



COURSE OUTLINE

1. **Course:** PHYS 497, Applied Physics Laboratory II - Winter 2019

Lecture 01: WF 12:00 - 12:50 in ST 129

| Instructor | Email | Phone | Office | Hours |
|----------------|---------------------|--------------|--------|------------------|
| Michael Wieser | mwieser@ucalgary.ca | 403 220-3641 | SB 131 | R 11:00 to 13:00 |

Course Site:

D2L: PHYS 497 L01-(Winter 2019)-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.

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 (13 weeks, 2 sessions per week) | 50 | |
| Midterm Tests (2 in-class tests) | 20 | February 06 and March 27 |
| Assignments (6) | 30 | |
| | | |

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 % |

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 N.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.

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.

7. **Examination Policy:**

The two term tests in Phys 497 are closed-book 50 minute tests. They are tentatively scheduled for February 6th and March 27th during regularly scheduled lecture time. Calculators and a one-sided single-page equation/notes sheet are permitted. There will be no final exam 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 **15 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 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) 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](tel: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 (FOIPPA). 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](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: suvpaca@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.

- 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.

Course Description

Intermediate laboratory electronics. AC circuit theory and semiconductor devices, including operational amplifiers. Digital sampling theory and frequency-domain signal processing. Computer automation of experimental control, data collection, and analysis, including error analysis and error propagation.

| Week | Lecture Topics | Laboratory | Date |
|--|--|---|------------------------|
| 1 | Introduction, DC circuits | No Lab | Jan 10-11 |
| 2 | DC Equivalent circuits (Norton and Thévenin) AC circuits chapter 1: AC sources and waveforms | Orientation/briefing DC circuits | Jan 14-15 Jan 16-17 |
| 3 | AC circuits chapter 2: Phasor analysis AC circuits chapter 3,6: Impedance in series; AC equivalent circuits | AC circuits RC circuits | Jan 21-22 Jan 23-24 |
| 4 | AC circuits chapter 4,5: RLC circuits AC circuits chapter 7: Power dissipation, transformers | RLC circuits Transformers | Jan 28-29 Jan 30-31 |
| 5 | Op-amps chapter 1: Introduction to op-amps Term test #1 on DC and AC circuit theory on February 6 | Transistors Op-amps | Feb 04-05 Feb 06-07 |
| 6 | Op-amps chapter 1: Operational amplifier (op-amp) circuits Op-amps chapter 1: Differential amplifiers | Integrator Bandwidth | Feb 11-12 Feb 13-14 |
| Reading week Feb 18-22 - No lectures or labs | | | |
| 7 | Op-amps chapter 1: Filters and op-amp bandwidth limitations Op-amps chapter 4.5: Sampling and aliasing | Comparator Difference Amp | Feb 25-26 Feb 27-28 |
| 8 | Op-amps chapter 2.3,2.4: Transfer functions, Fourier transforms Op-amps chapter 3: Fourier transform applications and filtering, Spectral estimation and wavelets | Active filters Linearity | Mar 04-05 Mar 06-07 |
| 9 | Op-amps chapter 4.5 - 4.7: Narrow-band signals and modulation Op-amps chapter 4.1-4.4: Digitization | Swept generator DFT Phase detection | Mar 11-12 Mar 13-14 |
| 10 | Term test #2 on March 27 covers weeks 1-9 Semiconductors chapter 1.1-1.2: Semiconductor basics | Intro to digital Digital instruments | Mar 18-19 Mar 25-27 |

| | | | |
|----|---|---|------------------------|
| 11 | Semiconductors chapter 1.2: Junctions and diodes | Intro to PLL | Apr 01-02 |
| | Semiconductors chapter 1.3: Transistors | PLL synthesis | Apr 03-04 |
| 12 | Semiconductors chapter 1.5: Transistor applications Field Effect Transistors | Soldering/Mechanical Make-up missed labs | Apr 08-09 Apr 10-11 |

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 laws - Use Fourier series to represent analytic functions Set up and conduct university-level physics experiment.

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

Department Approval:

Electronically Approved

Date: 2019-01-05 16:12

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

Electronically Approved

Date: 2019-01-07 08:55