

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: MATH 30-1, MATH 31, PHYS 30,

Co-requisites MATH 100 or equivalent

NOTE: PHYS 1130 is restricted to Engineering students.

Instructor

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Office Hours

Monday 13:00 – 13:50

Tuesday 13:00 – 13:50

Wednesday 13:00 – 13:50

Thursday 13:00 – 13:50

Friday 13:00 – 13:50

Hours of Instruction

Monday 11:00 – 11:50

Wednesday 11:00 – 11:50

Friday 11:00 – 11:50

Tuesday 14:00 – 16:50 (Lab, every other week)

Required Resources

Physics for Scientists and Engineers, Hawkes *et al.* Nelson, 2018 (2nd edition) with Mobius.

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.

Advice to Prospective Engineers

Engineers are problem solvers. If you want to succeed in engineering it is important that 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).

iLearn and Lecture Notes

You are responsible for keeping a complete record of classroom work (whiteboard notes, interactive problems, classroom exercises) in a proper notebook. Material projected onto your monitors or on the screen at the front of the classroom is posted to iLearn at the end of each week but does not constitute a complete record of lecture materials.

Assignments

It is important to start the problems early and not put them off until the day before they are due. This course uses web-based assignments: you will need to use the access kit purchased with your textbook to access the assignments; instructions will be provided in the first lecture. Assignments must be completed via the assignment web site before the posted due dates; partially completed assignments receive the score achieved before the due date.

- **You are required 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, labs, and tutorials.
- 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. The midterm exam takes place during a

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	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	Lectures	Text	Lab	Notes
Sep 4	Course Intro, Geometry Review		None	
Sep 11	Geometric Optics I	28-1 to 28-3	L: Intro/orientation	
Sep 16	Geometric Optics II	28-4 to 28-6	None	
Sep 23	Mechanics Review	5-1 to 5-4, 5-7	L: Thin Lenses	
Sep 30	Oscillations I	13-1 to 13-4	None	
Oct 7	Oscillations II	13-5 to 13-10	L: Oscillating Bracket	
Oct 14	Waves I	14-1 to 14-4	Midterm + Make-up Lecture	*Thanksgiving
Oct 21	Waves II	14-5 to 14-9	L: Spring SHM	
Oct 28	Interference I	14-10 to 14-14	None	
Nov 4	Interference II	15-1 to 15-4	L: Standing Waves	*Reading break
Nov 11	Interference III	15-5 to 15-7	Make-up Lecture	*Remembrance Day
Nov 18	Physical Options I	29-1 to 29-3	L: Diffraction	
Nov 25	Physical Options II	29-4 to 29-6	None	
Dec 2	Physical Options III	29-7 to 29-8	L: Lab exam (60 minutes)	

Please Note:

Date and time allotted to each topic is subject to change

Performance Requirements**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

The Student Academic Support Services (SASS) department: Accessibility Services, Skill Centre, Wellness Services and Student Life Department work together to support student success at Keyano College.

Accessibility Services (CC167) supports student success through group and individualized instruction of learning, study and test taking strategies, and adaptive technologies. Students with documented disabilities, or who suspect a disability, can meet with the Learning Strategists to discuss accommodation of the learning barriers that they may be experiencing. Students who have accessed accommodations in the past are encouraged to visit our office at their earliest opportunity to discuss the availability of accommodations in their current courses. Individual appointments can be made by calling 780-791-8934.

Skill Centre (CC119) provides a learning space where students can gather to share ideas, collaborate on projects and get new perspectives on learning from our tutorial staff. Students visiting the centre have access to one-to-one or group tutoring, facilitated study groups, and assistance in academic writing. The Skill Centre's Peer Tutor program provides paid employment opportunities for students who have demonstrated academic success and want to share what they have learned. Tutoring is available free to any students registered at Keyano College on a drop in basis, from 8:30 am to 5:00 pm Monday through Friday. Additional evening hours are subject to tutor availability and are posted in the Skill Centre.

Wellness Services (CC260) offers a caring, inclusive, and respectful environment where students can access free group and individual support to meet academic and life challenges. Mental Health Coordinators offer a safe and confidential environment to seek help with personal concerns. The Mindfulness Room in CC260 is available as a quiet space for students to relax during regular office

hours. Wellness Service welcomes students to participate in any of the group sessions offered throughout the academic year addressing such topics as Mindfulness and Test Anxiety. Individual appointments can be made by calling 780-791-8934.

Student Life Department (CC210) is a place for students to go when they don't know who else can answer their questions. The staff will help students navigate barriers to success and if they don't know the answer, they will find it out. Student success is directly affected by how connected a student feels to their college. The student life department is there to help students get connected.

Please watch your Keyano email for workshop announcements from our Student Academic Support Services team.