

# GRANDE PRAIRIE REGIONAL COLLEGE

## DEPARTMENT OF SCIENCE

Fall SEMESTER 2010 - 2011

### COURSE OUTLINE

#### PC 1300 – Wave motion, Optics and Sound

Lecture	Section A2	T R	8:30 - 9:50	Room J201
Labs	L1 F		14:30 - 17:20	Room J103 and J101

**INSTRUCTOR:**      **Dr. Desh Mitra**      **Office: J215; Office Hours:** By Appointment  
**Ph. 780 539 2981**      E-mail: [dmittra@gprc.ab.ca](mailto:dmittra@gprc.ab.ca)

<b><u>TRANSFER CREDIT:</u></b>	U. of Alberta	PC 130	67 Hours
	U. of Calgary	GLGY 201	3 credits
	U. of Lethbridge	GEOL 2060	3 credits
	Athabasca Univ.	GEOL 200	6 credits

**Prerequisites:** Pure Mathematics 30, Mathematics 31 and Physics 30.

**Co-requisites:** MA 1000

**TEXTBOOKS**      ***University Physics, 12th Edition***  
Hugh D. Young and Roger A. Freedman; Pearson/Addison-Wesley

**LAB BOOK**      ***Phys 130/En Ph 131 Laboratory Manual***  
Department of Physics, University of Alberta

**OBJECTIVE**      The course has been designed to generate competence in the fundamental concepts of optics and the physics behind some optical instruments. The wave nature, interference and diffraction of light.  
It also covers the wave propagation of sound, interference of sound and some related concepts.

**COURSE OUTLINE:**      PC 1300 3.8(3-0-1.5) UT – Wave Motion, Optics and Sound  
This course includes: geometrical optics, optical instruments, oscillations, waves, sound, interference, and diffraction.

**EXAMS:**      Mid-Term Exam.      October 21, 2010  
Final Exam.      TBA

# SYLLABUS

## INTRODUCTION

### Part I: Oscillations and Waves (Chapters 13, 15 and 16)

#### Periodic Motion (Chapter 13)

- 1.1. Oscillations
- 1.2. Simple harmonic motion
- 1.3. Harmonic motion and circular motion
- 1.4. Energy in simple harmonic oscillations
- 1.5. Applications of Simple Harmonic Motion
- 1.6. The simple and physical pendulums
- 1.7. Damped and forced oscillations; Resonance

#### Mechanical Waves (Chapter 15)

- 2.1. Characteristics of waves; transverse and longitudinal waves; wavelength and frequency
- 2.2. Mathematical description of a wave
- 2.3. Speed of a transverse wave
- 2.4. Energy in wave motion
- 2.5. Wave interference, boundary conditions and superposition
- 2.6. Standing waves on a string
- 2.7. Normal modes of a string

#### Sound and Hearing (Chapter 16)

- 3.1. Characteristics of sound waves
- 3.2. Speed of sound
- 3.3. Sound intensity
- 3.4. Standing sound waves and normal modes
- 3.5. Resonance
- 3.6. Interference of waves
- 3.7. Beats
- 3.8. The Doppler Effect; Shock waves

### Part II: Geometric Optics (Ch.33 and 34)

#### The Nature and Propagation of Light

- 4.1. The nature of light, wave fronts and ray approximation
- 4.2. Reflection and refraction
- 4.3. Dispersion and Polarization
- 4.4. Huygens's Principle
- 4.5. Reflection and Refraction at a Plane Surface
- 4.6. Reflection and Refraction at a Spherical Surface
- 4.7. Thin lenses
- 4.8. Optical instruments (magnifying glass, human eye, camera, microscope, telescope)

### Part III: Physical Optics (Chapters 35 and 36)

#### Interference (Chapter 35)

- 5.1. Interference and coherent sources
- 5.2. Two-Source interference of light
- 5.3. Intensity in interference patterns
- 5.4. Thin films

#### Diffraction (Chapter 36)

- 6.1. Fresnel and Fraunhofer diffraction
- 6.2. Diffraction from a single slit
- 6.3. Intensity in the single-slit pattern
- 6.4. Multiple slits
- 6.5. The diffraction grating
- 6.6. Circular apertures and resolving power

## Laboratory Component

Lab No.	Lab Title	Week of
1	Introduction to lab, Microsoft Excel, Microsoft Word	Sept. 10/17
2	Oscillations of a Spring	Sept. 24/Oct.1
3	Standing Waves on a String	Oct. 8/15
4	Speed of Sound in Air	Oct. 22/29
5	Geometrical Optics	Nov. 5/19
6	Interference of Light	Nov. 26/Dec.3

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 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 six 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 written using the format given in your laboratory manual. Unless instructed otherwise, the lab reports are due at the end of the lab. **LATE LAB REPORTS WILL NOT BE ACCEPTED.**

### Note:

- All assignments, homework, seminars, recitations etc. must be submitted on 8.5 x 11 in. 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 with the following information appearing at an appropriate place (see example handout).
  - **Your Last Name, First Name**
  - **Your College/Student ID**
  - **Course No. and Course Name (PC 1300, Wave Motion, Optics and Sound)**
  - **Assignment No.**
  - **Due Date**
- Leave space between problems or separate them with straight line.
- Box your final answers.
- ***Late homework will NOT be accepted/graded. Don't ask!***
- 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.
- There will be **NO** make-up exams. In case of an excused absence (supported by documentary proof), your midterm marks will be the same as those obtained in the final exam.

## Marks Distribution

Assignments	10%
Quiz	5%
Laboratory	20% (Note: Student must pass lab component to pass the course)
Midterm	25%
Comprehensive Final Exam	40%

## Grade Distribution:

<i>Descriptor</i>	<i>Grade</i>	<i>Points</i>	<i>Descriptor</i>	<i>Grade</i>	<i>Points</i>
<i>Excellent</i> <i>84 – 100%</i>	<i>A+</i>	<i>4.0</i>	<i>Satisfactory</i> <i>60 – 71 %</i>	<i>C+</i>	<i>2.3</i>
	<i>A</i>	<i>4.0</i>		<i>C</i>	<i>2.0</i>
	<i>A-</i>	<i>3.7</i>		<i>C-</i>	<i>1.7</i>
<i>Good</i> <i>72 – 83 %</i>	<i>B+</i>	<i>3.3</i>	<i>Poor</i>	<i>D+</i>	<i>1.3</i>
	<i>B</i>	<i>3.0</i>	<i>Minimal</i> <i>Pass</i>	<i>D</i>	<i>1.0</i>
	<i>B-</i>	<i>2.7</i>	<i>Fail</i>	<i>F</i>	<i>0</i>

Note: Other institutions may not consider grades of **D** sufficient to award transfer credit.

**Note** - All books and materials are available at the Bookstore

## STATEMENT ON PLAGIARISM AND CHEATING:

Please refer to pages 49-50 of the College calendar regarding plagiarism, cheating and the resultant penalties. These are serious issues and will be dealt with severely.