Physics 130 EA01/A01, Wave Motion, Optics, and Sound, Course Outline (Fall 2010), University of Alberta

Calendar description:

Geometrical optics, optical instruments, oscillations, waves, sound, interference, diffraction. Prerequisites: Pure Mathematics 30, Mathematics 31, Physics 30. Corequisite: MATH 100 or equivalent. Restricted to Engineering students. Other students who take this course will receive *3.0.

Lecture Time & Place:

Section **EA01/A01**: 9:00am - 9:50, MWF, ETLE-007

Instructor: Prof. Dmitri Pogosian Email: pogosyan@ualberta.ca (best way to contact me) Phone: 492-2150 Office: CEB Room 254 B. Office Hours: Tuesday from 1:00 pm to 3:00 pm. Any other time: set an appointment (use email).

Course Text: University Physics (12th Edition), by Young and Freedman. Published by Addison Wesley 2007 (ISBN 13: 978-0-321-50121-9)

Course Pre-requisites: Phys 30, Math 30, Math 31. If you do not have the necessary pre-requisites, you must have written permission from the Department of Physics to take this course (application forms "Waiver of a Prerequisite" are available from Ms Janet Couch in CEB 248A).

Tutorials: Open/Optional - Physics Tutorial Help Center (CEB 1-13): Certain times are specifically assigned to Phys 130, but you should be able to get answers to your questions anytime they are open.

Course Grading:

Component	Weight	Comment
Online Assignments	10%	11 Assignments*
Laboratory	20%	Minimum 50% required to pass course
Mid-term exam	20%	Friday, October 22, 2010, In class, self-made formula sheet.
Final Exam	50%	9:00am, Saturday, December 18, 2010, Location TBA, CONSOLIDATED, self-made formula sheet.
Total	100%	

* **Online assignments**
are done electronically using the Mastering Physics system (www.masteringphysics.com). Access is free with purchase of new textbook or available separately. Registered students will receive an email with the course code. There will be approximately 1 assignment per week. If all 11 assignments are attempted, only the best 10 will be counted towards the final grade. Late assignments will be accepted until the end of term, but with an increasing penalty. Registered students will receive an email with the course code.

Labs: Obtain lab manual in bookstore. Check your lab section and start date in lab manual. Lab schedules are available online and are also posted outside the labs.

Mid-term Exam: Formula sheet and calculator required. Formula sheet: one sheet of paper 11 x 8.5 inch, both sides. Calculator: any calculator with no communication features. Midterm will cover Parts 1,2,3 and 4 up to the topic covered in class.

Final Exam: Formula sheet (one sheet of paper 11 x 8.5 inch, both sides) and a calculator required. Deferred Exam: January 29, 2011.

COURSE OUTLINE for PHYSICS 130

This course is designed to be an introduction to the University Level Physics, specifically for students interested in Engineering. It is assumed that these students have mastered or at least been exposed to certain basics in physics (Classical Physics - forces, Newton's Laws, momentum, geometrical optics, waves, etc.), plus some more advanced topics including some quantum physics (The Hydrogen atom, energy levels, the electromagnetic spectrum, etc). The course covers periodic motion, oscillations, mechanical waves, sound waves and light (properties, geometrical optics and interference).

Part 1: Introduction (Ch. 1)
A brief introduction to problem solving in physics. Physical quantities (standards and units). Error and uncertainty, and some math.

Part 2: Oscillations and Waves (Ch. 13)
Oscillations Simple harmonic motion. Harmonic motion and circular motion. The force law. Energy in simple harmonic oscillators. Damping and forced oscillations.

Part 3: Mechanical Waves (Ch. 15)
Characteristics of waves. Wavelength and frequency Speed and energy in a travelling wave Standing waves.

Part 4: Sound Waves (Ch. 16)
The characteristics of sound waves. The speed of sound Intensity of sound waves. Superposition of sound waves (interference and beats). Musical instruments.

The Doppler effect.

Part 5: Geometrical Optics and Optical Instruments (Ch. 33,34)
The nature of light (particle vs. wave). Reflection and refraction Total internal reflection. Huygens' principle. Plane and spherical mirrors. Plane and spherical lenses. Thin lenses and multiple lens systems. Other optical instruments (the eye, telescopes, microscopes).

Part 6: The Wave Nature of Light: Interference (Ch.35)
Interference and coherent sources. Two slit interference: Young's experiment. Interference in thin films. The Michelson Interferometer.

Part 7: Diffraction (Ch. 36)
Fresnel and Fraunhofer diffraction. Single slit diffraction Multiple slits. Diffraction gratings, X-Ray diffraction. Circular apertures and resolving power.

Note: This list is general. Not all topics listed above will be covered with the same degree of detail. Additional/alternate topics may be covered depending on time constraints and student interest.

IMPORTANT NOTES:

1. YOU MUST PASS THE LABORATORY SECTION (minimum 50 % average) TO PASS THE COURSE.
2. MID-TERM EXAMINATIONS MISSED FOR ANY REASON WILL NOT BE RESCHEDULED. Students not writing the midterm exam, with a valid excuse (as defined by University policy) will have the midterm weight added to the final exam. This is not automatic, and if you miss the mid-term, you should follow all University guidelines and contact your instructor as soon as possible.
3. CALCULATOR POLICY: Any type of calculator without communications features may be used during examinations. Palm pilots, Blackberries, laptop computers, etc. are prohibited. Cellular phones must be shut off during exams.

"The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behaviour (online at www.ualberta.ca/secretariat/appeals.htm) and avoid any behaviour which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University." (GFC 29 SEP 2003)