



## DEPARTMENT OF SCIENCE

### COURSE OUTLINE – FALL 2016

#### PC1300 – WAVE MOTION, OPTICS AND SOUND – 3.8(3-1-3/2) UT 82.5 Hours 15 Weeks

**INSTRUCTOR:** Tanvir Sadiq, Ph.D., P.Eng.      **PHONE:** 780.539.2865  
**OFFICE:** J 209      **E-MAIL:** TSadiq at gprc dot ab dot ca

**OFFICE HOURS:** TBD or By Appointment

**DELIVERY MODE(S):** Lectures, Seminars, Labs

**PREREQUISITE(S)/COREQUISITE:** Math 30-1 or equivalent, Math 31 and Physics 30/MA 1000

**REQUIRED TEXT/RESOURCE MATERIALS:** *Fundamentals of Physics*, 10th Edition Extended with WileyPlus Access Code, Authors: Halliday, Resnick and Walker, Publisher: Wiley. A WileyPlus access code is required. You can choose any ONE of the following options (subject to availability at a retailer or campus bookstore): (i) A hardcover textbook with WileyPlus, OR (ii) a 3-hole-punched binder-ready textbook with WileyPlus, OR (iii) WileyPlus E-book (stand-alone; the E-book version gives online access only and does not include a physical textbook). **Contact your instructor for Lab Manual**

**CALENDAR DESCRIPTION:** This course includes geometric optics, optical instruments, oscillations, waves, sound, interference, and diffraction.

**LEARNING OUTCOMES:** Upon successful completion, a student is expected to have:

- Reasonable understanding of the concepts of oscillatory motion, superposition of waves, sound and electromagnetic waves, geometrical and physical optics
- Experience with common mathematical and experimental tools, including problem solving for this course.
- Skills collecting and analyzing experimental data.

**COURSE OBJECTIVES:** This course is designed to be an introduction to university level physics, specifically for students in Engineering. It is assumed that students have mastered or at least been exposed to certain basics in physics (classical physics- forces, Newton's laws, momentum, geometrical optics, waves, etc.). In this course students will gain knowledge on wave motion, acoustics, and optics. The properties of waves will be discussed. The effect of medium on the properties of waves will be covered. Students will gain knowledge in the reflection, interference, and diffraction of the waves. Students will understand the nature of lenses and their effect on the optical properties.

## **COURSE SCHEDULE:**

### **Chapter 1. Measurement**

- 1-1 Measuring Things Including Length
- 1-2 Time
- 1-3 Mass

### **Chapter 15. Oscillations**

- 15-1 Simple Harmonic Motion
- 15-2 Energy in Simple Harmonic Motion
- 15-4 Pendulums, Circular Motion
- 15-5 Damped Simple Harmonic Motion
- 15-6 Forced Oscillations and Resonance

### **Chapter 16. Waves - I**

- 16-1 Transverse and Longitudinal Waves
- 16-2 Wave Speed on a Stretched String
- 16-3 Energy and Power of a Wave Traveling Along a String
- 16-4 The Wave Equation
- 16-5 Interference of Waves
- 16-6 Standing Waves and Resonance

### **Chapter 17. Waves - II**

- 17-1 Speed of Sound
- 17-2 Traveling Sound Waves
- 17-3 Interference
- 17-4 Intensity and Sound Level
- 17-5 Sources of Musical Sound
- 17-6 Beats
- 17-7 The Doppler Effect
- 17-8 Supersonic Speeds, Shock Waves

### **Chapter 33. Electromagnetic Waves**

- 33-1 Electromagnetic Waves
- 33-4 Polarization
- 33-5 Reflection and Refraction
- 33-6 Total Internal Reflection
- 33-7 Polarization by Reflection

### **Chapter 34. Images**

- 34-1 Images and Plane Mirrors
- 34-2 Spherical Mirrors
- 34-3 Spherical Refracting Surfaces
- 34-4 Thin Lenses
- 34-6 Three Proofs

### **Chapter 35. Interference**

- 35-1 Light as a Wave
- 35-2 Young's Interference Experiment
- 35-3 Interference and Double-Slit Intensity
- 35-4 Interference from Thin Films
- 35-5 Michelson's Interferometer

### **Chapter 36. Diffraction**

- 36-1 Single-Slit Diffraction
- 36-2 Intensity in Single-Slit Diffraction
- 36-3 Diffraction by a Circular Aperture
- 36-4 Diffraction by a Double Slit
- 36-5 Diffraction Grating
- 36-6 Intensity in Double-Slit Interference

**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.

Students are expected to attend all classes. Stay awake in class. If you miss a class, make arrangements to copy the notes from your class fellows. If you are using older edition of the textbook, **you** are responsible for matching page numbers, topics, figures, and problems with the editions being used in the class. You are encouraged to ask questions, but do not monopolize the class time. Give others a chance to ask questions as well.

## Laboratory Component

Lab No.	Lab Title	
1a	Graphing and Analysis Using Spreadsheets (NEW)	
1b	Focal Length of a Thin Lens	
2	Oscillations of a Spring	
3	Standing Waves on a String	
4	Speed of Sound in Air	
5	Interference of Light	

### IMPORTANT NOTES:

1. YOU MUST PASS THE LABORATORY SECTION (minimum 50 % average) TO PASS THE COURSE.  
All students are expected to come to the laboratory well prepared for the experiment that is to be performed and on time. Pre-lab assignments, if any, must be submitted at the start of each lab period. Students are expected to attend all laboratory periods. Absences due to illness must be substantiated by presenting suitable evidence to the Instructor within five business days of missing the lab. An opportunity to make up a lab will be given only for **excused absences**.  
The laboratory experiments are designed to allow a well-prepared student to finish all the work within the allotted time. **IT IS YOUR RESPONSIBILITY TO COMPLETE THE LAB ON TIME.** Formal lab reports should be type-written using the format provided to you by the instructor. Unless instructed otherwise, the lab reports are due the following Monday by 10:00 a.m. **LATE LAB REPORTS WILL NOT BE ACCEPTED.**
2. CALCULATOR POLICY: Any type of calculator without communications features may be used during examinations. Smartphones, Blackberries, Tablets/Laptop computers, etc. are prohibited. Cellular phones must be shut off during exams.
3. All assignments, and some quizzes must be submitted online using WileyPlus. Seminars, recitations etc. must be submitted on 8.5 x 11 inch Engineering Paper on the due date during class (if applicable). All work must be neat and legible, **done in pencil on one** side of the paper and stapled. Leave space between problems or separate them with straight line. Box your final answers. In case you do not receive your submitted work back with the rest of the class, please see me right away to resolve the problem. For further information see the example handout. Please be advised that **late submittals will be awarded zero mark.**

### EVALUATIONS:

Assignments	5%	(Online using WileyPlus, + Paper; Late submittal NOT allowed)
Labs	20%	(Must pass Lab component to pass the course. Attendance Required)
Seminars & Quizzes	5%	(Attendance Required)
Midterm	25%	(Thursday October 20, 2016, possibly an evening exam)
Final Exam	45%	(Cumulative, Time & Location TBA by Registrar's office)

Note: You must get passing marks in Assignment and Lab components in order to pass the course. All submissions should strictly follow the format provided by the instructor to avoid any penalty.

Your final course grades will be announced by the Student Services. Grades/Marks will NOT be disclosed by email or telephone.

**Mid-term Exam:** Formula sheet (one sheet of paper 8.5 x 11 inch, both sides), calculator and HB pencils. Calculator: any calculator with no communication features. MID-TERM EXAMINATIONS MISSED FOR ANY REASON WILL NOT BE RESCHEDULED. Students not writing the midterm exam, with a valid excuse (as defined by College 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 College guidelines and contact your instructor as soon as possible.

**Final Exam:** Formula sheet (one sheet of paper 8.5 x 11 inch, both sides), calculator and HB pencil required. Note that since the Final Exam is cumulative you can be tested on any of the material listed under course schedule, regardless of whether or not we cover it in-class.

## GRADING CRITERIA:

GRADING CONVERSION CHART			
This is a general guideline only			
Alpha Grade	4-point Equivalent	Percentage Guidelines (General)	Designation
A+	4.0	90 – 100	EXCELLENT
A	4.0	85 – 89	
A-	3.7	80 – 84	FIRST CLASS STANDING
B+	3.3	77 – 79	
B	3.0	73 – 76	GOOD
B-	2.7	70 – 72	
C+	2.3	67 – 69	SATISFACTORY
C	2.0	63 – 66	
C-	1.7	60 – 62	
D+	1.3	55 – 59	MINIMAL PASS
D	1.0	50 – 54	
F	0.0	0 – 49	FAIL
WF	0.0	0	FAIL, withdrawal after the deadline

## STUDENT RESPONSIBILITIES:

Refer to the College Policy on Student Rights and Responsibilities at [www.gprc.ab.ca/d/STUDENTRIGHTSRESPONSIBILITIES](http://www.gprc.ab.ca/d/STUDENTRIGHTSRESPONSIBILITIES)

## **STATEMENT ON PLAGIARISM AND CHEATING:**

Refer to the College Student Misconduct: Academic and Non-Academic Policy at [www.gprc.ab.ca/d/STUDENTMISCONDUCT](http://www.gprc.ab.ca/d/STUDENTMISCONDUCT)

\*\*Note: all Academic and Administrative policies are available at [www.gprc.ab.ca/about/administration/policies/](http://www.gprc.ab.ca/about/administration/policies/)

***UNIVERSITY TRANSFER (If applicable):*** UA, UC, UL, AU, Augustana UA, CUC, GMU, KUC

**\*\* Grade of D or D+ may not be acceptable for transfer to other post-secondary institutions. Students are cautioned that it is their responsibility to contact the receiving institutions to ensure transferability.**

Please refer to the Alberta Transfer guide for current transfer agreements: [www.transferralberta.ca](http://www.transferralberta.ca)