

PHYS1130A Wave Motion, Optics and Sound

3 Credits, 3 hours lecture, 3 hours lab (every other week), 3.8 Engineering Units for U. Alberta

Geometrical optics, optical instruments, oscillations, waves, sound, interference, diffraction, accompanied by related laboratory work

Prerequisites and/or co-requisites

MATH 30-1, MATH 31, PHYS 30, MATH 100

Instructor

Jean-Pierre De Villiers

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Office Hours

Monday 14:00-14:50

Tuesday 11:00-11:50

Wednesday 13:00-14:50

Thursday 10:00-11:50

Hours of Instruction

Monday 15:00-15:50

Tuesday 10:00-10:50

Thursday 09:00-09:50

Friday 13:00-15:50 (Lab, every other week)

Required Resources

University Physics, Young and Freedman. Addison Wesley, 2015 (14th edition) with Mastering Physics.

Physics laboratory notebook

Lecture Notebook and separate bound notebook for assignments

Course Outcomes

Upon successful completion of the course, student will be able to:

- To understand at the conceptual and computational level two basic phenomena of the physical world: wave motion and light propagation. (Comprehension)
- To develop problem solving skills ranging from order-of-magnitude estimates to full algebraic/numeric solutions of multi-part verbal (word) problems in mechanics and wave propagation. (Practical)

- To develop basic laboratory skills: how to measure, quantify, and analyse physical phenomena; how to discuss and defend experimental results; how to communicate experimental results. (Practical)

Evaluation

Assignments	5%
Labs	20%
Midterm Exam	30%
Final Exam	45%
Total	100%

A grade of C- is required for progression or transfer.

Assignments

This course uses web-based assignments: you will need to use the Mastering Physics access kit purchased with your textbook to access the assignments; instructions will be provided in the first lecture. Assignments must be completed via the Mastering Physics web site before the posted due dates; partially completed assignments receive the score achieved before the due date.

- You are expected to keep fully worked out solutions to your assignments in a bound notebook; your instructor may ask to see these solutions at any time, and you should be prepared to produce these solutions when demanded. The best approach is to have your solution book with you during lectures, and labs.
- You may rework assignments after the due date for practice purposes; this will have no effect on your score.

NOTE: missed or incomplete assignments may result in a grade of F for the course.

Exams

There will be one midterm exam and a final exam in this course, as well as a lab exam. The midterm exam takes place during the lab period in the seventh week. The midterm will cover all topics covered up to the date of the exam. The three-hour final exam will take place during the exam period at the end of the term. The final exam is a closed book test where you are expected to demonstrate mastery of the subject. You will be expected to solve a set of problems, some similar to work you have previously done, some more challenging. The assignments and labs are designed to help you prepare for this examination, so make sure you take full advantage of these exercises to prepare for the final.

For all exams, you are expected to know fundamental relations and physical laws. No formula sheet will be supplied, although some hints may be given in some problems where a specialized identity or relation may be required. Only simple scientific calculators are allowed during examinations.

Laboratory Work:

- Students must keep a proper record of experimental results in a hardcover physics laboratory manual (available at bookstore). IF YOU DO NOT BRING YOUR LOGBOOK TO A LAB, YOU WILL BE EXCUSED FROM THE LAB.
- Laboratory attendance is compulsory and no unexcused absences will be tolerated. An unexcused absence will result in a grade of zero for the missed lab and may result in course failure. See attendance policy.
- A properly formatted laboratory report produced using Microsoft Word and Excel is to be produced by the due date indicated by your instructor.
- Pre-lab: you are expected to arrive at a lab having read all advance material (posted on iLearn). A pre-lab exercise is due before the start of the lab period. If this exercise is not completed by the deadline, it must be completed during the lab period; the remaining time in the lab period will then be available for the experiment.
- A passing grade must be obtained in the lab portion of the course in order to pass the course. Specifically, students must achieve a 50% or greater aggregate score on lab reports in order to avoid an automatic grade of F. If a passing grade is obtained in the lab component, then a grade is assigned a grade based on term work using the weighting given below.

Grading System

Descriptor	Alpha Grade	4.0 Scale	Percent	Rubric for Letter Grades
Excellent	A+	4.0	> 92.9	Work shows in-depth and critical analysis, well developed ideas, creativity, excellent writing, clarity and proper format.
	A	4.0	85 – 92.9	
	A-	3.7	80 – 84.9	
Good	B+	3.3	77 – 79.9	Work is generally of high quality, well developed, well written, has clarity, and uses proper format.
	B	3.0	74 – 76.9	
	B-	2.7	70 – 73.9	
Satisfactory Progression	C+	2.3	67 – 69.9	Work has some developed ideas but needs more attention to clarity, style and formatting.
	C	2.0	64 – 66.9	
	C-	1.7	60 – 63.9	
Poor Minimum Pass	D+	1.3	55 – 59.9	Work is completed in a general way with minimal support, or is poorly written or did not use proper format.
	D	1.0	50 – 54.9	
Failure	F	0.0	< 50	Responses fail to demonstrate appropriate understanding or are fundamentally incomplete.

Proposed Schedule of Topics

Week	Chapter	Topic	Lab
1	1-8	Refresher: Calculus, Trig, Geometry, Vectors, Forces, Energy	
2	14	Oscillations and SHM	G1 - Intro to physics lab
3	14	Oscillations and SHM	
4	15	Waves - Basic	W6 - Oscillating Bracket
5	15	Waves - Superposition	
6	16	Sound	W2 - SHM (physical spring)
7	16	Midterm	
8	16	Sound Interference	W1 - Waves on a string
9	33	Light: Reflection and Refraction	
10	33/34	Images, Geometric Optics	W4 - Thin Lenses
11	34	Optics	
12	35	Interference	W5 - Diffraction and spectroscopy
13	35/36	Thin films, Diffraction	
14	36	Diffraction	Lab Exam

Please Note:

Date and time allotted to each topic is subject to change

Performance Requirements

Engineers are problem solvers. If you want to succeed in engineering it is important you learn how to organize your thoughts, to analyze, set up, and solve problems and to experience the often frustrating trials that arise in doing so. The best way to learn and retain knowledge is by practicing; the more problems you attempt and complete, the more experienced and confident you will become.

Engineering is a demanding profession: you must be able to clearly articulate solutions to complex problems in a timely manner. This course will encourage you to develop the work habits and skills necessary to submit clear and concise work on deadline. To reinforce this, keep in mind that sloppy work will not be graded in any component of this course, and late work will also not be accepted.

Teamwork is pervasive in engineering, but this is an activity that takes place among competent peers. Teamwork is a privilege that comes with competence. It is not a way to get by when you lack the skills to do the work yourself. In this course, working in groups can be helpful and is not discouraged, but you must be careful not to use teamwork to coast through an assignment or project; any work that you turn in must be your own (see rules on plagiarism below).

Lecture Notes

You are responsible for keeping a complete record of classroom work (lecture notes, interactive problems, classroom exercises) in a proper notebook.

Mentoring

All engineering students will be assigned a mentor (a faculty member). Brief meetings between student and mentor will take place at regular intervals, usually weekly, to help students manage the demands of the engineering program. Typical topics discussed with a mentor include study strategies, guidance, monitoring academic progress, among others.

Student Responsibilities

It is your responsibility as a student to contact the Office of the Registrar to complete the forms for Withdrawal or Change of Registration, and any other forms. Please refer to the list of important dates as noted in the Academic Schedule in the Keyano College credit calendar.

More specific details are found in the Student Rights and Student Code of Conduct section of the Keyano College credit calendar. It is the responsibility of each student to be aware of the guidelines outlined in the Student Rights and Student Code of Conduct Policies.

Laboratory Safety

In the science laboratories, safety is important.

Students must complete the *WHMIS for Students* online training course on Moodle before entering the science laboratories.

Students must comply with the mandatory laboratory safety rules for this course as provided in the laboratory manual. Failure to do so will result in progressive discipline such as a verbal warning, refused entry into the laboratory, or suspension from the College.

Student Attendance

Class attendance is useful for two reasons. First, class attendance maximizes a students' learning experience. Second, attending class is a good way to keep informed of matters relating to the administration of the course (e.g., the timing of assignments and exams). Ultimately, you are responsible for your own learning and performance in this course.

It is the responsibility of each student to be prepared for all classes. Students who miss classes are responsible for the material covered in those classes and for ensuring that they are prepared for the next class, including the completion of any assignments and / or notes that may be due.

Academic Misconduct

Students are considered to be responsible adults and should adhere to principles of intellectual integrity. Intellectual dishonesty may take many forms, such as:

- Plagiarism or the submission of another person's work as one's own
- The use of unauthorized aids in assignments or examinations (cheating)
- Collusion or the unauthorized collaboration with others in preparing work
- The deliberate misrepresentation of qualifications
- The willful distortion of results or data
- Substitution in an examination by another person
- Handing in the same unchanged work as submitted for another assignment
- Breach of confidentiality.

The consequences for academic misconduct range from a verbal reprimand to expulsion from the College. More specific descriptions and details are found in the Student Rights and Student Code of Conduct section of the Keyano College credit calendar. It is the responsibility of each student to be aware of the guidelines outlined in the Student Rights and Student Code of Conduct Policies.

In order to ensure your understanding of the concept of plagiarism, you must successfully complete the online tutorial found on ilearn.keyano.ca. Then print the certificate, sign it, and show it to each of your instructors. Your course work will not be graded until you show this signed certificate.

Specialized Supports**Counselling and Disability Services**

Counselling Services provides a wide range of specialized counselling services to prospective and registered students, including personal, career and academic counselling.

SKILL Centre

The SKILL Centre is a learning space in the Clearwater Campus at Keyano College where students can gather to share ideas, collaborate on projects and get new perspectives on learning from our tutorial staff.

The SKILL Centre, through a variety of delivery methods, provides assistance in skill development to Keyano students. Assistance is provided by instructors, staff and student tutors. Individuals wishing to improve their mathematics, writing, grammar, study, or other skills, can take advantage of this unique service.

Authorization

This course outline has been reviewed and approved by the Program Chair.

Jean-Pierre De Villiers, Instructor

Louis Dingley, Chair

Date Authorized

Guy Harmer, Dean

Date Authorized

Signed copies to be delivered to:

Instructor

Registrar's Office