UNIVERSITY OF CALGARY
DEPARTMENT OF PHYSICS AND ASTRONOMY
COURSE INFORMATION SHEET

1. Course: **PHYSICS 369, Acoustics, Optics and Radiation**

    Lecture/Time/Session(s): L20: MWF, 10:00–11:50, SB 146, Spring 2010

    Instructor: Dr. J. K. Biel Office Hours: MW: 12:00–1:00 in SB 642, Phone: 220-8769
      Email: biel@ucalgary.ca
      PHAS Main Office: SB 605, Telephone: 220-5385

2. Prerequisites: Applied Mathematics 217, 219, Physics 259

Note: The Faculty of Science policy on pre- and co-requisite checking is outlined on page 203, columns 2 and 3
     of the 2009-2010 Calendar. A student may not register in a course unless a grade at least" C-"has been
    obtained in each pre-requisite course; it is the responsibility of students to ensure that their registrations are in order.

3 The University policy on grading and related matters is described on pages 41-53 of the 2009 - 2010 Calendar.
     In determining the overall grade in the course the following weights will be used:

Assignments (6)	20.0%
Laboratory Experiments (5)	20.0%
Midterm Exam	20.0%
Final Examination	40.0%

    There will be a final examination scheduled by the Registrar's Office. A passing grade on the final examination is required in
    order to pass the course.

4. Missed Components of Term Work. The regulations of the Faculty of Science pertaining to this matter are outlined on page
    204, column 1 of the 2009-2010 Calendar. It is the student's responsibility to familiarize himself/herself with these regulations.

5.

    A grade of at least C in the laboratory portion of the course is necessary for a passing grade in the course.

    TEXTBOOK: "*University Physics*," 12th Edition, Volume II, by Young and Freedman, Addison-Wesley.

    Department Approval: _____ Date: _____

    Associate Dean's Approval for out of regular
    class-time activity: _____ Date:_____

**IMPORTANT/SAFEWALK: Campus Security will escort individuals day or night. Call 220-5333 for assistance. Use any campus phone,
emergency phone or the yellow phones located at most parking lot pay booths.**

*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 the heading "Student
Misconduct (pages 49-53 for 2009-2010).*

FOIP: This course will be conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIP). 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.

STUDENT UNION INFORMATION: VP Academic **Phone**: 220- 3911 **Email**: suvpaca@ucalgary.ca
SU Faculty Rep. **Phone:** 220 3913 **Email:** sciencerep@su.ucalgary.ca

JKB/lh
13/04/2010

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1.   Textbooks

University Physics, 12th Edition, Volume II by Young and Freedman, Addison-Wesley is available at
the U of C bookstore. Study Guide, Volume 2 and 3 (to accompany the textbook), by J.R. Gaines and
W.F. Palmer, as well as Student Solution Manual, Volume 2 and 3, by A. Lewis Ford, are also available
at the U of C bookstore.

Extra Notes For Physics 369 by R.B. Hicks and W.J.F. Wilson to Supplement the Textbook.
 Available at the U of C bookstore.

You are advised not to mark your name or write in textbooks until lectures have commenced, since the bookstore
will not give refunds on used books.

In addition, printed lecture notes will be available on the Physics 369 website in Blacboard.

2.   Laboratories

One 3-hour laboratory session will be attended every week except the week May 31 - June.04. Each student will
attend a total of five sessions during the course. Labs are held in the class rooms of the basement of Science Theatres.
LAB Manuals will be for sale for $6.00 at the Junior Lab office on Monday May 17, after the first lecture.

Physics 369 Lab Schedule

Date		Experiment
May	18/20	Concave Mirrors
May	25/27	Thin Lenses and Optical Instruments
June	08/10	Torsional Oscillations
June	15/17	Standing Waves on a Wire
June	22/24	Malus' law and Birefringence

Exemption from laboratory for students repeating the course: Students who are taking Physics 369 for the
second time, and who obtained a grade of C+ (or, equivalently, 65/100) or better (C is not acceptable) in the
lab in a previous course, may be excused from repeating the laboratory. In this case the lab grade from the
previous year will be used in determining the final grade.

Students who wish to be exempted from the lab must submit a lab exemption form (available in the Physics
Office, SB 605) during the first week of lectures.

3.   Examinations

There will be two examinations in this course, a 90-minute closed-book midterm examination held during the
lecture time on **Wednesday, June 09**, and a final examination, three hours, will be scheduled by the Registrar
sometime in the period of June 28-30 and June 30.

4.   Assignments (read carefully).

 Assignments will be posted on the Phys 369 website. Students will attempt assignment questions on their own as
much as possible, with little advice from the instructor.

Assignment due dates: Your completed assignments are due in my drop box, across Hugo Graumann's office before 9:55 on the dates shown in the table below: (except the last assignment which will be due 1.30 PM at the same place).

Assignment				Assignment			
1	W	May	26	4	M	June	14
2	M	May	31	5	M	June	21
3	M	June	07	6	F	June	25

An assignment is considered late if not handed in by the due time. A LATE assignment will be accepted if handed in before the solution is posted, however, 20% of the total mark will be deducted.

Assignment return: Your marked assignment will be returned to you in lectures (allow a few of days for marking)

Solutions to the assignments will be posted on the Phys 369 website.

Queries about missing assignments and assignment marks should be addresses to the course instructor.

Important Assignment Format Rules: Follow the diagram below as closely as possible for every single sheet of your assignment. **Number all pages as shown. PRINT your name at the top right-hand corner of the first page and your ID# at all other pages. UNDERLINE your SURNAME.**

Use standard size 8" x 11" paper. 3-hole punched paper is acceptable. Staple pages together in upper Left-Corner. Pages should otherwise be unprotected and unbound. **NO PLASTIC or CARDBOARD BINDINGS PLEASE.**

(every page should have this information at the top exactly as indicated)

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5.   Electronic Tutorials

Students who buy a new copy of the 12th Ed. of the textbook will discover that they have also purchased access to an electronic tutorial system, MasterinfPHYSICS. This is the system developed at the Massachusetts Institute of Technology, and "test-driven" at many schools at the USA and Canada. The web address of the system is: www.masteringphysics.com, and the course name on this website is: **Spring 2010**

To log in you will need an access code, which is enclosed with your new copy of the 12th edition of Young and Freeman. Alternatively, you can purchase an access code separately at the U of C bookstore for approximately $30.

These tutorials involve relatively simple problems and provide good instruction in basic concepts that you need to master in order to do more complex problems. I believe you will find it worthwhile.

If you are not already familiar with the system, then before attempting any of the tutorials you should work through the pre-tutorial exercise named "Introduction to MasteringPHYSICS" that you will find on the website. This will familiarize you with the data entry protocol for electronic tutorial work. Here are some examples.

ab	is entered as	$a*b$	$\dfrac{a}{b}$ is entered as	a/b
$\sqrt{u}$	is entered as	$sqrt(u)$	q_1 is entered as	q_1
$\vec{A}$ (a vector) is entered as		$Avecab$	$\hat{x}$ is entered as	$xunit$
3.2×10^{-9}	is entered as	3.2×10^-9	$\lvert z\rvert$ is entered as	$abs(z)$
θ	is entered as	$theta$	$\sin(\omega t)$ is entered as	$\sin(omega*t)$

We strongly suggest using the "display math" button to look at the properly notated version of your answer before clicking the "submit" button. Use the HELP facility on the website.

6. **Lecture Schedule**

The following schedule will be used as a guide by the lecturer:

Day and Date	Text Reference	Topics
		Geometrical Optics
M May 17	- - -	Introduction to Physics 369.
	33.1	Nature of light.
	33.1	Wave fronts. Ray approximation.
	33.2	Laws of reflection and refraction. Index of refraction.
	33.3	Total Internal reflection.
	33.3	Fibre optics and waveguides.
	34.1, 34.2	Imaging by reflection at a spherical surface.
W May 19	34.2	Graphical methods for spherical mirrors.
	34.1, 34.2	Lateral magnification. Longitudinal magnification.
	- - -	Longitudinal Magnification.
	34.3	Imaging by refraction at a spherical interface.
	- - -	Multi-surface problems; virtual object.
F May 21	34.4	Derivation of thin lens equation.
	34.4	Graphical methods for thin lenses.
	34.5, 34.7 – 34.8	Multi-lens systems, optical instruments.
M May 24		Victoria Day. NO lectures.
		Simple Harmonic Motion
W May 26	Notes	SHM of systems obeying Hooke's law.
	Notes	Differential equation of simple harmonic motion.
	Notes	Solutions of the SHM equation. Initial conditions.
F May 28	Notes	Superposition of SHM's of the same frequency.
	Notes	Phasors, phasor addition; phasor diagrams.
	Notes	Phasors as complex quantities.

Waves

M May 31	Notes	Traveling wave pulse: mathematical description, particle motion.
	Notes	Partial derivatives; harmonic wave equation.
	Notes	Principle of wave superposition.
	Notes	Harmonic (sinusoidal) waves: mathematical description, particle motion, phase differences.
W June 02	Notes	Complex representation of a traveling harmonic wave.
	Notes	Speed of waves in real media: stretched string.
	Notes	Sound waves as longitudinal waves in solid, liquids, and gases.
	Notes	Speed of sound waves.
	Notes	Energy transport by a harmonic wave; mechanical impedance.
	Notes	Mechanical impedance of a stretched string.
F June 04		Midterm break. NO lectures.
M June 07	Notes	Acoustical impedance.
	Notes	Sound intensity and sound intensity level.
	Notes	Sound field around point and line sources; inverse square law.
	Notes	Acoustical attenuation.
	Notes	Reflections at boundaries between two media; boundary conditions.
	Notes	Amplitude reflection and transmission coefficients at a junction.
	Notes	Energy reflection and transmission coefficients.
W June 09		Midterm exam start at 10:00 o'clock
F June 11	Notes	Standing wave ratio.
	Notes	Standing waves on a stretched string of fixed length; normal modes.
	Notes	Acoustical standing waves: vibrations of air columns, normal modes.
	Notes	Resonance.
	Notes	Doppler effect.
M June 14	16.7	Superposition of two harmonic waves of different frequencies: beats.
	33.4	Dispersion.
	- - -	Superposition of two harmonic waves of different frequencies in a dispersive medium: phase and group velocities.

Physical Optics: Polarization

W June 16	33.5	Light as a transverse electromagnetic wave.
	33.5	Plane polarization.
	33.5	Elliptical and circular polarization.
	33.5	Malus' Law.
F June 18	33.5	Polarization by reflection: Brewster's law.
	- - -	Fresnel equations.
	- - -	Birefringence; Polarization with two refractive indices.
	33.5	Optical stress analysis.

Physical optics; Interference and Diffraction

M June 21	33.7	Huygens' Principle: Interference effects in light.
	35.1	Coherent and incoherent sources.
	35.1, 35.2	Two slit interference.
	35.3	Intensity in interference patterns.
	35.4	Thin film interference.
W June 23	- - -	Multiple reflections in thin films.
	36.1, 36.2	Diffraction pattern of single slit.
	36.3	Intensity in the single-slit pattern
	36.7	Circular aperture.
	36.7	Resolving power.

Illumination and Thermal Radiation

F June 25	Notes	Radiometric quantities.
	Notes	Irradiance of a plane surface element due to a point source.
	Notes	Irradiance due to an extended source: Lambert's law.
	Notes	Plane source surfaces, spherical surfaces.
	Notes	Kirchhoff's radiation law, ideal radiator.
	Notes	Absorbtance, reflectance, emissivity.
	Notes	Blackbody radiation, Planck law, Stefan-Boltzmann law,Wien displacement Law.