



DEPARTMENT OF PHYSICS AND ASTRONOMY  
COURSE OUTLINE

1. **Course:** PHYSICS 369, Acoustics, Optics and Radiation (for students in Engineering)

**Instructor:** Dr. Christopher Cully | SB 631 | 403-220-6088 | [cmcully@ucalgary.ca](mailto:cmcully@ucalgary.ca)

**Lectures Section:** L01: TuTh, 12:30-13:45, ICT 102

**Office Hours:** will be posted on D2L

**Phys 369 Course coordinator:** Dr. M. Kastyak-Ibrahim | SB 507 | 403- 220-8073 | [marzena.kastyakibrah@ucalgary.ca](mailto:marzena.kastyakibrah@ucalgary.ca)

**Course website on D2L:** PHYS 369 L01 - (Fall 2017) - Acoustics, Optics and Radiation (for students in Engineering)  
PHYS 369 B01-B16 - (Fall 2017) – Labs

**Departmental Office:** SB 605 | 403-220-5385 | [phasugrd@ucalgary.ca](mailto:phasugrd@ucalgary.ca)

2. **Prerequisites:** Applied Mathematics 219 or [Mathematics 277](#); and [Physics 259](#).

Note: In Physics 369, we follow the policy of the Schulich School of Engineering regarding prerequisite courses. A student may not register in Physics 369 unless a grade of at least “C-” has been obtained in each prerequisite course, and the student’s previous GPA is at least 2.00. It is the responsibility of students to ensure that their registrations are in order.

3. **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:

Electronic response (TopHat)	3%	
Assignments (WileyPlus)	12%	
Laboratory experiments (5)	20%	(Beginning week of Sep 11, 2017 for odd-numbered labs; Sep 18, 2017 for even-numbered labs.)
In-class Quiz	5%	
Midterm test	20%	(Tue Oct 31, 2017, evening, 7:00–8:30 pm, rooms TBA)
Final Examination	40%	(To be scheduled by the Registrar)

Percentage grades will be given for all elements of term work and examinations in Physics 369. A weighted course percentage will be calculated for each student after the final exam is written. If the student's overall course grade is greater than 50%, but receives 0% on the final exam, the student will receive a D in the course.

Percentage to letter grade conversion scale:

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

#### **Missed labs**

Students are NOT allowed to come to a lab section different than their own. Make-ups for all labs will be scheduled in the 8<sup>th</sup> (Nov 3, 2017) and 13<sup>th</sup> week of classes (Dec 4, 2017). You can make up one lab.

Priority for scheduling a make-up lab will be given to students who missed a lab for a legitimate reason. A note from a physician/counsellor should be provided. Please fill in the form (Excel file, should be saved as an Excel file) posted on D2L (Folder: Forms missed lab or exam) and email it to Dr. Kastyak-Ibrahim, the Undergraduate Learning Coordinator at [marzena.kastyakibrah@ucalgary.ca](mailto:marzena.kastyakibrah@ucalgary.ca) in order to arrange for a make-up laboratory as soon as you know that you might need one. Requests submitted more than 7 days after the date of the missed lab will not be considered

#### **Missed assignments:**

Please contact Dr. Kastyak-Ibrahim, the Undergraduate Learning Coordinator at [marzena.kastyakibrah@ucalgary.ca](mailto:marzena.kastyakibrah@ucalgary.ca) if you have a legitimate reason for missing a deadline for an assignment. Sleeping in, forgetting about the deadline etc. is NOT considered a legitimate reason.

#### **Missed In-class Quiz:**

Students who miss the In-class quiz because of ill health, or for other valid reasons, will be granted an excused absence by the Course Coordinator [provided that alleged problems are supported in writing by a person in a position of authority \(physician, counselor, etc.\)](#). In the case of a missed In-class quiz due to illness, students must notify the Course Coordinator by sending the form: Missed quiz (Folder: Forms missed lab or exam) the day of the In-class quiz, at the latest. Once the claim of illness is substantiated, the weight of the In-class quiz will be shifted to the midterm exam.

#### **Missed midterm:**

Students who miss the midterm because of ill health, or for other valid reasons, will be granted an excused absence by the Course Coordinator [provided that alleged problems are supported in writing by a person in a position of authority \(physician, counselor, etc.\)](#). In the case of a missed exam due to illness, students must notify the Course Coordinator by sending the form: Missed midterm (Folder: Forms missed lab or exam) the day of the exam, at the latest. Once the claim of illness is substantiated, the weight of the midterm will be shifted to the final exam.

5. **Scheduled out-of-class activities:** The **midterm test** will be on Tuesday evening, October 31, 2017 7:00 pm – 8:30 pm; rooms to be announced on D2L.

**REGULARLY SCHEDULED CLASSES HAVE PRECEDENCE OVER ANY OUT-OF-CLASS-TIME-ACTIVITY.** If you have a clash with this out-of-class-time activity, please inform the Course Coordinator as soon as possible so that alternative arrangements may be made for you. Students are expected to make every effort to attend the midterm exam. If you have a legitimate conflict, you must inform the course coordinator [at least 2 weeks prior](#) to the exam dates so that alternative arrangements may be made.

#### **6. Course Materials:**

- 1) Textbook: *"Fundamentals of Physics, Halliday, Resnick"*, 10<sup>th</sup> Edition, by Jearl Walker, Wiley (same as used in Physics 259 for first-year Engineering students.) Please note that the Bookstore is no longer organizing textbooks by course number, but instead alphabetically by author, please look under "W" for Walker. An e-version of the text (all chapters) can be purchased along with the WileyPlus license.
- 2) WileyPlus license (see information about on-line Assignments below).

- 3) A TopHat license (free for UC students at [tophat.com](http://tophat.com)) and a response device such as a phone, laptop or tablet.
  - 4) An extensive set of supplemental Extra Notes will be posted on D2L (free of charge).
7. **Examination Policy:** the In-class quiz, midterm and final examinations in Physics 369 are multiple choice questions, closed-book exams, although a formula sheet will be provided with the question paper. You are required to use the Schulich School of Engineering approved calculator in these examinations. Students should also read the Calendar, Section G, on Examinations.

## 8. OTHER IMPORTANT INFORMATION FOR STUDENTS:

- (a) **Academic 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) **Student Accommodations:** 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 [http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities\\_0.pdf](http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities_0.pdf). Students needing an Accommodation in relation to their coursework or to fulfil 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 and Astronomy, Dr. David Feder, by email ([dfeder@ucalgary.ca](mailto:dfeder@ucalgary.ca)) or by phone (403. 220.3638).
- (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@ucalgary.ca](mailto:suvpaca@ucalgary.ca).  
SU Faculty Rep: Phone: 220-3913 Email: [science1@su.ucalgary.ca](mailto:science1@su.ucalgary.ca), [science2@su.ucalgary.ca](mailto:science2@su.ucalgary.ca) and [science3@su.ucalgary.ca](mailto:science3@su.ucalgary.ca)  
Student Ombuds Office: 403 220-6420  
Email: [ombuds@ucalgary.ca](mailto:ombuds@ucalgary.ca); <http://ucalgary.ca/provost/students/ombuds>
- (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](http://www.ucalgary.ca/usri)). Your responses make a difference - please participate in USRI Surveys.

(i) **COURSE INCOMES:**

Students coming into PHYS 369 should be able to:

- Use trigonometric functions and identities as well as geometry to solve problems
- Employ algebraic manipulations (including solving the quadratic formula)
- Perform derivatives and integrals of functions as well as perform calculations using complex numbers
- Demonstrate ability to use vector algebra
- Exploit and use symmetry to simplify physical problems in electricity and magnetism.
- Apply the principle of superposition to calculate the electric and magnetic fields of extended objects
- Develop mathematical models of physical situations.
- Carry out calculations symbolically (in terms of physical variables) and numerically (using appropriate values and their units)
- Obtain experimental data and relate them to predicted physical laws governing electricity and magnetism.

(j) **COURSE OUTCOMES:**

By the end of the course, students will be expected to:

- Exploit and use mathematical representations to predict the behavior of physical systems exhibiting simple harmonic oscillations or containing waves.
- Analyze and describe the effect of a system's physical properties (density, temperature, mechanical impedance, motion) on wave propagation (speed, reflection, transmission, resonance, and interference.)
- Compute properties and effects of electromagnetic radiation emitted and absorbed by physical systems.
- Solve problems in geometric optics, incorporating reflection and refraction from multiple curved surfaces.
- Carry out calculations symbolically (in terms of physical variables) and numerically (using appropriate values and their units)
- Obtain experimental data, estimate uncertainties, and relate the results to predicted physical laws governing wave behavior of oscillating systems and waves.
- Collaborate effectively within a team environment and communicate laboratory results in written scientific format.

## (k) LABORATORIES

Laboratories begin Monday, September 11, 2017. Check the timetable below for the dates of your labs. Labs take place in ST 036 and ST 038, as indicated in your Student Centre.

Week	Dates	Odd-numbered lab sections	Even-numbered lab sections
1	Sep 11-15	Lab 1	NO LABS
2	Sep 18-22	NO LABS	Lab 1
3	Sep 25-29	Lab 2	NO LABS
4	Oct 2-6	NO LABS	Lab 2
5	Oct 9-13	NO LABS	NO LABS
6	Oct 16-20	NO LABS	Lab 3
7	Oct 23-27	Lab 3	NO LABS
*** Midterm Exam – Tuesday October 31 <sup>st</sup> ***			
8	Oct 30- Nov 3	NO LABS	NO LABS
Make-up labs – Friday November 3 (Labs 1-3)			
9	Nov 6-9	Lab 4	NO LABS
10	Nov 14-17	NO LABS	NO LABS
11	Nov 20-24	NO LABS	Lab 4
12	Nov 27 -Dec 1	Lab 5	NO LABS
13	Dec 4 - 8	NO LABS	Lab 5
Make-up labs – Friday December 8 (Labs 4-5)			

### List of Experiments:

Lab 1	Uncertainties
Lab 2	Simple Harmonic Oscillations
Lab 3	Standing Waves on a Wire
Lab 4	Concave Mirrors
Lab 5	Thin Lenses & Optical Instruments

**Lab Write-ups:** Lab write-ups are prepared by the Department of Physics and Astronomy and will be posted on Desire2Learn. Each student should download his/her own copy of each lab.

**Before you come to your first lab session** (see the schedule, above) make sure you have read the relevant sections of the Manual and completed any Preliminary Work required. Lab preliminary work is to be submitted individually by each lab group member via D2L at least 30 min before the section starts.

**Lab 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.

**Raw Lab Notes.** According to good laboratory practice, all data and any other relevant notes and observations should be recorded as the lab proceeds. In PHYS369, these can be recorded on clean, loose-leaf lined or graph paper (NO torn or spiral-bound pages). Title these notes with the course number, lab section, and names of all group members. Write the lab section number and date on each page. Please write **in pen**, and leave margins for corrections and comments from your lab instructor. If there is a problem with any set of measurements, they can be crossed out (**but not erased**) and new measurements recorded. These pages will be checked by the lab TA at the end of the lab, and should be scanned or photographed and attached to the final lab report.

**Final Laboratory reports are due at 22:59 p.m.**, 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.). Use a word processor to write your lab report and attach a scan of your raw lab notes to your write-up. Save the lab report as a PDF.

Your group's report saved as a PDF should be submitted to D2L Dropbox by each member of the group individually. Your TA will download it and submit the feedback via D2L. 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.

As your term work items (labs, electronic response scores and midterm test) accumulate, your marks will be posted on the Physics 369 grades website. Check this posting regularly by going to the Physics 369 D2L site. **Missing or incorrectly posted term work scores should be reported to the Course Coordinator not later than two weeks after they have been posted.** You should be prepared to produce the original work to verify the requested correction.

### (I) WileyPLUS On-line ASSIGNMENTS

Your text, **Fundamentals of Physics by Halliday, Resnick and Walker** is available in the bookstore bundled with a WileyPLUS code. If you did not take PHYS 259 in Winter 2017, you must obtain the book or WileyPLUS standalone and keep this code, as it will be used to access the online homework system. If you did buy the book last term and used your code, you will **not** need another code as it is still valid.

To register, please go to [www.wileyplus.com](http://www.wileyplus.com) and logon with your U of C email address and your password, which is your student ID. If you changed your password to something different than your student ID last year, the change will remain intact. For any technical support issues, go to [www.wileyplus.com/support](http://www.wileyplus.com/support) and choose the live chat option. A new text comes bundled with a code, which will give you access to the eBook, Assignments, Tutorials, Videos, Animations and Orion, an adaptive learning self-practice system.

If you would like to purchase just WileyPLUS by itself (without the text), you can do so through the bookstore or else from [www.wileyplus.com](http://www.wileyplus.com).

Lastly, if you are not able to purchase a new book or the WileyPLUS standalone, you will be able to access the homework in the computer lab in ST142 or Taylor Library. You will not have access to the e-text or other WileyPLUS materials, and must do your homework in the lab, but can upgrade at any time. You will need to register as directed above, and choose the free option.

Physics 369 Assignment Schedule – Fall 2017

Week	Dates	Assignment	Available	Due Date
1	Sep 11-15	Assignment 0	Monday, September 11, 2017	Monday, September 18, 2017
2	Sep 18-22	Assignment 1	Thursday, September 14, 2017	Thursday, September 21, 2017
3	Sep 25-29	Assignment 2	Thursday, September 21, 2017	Thursday, September 28, 2017
4	Oct 2-6	Assignment 3	Thursday, September 28, 2017	Thursday, October 05, 2017
5	Oct 9-13	Assignment 4	Thursday, October 05, 2017	Thursday, October 12, 2017
6	Oct 16-20	Assignment 5	Thursday, October 12, 2017	Thursday, October 19, 2017
7	Oct 23-27	Assignment 6	Thursday, October 19, 2017	Thursday, October 26, 2017
*** Midterm Exam – Tuesday October 31 <sup>st</sup> ***				
8	Oct 30- Nov 3	Midterm practice	Tuesday, October 24, 2017	Practice
9	Nov 6-9	Assignment 7	Thursday, November 02, 2017	Thursday, November 09, 2017
10	Nov 14-17	Assignment 8	Thursday, November 09, 2017	Thursday, November 16, 2017
11	Nov 20-24	Assignment 9	Thursday, November 16, 2017	Thursday, November 23, 2017
12	Nov 27 -Dec 1	Assignment 10	Thursday, November 23, 2017	Thursday, November 30, 2017
13	Dec 4 - 8	Final practice	Thursday, November 30, 2017	Practice

### (m) TopHat

As a vehicle to encourage class participation and student interaction as well as providing instructors with rapid, in-class feedback, the TopHat system will be employed. This is the same response system used in the Winter 2017 semester for Physics 259. A demonstration of this system could happen in your lecture section in the first week of classes.

Each lecture section will have its own TopHat course name which will be given to you by your instructor.

The type and number of response questions you will encounter over the semester is at the sole discretion of your instructor. If students make any attempt to answer a question they get 1 mark, and if they get the answer correct they get 1 more mark. Such questions are worth 2 marks. Some of the questions asked will not have a specific correct answer and are worth 1 mark. The TopHat marks are worth 3% of the total course grade.

### (n) FAQs (Frequently asked questions):

1. **What do we cover in this course?** See Detailed Course Outline below..
2. **Where do I get the Extra Notes?** Download them in small chunks from the course Desire2Learn site (free). These notes deal with material included in the course but not covered in sufficient depth in the textbook.
3. **When do labs start?** Week starting Monday, Sep 11, 2017 for ODD-numbered lab sections (This is in the FIRST week of lectures in the course.) Week starting Monday Sep 18, 2017 for EVEN-numbered sections.
4. **Where do I get my lab manual?** Lab Manuals are posted on D2L. You must read the labs and answer pre-lab questions before coming to each lab.
5. **Where do I get the first assignment?** Information for accessing WileyPlus is provided on the previous page
6. **My instructor said he posted his lecture notes...where is that?** Your instructor will post lecture notes in the Content section on Desire2Learn.
7. **Who do I contact if something is wrong with my grades, or I have any other problem with the course?** For an incorrectly entered lab grade, talk to your own lab TA at your next scheduled lab. For all other enquiries, send an e-mail to the course coordinator, Dr. Kastyak-Ibrahim at marzena.kastyakibrah@ucalgary.ca. IMPORTANT: include the course number, your name and ID number in the subject line. Keep messages brief and to the point.

Physics 369 Lecture-by-lecture Course Schedule, Fall 2017

Week	Dates	Day	Topics	Text reference*
1	Sep 11-15	<b>Simple Harmonic Oscillations</b>		
		T	Introduction to PHYS369 SHM of systems obeying Hooke's law Differential equation of simple harmonic motion	EN1, HR15.1 EN1, HR15.1
		R	Superposition of SHMs of the same frequency Phasors, phasor addition; phasor diagrams Phasors as complex quantities	EN1, EN1, HR 16.6 EN1
2	Sep 18-22	<b>Waves</b>		
		T	Travelling wave pulse: mathematical description, particle motion Partial derivatives; harmonic wave equation	EN2, HR 16.1, EN2, HR 16.4
		R	Principle of wave superposition Harmonic (sinusoidal) waves Mathematical description, particle motion, phase differences Complex representation of a traveling harmonic wave	EN2, HR 16.5 EN2, HR 16.6 EN2 EN2
3	Sep 25-29	T	Speed of waves in real media: stretched string Sound waves as longitudinal waves in solids, liquids, and gases Speed of sound waves	EN3, HR16.2, EN3, HR 17.1-2 EN3, HR 17.1-2
		R	Energy transport by a harmonic wave Mechanical impedance; Power transported by a wave Acoustical impedance Sound intensity and sound intensity level (dB)	EN4, HR 16.3, EN4 EN4 EN4, HR 17.4
4	Oct 2-6	T	Sound field around point and line sources; inverse square law Acoustical attenuation Reflections at boundaries between two media; boundary conditions	EN4, HR 17.4 EN4 EN4, HR 17.5
		R	Amplitude reflection and transmission coefficients at a junction Energy reflection and transmission coefficients	EN4 EN4
Oct 9 Thanksgiving Day. No lectures. University is closed				
5	Oct 9-13	T	<b>In-class quiz</b>	
		R	Standing waves on a stretched string of fixed length: normal modes Acoustical standing waves: vibrations of air columns, normal modes Standing wave ratio; Resonance	EN6, HR 16.7 EN6, HR 16.7 EN6, HR 16.7
6	Oct 16-20	T	Doppler effect Superposition of two harmonic waves of different frequencies: beats	EN7, HR 17.7 EN7, HR 17.6
		R	Coherent and incoherent sources Two-slit interference	HR 33.4 HR 35.2-3
7	Oct 23-27	T	Thin film interference; Multiple reflections in a thin film	HR 35.4
		R	Diffraction pattern of a single slit Circular aperture, resolving power	HR 36.1-2 HR 36.3
*** Midterm Exam – Tuesday October 31st ***				
8	Oct 30- Nov 3	T	Review	
		<b>Geometrical optics</b>		
		R	Nature of light Wavefronts, ray approximation Laws of reflection and refraction, index of refraction	HR 33.1 HR 33.1 HR 33.5



Week	Dates	Day	Topics	Text reference*	
9	Nov 6-8	T	Total internal reflection Fibre optics and waveguides Imaging by reflection at a spherical surface	HR 33.6 HR 33.6 HR 34.1-2	
Nov 9-13 are Reading Days. No lectures on Nov 9 and 13. Nov 11 <sup>th</sup> is Remembrance Day – University is closed					
10	Nov 14-17	T	Graphical methods for spherical mirrors Lateral magnification Imaging by refraction at a spherical interface	HR 34.2 HR 34.2 HR 34.3	
		R	Multi-surface problems; virtual object Derivation of thin lens equation Graphical methods for thin lenses	HR 34.4 HR 38.4-5	
11	Nov 20-24	T	Multi-lens systems, cameras, the eye Magnifiers, microscopes, telescopes	HR 34.5	
		R	Light as a transverse electromagnetic wave Plane and circular polarization; Malus' Law	EN9, HR 35.1 EN9, HR 33.4	
12	Nov 29 - Dec 1	T	Elliptical and Circular Polarization Polarization by Reflection: Brewster's Angle Fresnel Equations	EN9, HR 33.4 EN9, HR 33.7	
		R	Doubly Refracting Materials Optical Stress Analysis Huygen's Principle	HR 35.1	
13	Dec 4 - 8	<b>Illumination and thermal radiation</b>			
		T	Resolving Power. Irradiance Radiometric quantities; solid angle; point sources Irradiance due to an extended source: Lambert's law	EN10 EN10 EN10	
		R	Plane source surfaces; radiance Absorptance, reflectance; thermal equilibrium Blackbody radiation, Planck's Law Stefan-Boltzmann law; emissivity; heat transfer Wien displacement law	EN10 EN10 EN10	

\* HR=Course Textbook: Halliday & Resnick Fundamentals of Physics, 10<sup>th</sup> Edition  
by Jearl Walker (under "W" in the Bookstore)  
EN=Extra Notes (by Dr. A. Louro), downloadable from Desire2Learn.

Department Approval \_\_\_\_\_ Date \_\_\_\_\_

Associate Dean Approval \_\_\_\_\_ Date \_\_\_\_\_