



### COURSE OUTLINE

1. **Course:** PHYS 375, Introduction to Optics and Waves - Fall 2020

Lecture 01: TR 12:30 - 13:45 - Online

| Instructor               | Email                | Phone        | Office | Hours         |
|--------------------------|----------------------|--------------|--------|---------------|
| Dr Nasser Moazzen-Ahmadi | nmoazzen@ucalgary.ca | 403 830-4053 | SB 525 | W 10:00-11:00 |

Live lectures will be delivered on-line via zoom. The lectures will be recorded and posted (or their links) soon after the lecture. Lecture notes, assignments, and solutions for assignments and midterms will be posted on D2L.

**In Person Delivery Details:**

Students are expected to come to campus for some of three of the labs. The in-person labs are listed in the lab schedule in Section 13.

**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.

Live lectures will be delivered on-line via zoom. The lectures will be recorded and posted (or their links) soon after the lecture. Lecture notes, assignments, and solutions for assignments and midterms will be posted on D2L.

**Course Site:**

D2L: PHYS 375 L01-(Fall 2020)-Introduction to Optics and Waves

**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 Mathematics 267 or 277.

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  |
|------------------------|-------------|---|
| Assignments            | 15%         |   |
| Laboratory experiments | 25%         | See Section 12.   |
| Midterm tests (2)      | 25%         | During lectures, October 27, and November 24, 2020; subject to change |
| Final Examination      | 35%         | To be scheduled by the Registrar                                      |

The midterms are designed to take 50 minutes but students will be given 75 minutes to complete it. All students will start writing at the same time.

The final exam is designed to take 2 hrs to write but students will be given 3 hrs to complete it. All students will start writing at the same time.

Additional time will be granted to SAS students, and other accommodation will be done on a case-by-case basis in case of conflict or student location in different time zones.

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 % |

This course has a registrar scheduled final exam.

If the student obtains less than 50% on the combined mid-term and final exams, then the final grade will at most be a D+.

**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:**

Required Textbook(s):

F. Pedrotti, L.M. Pedrotti, and L.S. Pedrotti ,*Introduction to Optics*: Cambridge University Press, Third edition.

Recommended Textbook(s):

Eugene Hecht, *Optics (4th or 5th Edition)*: Addison-Wesley.

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:**

No aids are allowed on tests or examinations.

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](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 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](mailto: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](#) Email: [suvpaca@ucalgary.ca](mailto:suvpaca@ucalgary.ca). SU Faculty Rep., Phone: [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.

### (a) Assignments

There will be six assignments in total. Problem sets will usually be assigned on Thursday and be due the following Thursday or at a date/time specified on the assignment. Late homework will be penalized 20% per calendar day.

### (b) Missed labs

Students who miss a lab for a valid reason (the validity being determined by the instructor) are eligible to make up one lab. **Only one lab can be made up per student.** To make up the lab, the student must make arrangements in advance with the tech staff to perform their lab during the week of Nov 30-Dec 4. When the student makes these arrangements with the tech staff they must cc the instructor to obtain his/her consent. The tech staff then set up a table in the room with the apparatus needed by the student.

### (c) Course Learning Incomes

Trigonometry, geometry, algebra, basic calculus, and high-school-level physics  
 Basic understanding of data analysis, significant figures, error analysis  
 Familiarity with complex analysis, complex numbers, plotting numbers on complex plane  
 Basic data plotting tools

### (d) Syllabus

1. Geometrical optics  
 Ray optics: Reflection, refraction, dispersion  
 Mirrors and lenses  
 Optical instruments: eye, eyeglasses, magnifying glass, microscope, telescope, camera, spectrometer,
2. Interference and diffraction  
 Optical waves, phase and group velocities.  
 Superposition of waves, interference  
 Simple interferometers  
 Coherence theory (coherence time, width, length) (time permitting)  
 Fraunhofer diffraction. Single slit, two slits, Diffraction grating  
 Resolution of optical instruments  
 Fourier Optics (time permitting)
3. Polarization  
 Fresnel equations  
 Birefringence  
 Polarizers, waveplates, Stokes/Jones vectors and matrices, Poincaré sphere
4. Interaction between light and matter
5. 20th Century optics (time-permitting)  
 Blackbody radiation  
 Principles of lasers  
 Spectroscopy

### (d) Lab Schedule

Labs: The laboratory website can be found at <http://www.pjl.ucalgary.ca/> - it includes general information

regarding the labs. The lab schedule is as follows:

| Date           | Method of delivery           | Lab                       |
|----------------|------------------------------|---------------------------|
| Sept 14-18     | On-line experiment by lab TA | Reflection and refraction |
| Sept 21-25     | At-home experiment           | Thin lenses               |
| Sept 28-Oct 2  | At-home experiment           | Malus' law                |
| Sept 28-Oct 16 | In-person experiment         | Michelson Interferometer  |
| Oct 19-Nov 6   | In-person experiment         | Fizeau Bands              |
| Nov 16-Dec 4   | In-person experiment         | Fraunhofer Diffraction    |

Students are expected to pick up lab kits for the at-home experiments from the library. The date and exact location of the pick up for the lab kits will be provided in the first week of classes.

Students are expected to come to campus for the in-person labs. Because of concern with social distancing, each student will complete his/her own experiment at a designated lab set up. The scheduling for this component of the labs will be done by the technical staff. Further information will be provided in the first two weeks of classes.

Further information will be provided by the laboratory instructor.

**Course Outcomes:**

- Describe the laws that determine how an optical ray propagates through media of varying refractive index.
- Analyze examples of image formation using ray optics and thin lens theory
- Describe how interference of waves results in variations in optical intensity
- Analyze diffraction a thin slit and other objects using the concept of wave interference

Electronically Approved - Aug 17 2020 13:45

---

**Department Approval**

Electronically Approved - Aug 26 2020 17:17

---

**Associate Dean's Approval**