



## COURSE OUTLINE

### 1. **Course:** PHYS 497, Applied Physics Laboratory II - Winter 2021

Lecture 01: WF 12:00 - 12:50 - Online

Instructor	Email	Phone	Office	Hours
Dr Michael Wieser	<a href="mailto:mwieser@ucalgary.ca">mwieser@ucalgary.ca</a>	403 220-3641	SB 131	Please contact me via email to schedule virtual office hours.

#### **In Person Delivery Details:**

In-person laboratory experiments will begin the week of February 22nd in ST 030 and ST 032 in the Registrar scheduled laboratory sections B01 (MW 14:00 to 16:50) and B02 (MW 09:00 to 11:50).

There are four laboratory exercises that are essential to this course (Op-Amps, Op-Amps I/V, Difference Amplifiers, Comparator). **In the case that on-campus operations are suspended due to Covid-19 restrictions, these four labs will be completed after the Winter 2021 term but before the Fall 2021 semester.** Multiple scheduling options will be available to students to complete the in-person laboratory component and scheduling details will be available before the end of the Winter 2021. In the case that the completion of these four labs must be completed after the Winter 2021 term, you will receive a DFT (Deferred Term Work) grade until the in-person laboratory for these four exercises has been completed. If you fail to complete the in-person lab component before the Fall 2021 semester you will receive a zero on the laboratory component of the course.

#### **Re-Entry Protocol for Labs and Classrooms:**

To limit the spread of COVID-19 on campus, the University of Calgary has implemented an Instructional Space Re-Entry Protocol that must be followed. Details are found in the [Covid-19 Protocol for Class and Lab re-entry.pdf](#) document. **Online Delivery Details:**

This course is being offered online in real-time via scheduled meeting times, you are required to be online at the same time.

To help ensure Zoom sessions are private, do not share the Zoom link or password with others, or on any social media platforms. Zoom links and passwords are only intended for students registered in the course. Zoom recordings and materials presented in Zoom, including any teaching materials, must not be shared, distributed or published without the instructor's permission.

Synchronous lectures will be delivered on Wednesday and Friday from 12:00 to 12:50 on-line via Zoom.

Arduino-based experiments will be conducted off-campus in a virtual classroom. Instructions on how to pick up the Arduino kits will be made in class on January 18th.

#### **Course Site:**

D2L: PHYS 497 L01-(Winter 2021)-Applied Physics Laboratory II

**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):**

Physics 397; and Mathematics 433 or Physics 435.

### 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 %	Date
Laboratory*	45	
Arduino Exercises	10	
Midterm Exam (Written 10 % + Oral 5 %)	15	Written March 16; Oral March 17
Assignments (5)	30	

\*All laboratories are in-person. There are four laboratory exercises that are essential to this course (Op-Amps, Op-Amps I/V, Difference Amplifiers, Comparator). **In the case that on-campus operations are suspended due to Covid-19 restrictions, these four labs will be completed after the Winter 2021 term but before the Fall 2021 semester.** Multiple scheduling options will be available to students to complete the in-person laboratory component and scheduling details will be available before the end of the Winter 2021. In the case that the completion of these four labs must be completed after the Winter 2021 term, you will receive a DFT (Deferred Term Work) grade until the in-person laboratory for these four exercises has been completed. If you fail to complete the in-person lab component before the Fall 2021 semester you will receive a zero on the laboratory component of the 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
<b>Minimum % Required</b>	95 %	90 %	85 %	80%	75%	70 %	65 %	60%	55%	50 %	45 %

#### 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.

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

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

#### 6. Course Materials:

Physics 497 Course Notes (R. B. Hicks) available on D2L.

Other useful reference books include:

Electronics: Circuits Amplifiers and Gates, 2nd Edition, D.V. Bugg, CRC Press.  
 The Art of Electronics, Paul Horowitz and Winfield Hill, Cambridge University Press.  
 The Fast Fourier transform and its applications, E. Oran Brigham, Prentice-Hall.  
 Schaum's Outline of Electric Circuits, M. Nahvi and J.A. Edminster, McGraw-Hill.  
 Building Scientific Apparatus, John H. Moore, C.C. Davis and M.A. Coplan, Cambridge University Press.

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 one midterm examination in this course with written and oral components. The questions will be available electronically at 08:00 on Monday, March 15. Written solutions are due by 24:00 on Tuesday, March 16 and are worth 10 % of the course grade. There will be a 10-minute oral examination via Zoom based on the questions and your written responses worth 5 % of the course grade. The oral examinations will be scheduled in advance and take place during your normal laboratory period on Wednesday, March 17. The exam is to be completed individually. You are free to consult your notes and course notes distributed on D2L. You may not access the internet to solve the examination questions.

There is no final examination in this course.

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](http://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](mailto: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 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:** 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](mailto: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.

- 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](mailto:suvpaca@ucalgary.ca). SU Faculty Rep., Phone: [403-220-3913](tel:403-220-3913) Email: [sciencerep@su.ucalgary.ca](mailto:sciencerep@su.ucalgary.ca). [Student Ombudsman](#), Email: [ombuds@ucalgary.ca](mailto: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.

**Arduino Exercises:** For the first few weeks of the course, we will work on learning the basics of micro-controllers with the Arduino microcontroller kits. Instructions on how to get the Arduino kits will be announced the week of January 18<sup>th</sup>. The exercises will be posted on the D2L website prior to the date of the experiment. There are four Arduino-based experiments that we will work on during the scheduled laboratory periods beginning February 1<sup>st</sup>.

#### Arduino Exercises

1	Introduction	01-Feb
2	Piezoes and Speakers	03-Feb
3	PWM Motor Control	08-Feb
4	PWM Sound and Registers	10-Feb

**Laboratory Experiments:** In-person experiments will begin the week on February 22<sup>nd</sup>. There are two laboratory exercises scheduled every week as shown in the table below. The laboratory manual is available on the course D2L pages. Your completed laboratory reports are submitted for grading on the course D2L dropbox.

#### Laboratory Experiment

1	DC circuits	22-Feb
2	AC circuits	24-Feb
3	Waveforms/Phase	01-Mar
4	LRC Filters	03-Mar
5	Transformers	08-Mar
6	Op-amps	10-Mar
7	OpAmps I/V	15-Mar
8	<i>Midterm Exam – Oral</i>	17-Mar
9	Bandwidth	22-Mar
10	Difference Amplifier	24-Mar
11	Comparator	29-Mar
12	Active filters	31-Mar
13	DFT	05-Apr
14	Phase detection	12-Apr

**Assignments:** There are five assignments spread over the semester. The questions will be distributed via D2L and responses must be submitted electronically to the D2L dropbox.

### Course Learning Incomes:

Before beginning this course, students should be able to:

- Manipulate complex algebraic expressions;
- Solve second-order linear ordinary differential equations;
- Analyze DC circuits using Ohm's law and Kirchhoff's law;
- Use Fourier series to represent analytic functions;
- Set up and conduct university-level physics experiments.

### Course Outcomes:

- Proficiently use standard electronic lab equipment (oscilloscope, multimeter, etc.) to test and troubleshoot electrical circuits in an individual (non-group) laboratory setting
- Build functional electrical circuits incorporating passive components, operational amplifiers, digital components and discrete semiconductor devices
- Predict the behavior of networks of passive electrical components (resistors, capacitors, inductors, power supplies) and operational amplifiers (including limited non-ideal effects) using AC phasor analysis
- Explain how discrete semiconductor devices operate and demonstrate their use in simple circuits
- Describe and design digital signal acquisition chains
- Analyze digital data using frequency-domain (Fourier) methods and convolution

Electronically Approved - Jan 08 2021 14:39

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### Department Approval

Electronically Approved - Jan 10 2021 10:32

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### Associate Dean's Approval