UNIVERSITY OF CALGARY
FACULTY OF SCIENCE
DEPARTMENT OF PHYSICS AND ASTRONOMY
COURSE OUTLINE

1. **Course: Physics 497, Applied Physics Laboratory II**

Lecture Sections:

L01: MW, 11:00-11:50, KNB 128 Dr. Christopher Cully Office: SB 631, Telephone: 403-220-6088
Office hours: MW 12:00-12:50, SB 631
Email: cmcully@ucalgary.ca

Lab sections:

Lab01: MW, 14:00-16:50 ES002B
Lab02: TR, 14:00-16:50 ES002B
Lab03: TR, 11:00-13:50 ES002B

Lab Instructor: Pat Irwin, Physics Senior Laboratory, ES02, 403-220-6864, pjirwin@ucalgary.ca

Course website Desire 2 Learn (D2L) site is PHYS 497 L01 – W2015PHYS497L01

Departmental Office: SB 605, 403-220-5385, phasugrd@ucalgary.ca

2. **Prerequisites:** Physics 397, Applied Physics Laboratory I
See calendar: http://www.ucalgary.ca/pubs/calendar/current/physics.html

3. **Grading: Grading:** The University policy on grading and related matters is described sections F.1 and F.2 of the online University Calendar. In determining the overall grade in the course the following weights will be used:

Laboratory (13 weeks, 2 sessions per week)	50%
Midterm tests (2 in-class tests, dates below)	20%
Assignments (4)	30%

Percentage grades will be given for all elements of term work and examinations in Physics 497. A weighted course percentage will be calculated for each student after the course ends. The weighted course percentage will be converted to a letter grade using the following scheme:

> = 95 %	A +	> = 80 %	B +	> = 65 %	C +	> = 50 %	D +
> = 90 %	A	> = 75 %	B	> = 60 %	C	> = 45 %	D
> = 85 %	A -	> = 70 %	B -	> = 55 %	C -	< 40 %	F

4. **Missed Components of Term Work:** 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 himself/herself with these regulations. See also Section E.6 of the University Calendar

5. **Scheduled out-of-class activities:** There are no scheduled activities outside of class time. The scheduled class time on Fridays from 11-11:50 will not be used for lectures, but may be used for the midterm tests (tentatively Feb. 13) and for optional tutorials.

6. **Course Materials:** *"Electronics: Circuits Amplifiers and Gates", 2nd Edition, by D.V. Bugg, CRC Press*
Physics 497 Course Notes, R.B. Hicks, available on D2L.

Useful reference books:

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 13th and March 25th from 11:00 to 11:50 in KNB 128. Calculators and a one-sided single-page "crib sheet" are permitted. There will be no final exam in this course. Students should also read the Calendar, Section G, on Examinations.

8. **Writing across the curriculum:** In this course, the quality of the student's writing in laboratory reports will be a factor in the evaluation of those reports. See also Section E.2 of the University Calendar.

9. OTHER IMPORTANT INFORMATION FOR STUDENTS:

(a) 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.

(b) Assembly Points: In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on assembly points.

(c) Academic Accommodation Policy: Students with documentable disabilities are referred to the following links: Students with Disabilities: http://www.ucalgary.ca/pubs/calendar/current/b-1.html B.1 and Student Accessibility Services: http://www.ucalgary.ca/access/.

(d) Safewalk: Campus Security will escort individuals day or night (http://www.ucalgary.ca/security/safewalk/). Call 220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.

(e) Freedom of Information and Privacy: This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, 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 also http://www.ucalgary.ca/secretariat/privacy.

(f) Student Union Information: VP Academic Phone: 220-3911 Email: suvpaca@ucagary.ca.
SU Faculty Rep. Phone: 220-3913 Email: sciencerep@su.ucalgary.ca; Student Ombudsman

(g) Internet and Electronic Device Information: You can assume that in all classes that you attend, your cell phone should be turned off unless instructed otherwise. Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.

(h) U.S.R.I.: At the University of Calgary, feedback provided by students through the Universal Student Ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses (www.ucalgary.ca/usri). Your responses make a difference - please participate in USRI Surveys.

Department Approval_____Date_____

Associate Dean's Approval for
Alternate final examination arrangements: _____Date:_____

Tentative lecture and lab outline

The lab part of the course involves six hours per week in the laboratory (ES02). Each lab exercise involves preliminary work and a detailed in-lab presentation by the lab instructor, Pat Irwin. These will provide the specific background needed for each lab exercise. The two lecture hours per week are intended to provide a more in-depth theoretical treatment to complement the practical lab experience. You will find that, as the term proceeds, the topics of the practical lab exercises will quickly outpace the lectures.

The table below details the tentative schedule as currently planned. Lectures may be shifted and/or topics altered as the course progresses. Lecture topics refer to chapters in the online course notes.

Week	**Dates**	**LectureTopics**	**Labs**
1	Jan 12,14	Introduction, DC circuits AC circuits chapter 1: AC sources and waveforms	Orientation/briefing DC circuits
2	Jan 19,21	AC circuits chapter 2: Phasor analysis AC circuits chapter 3: Impedance in series	AC circuits RC circuits
3	Jan 26,28	AC circuits chapter 4,5: RLC circuits AC circuits chapter 5,6: Equivalent circuits	RLC circuits Transformers
4	Feb 2,4	AC circuits ch. 7: Power dissipation, transformers Op-amps chapter 1: Introduction to op-amps	Transistors Op-amps
5	Feb 9,11	Op-amps chapter 1: Operational amplifier (op-amp) circuits	Op-amp integrator Op-amp bandwidth
	Feb 13 (Fri)	**Term test #1 on AC circuit theory**	
Reading week Feb 16-20. No lectures.			
6	Feb 23,25	Op-amps ch. 2.1-2.2: Linear two-port systems and transfer functions Op-amps chapter 2.4: Fourier Transforms	Comparator Difference Amp
7	Mar 2,4	Op-amps chapters 4.1, 4.7: Discrete FTs Op-amps chapters 4.8: FFTs	Active filter Linearity
8	Mar 9,11	Filtering using FFTs Op-amps 2.5, 2.6: Convolution, impulse response	Swept generator DFT Phase detection
9	Mar 16,18	Op-amps chapter 4.1-4.4: Digitization Op-amps chapter 4.5: Sampling and aliasing	Intro to digital Digital instruments
10	Mar 23	Computation: practical power spectral estimation and windowing	Intro to PLL PLL synthesis
	Mar 25	**Term test #2 on weeks 1-9**	
11	Mar 30, Apr 1	Op-amps chapter 4.5.7: Narrow-band signals and modulation Semiconductors ch. 1.1-1.2:Semiconductor basics	Soldering/Mechanical Lab Exam
12	April 6,8	Semiconductors ch. 1.2: Junctions and diodes Semiconductors ch. 1.3:Diode circuits	Make-up for missed labs
13	April 13, 15	Semiconductors ch. 1.5: Transistors	No labs