 06	12-Oct	T01 Spectroscopy	T02 Traveling Waves	T03 X-Rays
	13-Oct			
	14-Oct			
	15-Oct	R01 Spectroscopy	R02 Traveling Waves	R03 X-Rays
16-Oct				
Week 07	19-Oct	T02 Fourier Series	T03 Circuit 2	T01 Circuit 1
	20-Oct			
	21-Oct			
	22-Oct	R02 Fourier Series	R03 Circuit 2	R01 Circuit 1
23-Oct				
Week 08	26-Oct	T01 Fourier Series	T02 Circuit 2	T03 Circuit 1
	27-Oct			
	28-Oct			
	29-Oct	R01 Fourier Series	R02 Circuit 2	R03 Circuit 1
30-Oct				
Week 09	02-Nov	T03 Fourier Series	T01 Circuit 2	T02 Circuit 1
	03-Nov			
	04-Nov			
	05-Nov	R03 Fourier Series	R01 Circuit 2	R02 Circuit 1
06-Nov				
Week 10	09-Nov	READING BREAK		
	10-Nov			
	11-Nov			
	12-Nov			
	13-Nov			
Week 11	16-Nov			
	17-Nov			
	18-Nov			
	19-Nov			
	20-Nov			
Week 12	23-Nov	Lab Exams		
	24-Nov			
	25-Nov			
	26-Nov			
	27-Nov			
Week 13	30-Nov	Lab Exams		
	01-Dec			
	02-Dec			
	03-Dec			
	04-Dec			
Week 14	07-Dec			
	08-Dec			
	09-Dec			

Online Delivery Details:

Some aspects of this course are being offered in real-time via scheduled meeting times. For those aspects you are required to be online at the same time.

Laboratory Tutorial Videos and/or Presentations, familiarizing students with the equipment, discussing safety, and providing guidelines to the experiment will be recorded and posted on D2L under "Laboratory Tutorials". Each student is responsible for watching/reviewing the appropriate material prior to attending the experiment.

The following documents will be available:

Table 1.2 List of available video tutorials/ instructions with dates of availability

Video	Laboratory	Date Available
Introduction to Oscilloscope Video Instructions	AC Measurements and Sources	September 1st
Interferometers		

Video Instructions	Spectroscopy	September 22nd
X-Ray Spectrometer Video Instructions	X-Ray Spectroscopy	September 22nd
Multimeters and Wiring Video Instructions	Voltage Sources and Dividers RLC Circuit	October 13th
RLC Circuits Video Instructions	RLC Circuit	October 13th
Fourier Synthesizer Video Instructions	Fourier Series	October 13th

Lecture material will be divided between the asynchronous lectures covering theoretical concepts related to each experiment. As not everyone will do the experiments at the same order, the responsibility to review the appropriate material lies with the student. A list of asynchronous lectures is provided in Table 1.3.

Table 1.3. Asynchronous class recordings with dates of availability

Video	Laboratory	Date Available
Uncertainty Propagation		September 1st
Report Writing		
Pendulum	Pendulum	
Spectroscopy	Spectroscopy	September 21st
X-Ray Diffraction	X-Ray Diffraction	
Traveling Waves	Traveling Waves	
Waves and Superposition	Fourier Series	September 28th
Phasors	RLC Circuit/ Fourier Series	
Fourier Series	Fourier Series	
Electric Current	Voltage Sources and Dividers // RLC Circuit	October 5th
Voltage and Current Dividers	Voltage Sources and Dividers	
Ohm's Law and Kirchoff's Rules	Voltage Sources and Dividers	
Thevenin's Equivalence	Voltage Sources and Dividers	
AC Circuits	RLC Circuit	
RLC Circuit	RLC Circuit	

Synchronous lectures will be happening during the regular class slot (15:00 - 15:50) according to the schedule shown in Table 1.4. All synchronous classes will be recorded and posted on D2L.

Table 1.4 Synchronous Classes

		Zoom Room	981 1812 6306
Week 01	07-Sep		
	08-Sep		
	09-Sep	Introductory Class	
	10-Sep		
	11-Sep		
Week 02	14-Sep	Creating Models and Forming Hypothesis	
	15-Sep		
	16-Sep	Library Introduction - <i>Jennifer Lee</i>	
	17-Sep		
Week 03	18-Sep		
	21-Sep	Writing a proposal	
	22-Sep		
	23-Sep		
	24-Sep		
Week 04	25-Sep		
	28-Sep	Scientific Communication	
	29-Sep		
	30-Sep		
	01-Oct		
Week 05	02-Oct		
	05-Oct	Peer Review Process	
	06-Oct		
	07-Oct		
	08-Oct		
Week 06	09-Oct		
	12-Oct	Peer Review Practice	
	13-Oct		
	14-Oct		
	15-Oct		
Week 07	16-Oct		
	19-Oct	Presentation Workshop	
	20-Oct		
	21-Oct		

	22-Oct	
	23-Oct	
Week 08	26-Oct	Oral Exam Practice
	27-Oct	
	28-Oct	Consultations
	29-Oct	
	30-Oct	
Week 09	02-Nov	Consultations
	03-Nov	
	04-Nov	Consultations
	05-Nov	
	06-Nov	
Week 10	09-Nov	READING BREAK
	10-Nov	
	11-Nov	
	12-Nov	
	13-Nov	
Week 11	16-Nov	Consultations
	17-Nov	
	18-Nov	
	19-Nov	
	20-Nov	
Week 12	23-Nov	Publications and Language - <i>Dr. Katharina Koch</i>
	24-Nov	
	25-Nov	
	26-Nov	
	27-Nov	
Week 13	30-Nov	Presentations
	01-Dec	
	02-Dec	Presentations
	03-Dec	
	04-Dec	
Week 14	07-Dec	Presentations
	08-Dec	
	09-Dec	

Course Site:

D2L: PHYS 397 L01-(Fall 2020)-Applied Physics Laboratory I

TopHat: F2020PHYS397L01 - Join Code **086574**

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:

Course Component	[%]	Notes
Laboratory Reports [5]	25	Pendulum 1, Pendulum 2, Spectroscopy, X-Rays, Traveling Waves
Laboratory Worksheets [4]	10	Oscilloscope, DC Circuits, AC Circuits, Fourier Series
Laboratory Workbook	3	Appropriate pages due at the end of each laboratory
Pre-Lab Worksheets [9]	5	Due: Monday at 21:59 for <u>Tuesday</u> Sections, Wednesday at 21:59 for <u>Thursday</u> Sections
Peer Evaluations [3]	2	Due at 21:59 on: September 28 (Monday of Week 04), October 19 (Monday of Week 07), November 16 (Monday of Week 11), November 30 (Monday of Week 13), December 9 (Last day of classes)
Assignments	10	Assignment 1: Literature Review [2%], Due September 28 at 21:59 Assignment 2: Annotated Literature Review [6%], Due October 19 at 21:59 Assignment 3: Paper Outline [2%], Due <u>on or before</u> November 2 at 21:59
Peer Reviews	10	Review of the 1st draft of the paper [5%], Due November 24 at 21:59 Review of 4 presentations [5%], Due December 9 at 21:59
Writing Project	20	1st draft of the paper [5%], Due November 16 at 21:59 Final Paper [10%] + Letter to the Editor [5%], Due December 9 at 21:59
Lab Exam	10	Online self-reflection + lab skill and content questions [5%] - asynchronous opens at 9:00 on November 16, closes 9:00 am on November 23 Individual discussion via Zoom Meeting - scheduled during laboratory sessions during Weeks 12 and 13 (Nov 24/26 and Dec 1/3)
Presentation	5	Ignite-style (5 minutes) group presentation on the chosen experiment, scheduled during Weeks 11, 12 and 13

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 (Lab Reports) or to the course instructor within 10 business days from being notified about the grade.**

NOTE: Total final mark of the Writing Project is determined according to the *Peer Evaluations*.

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, then the percentage weight of the legitimately missed assignment could also be pro-rated among the components of the course.

Missed laboratories can be made up during the week of November 16th, 2020 (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 **November 6th, 2020** at 21:59.

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

Laboratory reports are due at the beginning of the next laboratory session. Extensions and late submissions are

to be discussed in the TAs are granted at their discretion.

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, videos, and all additional resources will be posted on D2L.

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.

All work submitted in the course, whether submitted individually or as a group, is expected to be original. Proper references are required where appropriate.

Any suspicious activities will be reported and investigated according to Section K, "Integrity and Conduct" of the "Academic Regulations" section of the University of Calgary Calendar.

<https://www.ucalgary.ca/pubs/calendar/current/k.html>

Laboratory Exam consisting of online evaluation of laboratory skills and techniques AND self-reflection on one's learning followed by a one-on-one discussion with the instructor via Zoom will be administered during weeks 11 (online portion) and 12 & 13 (discussions, according to schedule).

By taking the exam student declares that they are completing their work by themselves, with the aid of notes, textbooks, lectures, and other course approved online resources, with no third party involved in their evaluation. This includes no use of file sharing websites and services that are not affiliated with the University of Calgary.

The format of the Laboratory Exam will be discussed in class. A rubric for the evaluation of the discussion will be provided.

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 Center:** 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 (svsa@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/policies/files/policies/sexual-violence-policy.pdf>)
- 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. **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](tel: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.

- 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 Course Information

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 a hard or a digital copy of the write-up to the lab.

Pre-labs

Pre-labs are to be completed and submitted individually on tophat and are due on the evening preceding the laboratory report.

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 the 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.

Writing Project

You will rewrite one of your laboratory reports or worksheets 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 would provide a reasonable critique. The instructor take the role of an editor, ensuring the 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 2nd, 2020, 21:59. NOTE: This outline is graded as Assignment #3.

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 16th, 2020 at 21:59.**

The papers with all the comments will be returned to students on **NOVEMBER 25th at 2020.**

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 9h, 2020 at 21:59.**

The paper is worth 20% of the final grade*, with 5% being awarded for the first draft (one due on November 16th) 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 final grade for the group project.

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 25 2020 13:04

Department Approval

Electronically Approved - Aug 26 2020 15:33

Associate Dean's Approval