# Grande Prairie Regional College
## Department of Science and Technology

PC 1300 – Wave Motion, Optics and Sound
Fall, 2000
3.8(3-0-1.5)UT

## Course Outline

This course includes: geometrical optics, optical instruments, oscillations, waves, sound, interference and diffraction.
Prerequiste: Pure Mathematics 30, 31 and Physics 30
Corequisite: MA1000

Note: Restricted to Engineering students only.

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|---|---|
| **Instructor** | Jaime P. Santiago<br>J209<br>539-2865<br>santiago@gprc.ab.ca |
| **Lecture** | TR     08:30 - 09:50   J201 |
| **Laboratory** | W     14:30 – 15:50   J103<br>       16:00 – 17:20   A305 |
| **Textbook** | Fundamentals of Physics, 6th Edition<br>by Halliday, Resnick and Walker |
| | Phys 130/En Ph 131 Laboratory Manual<br>University of Alberta |

**Marks Distribution**

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|---|---|---|
| **Problem Sets** | 15 % | |
| **Laboratory Work** | 20 % | Students must pass the lab to pass the course. |
| **Midterm Exams** | 30 % | |
| **Final Exam** | 35 % | |

## Lecture Topics

| Chapter | Time (Days) | Topic |
|---|---|---|
| | 0 5 | Course Introduction |
| 34 | 2.5 | Electromagnetic Waves:<br>• Maxwell's Rainbow, traveling em waves, energy transport, radiation pressure,<br>• polarization, reflection, refraction<br>• total internal reflection, polarization by reflection |
| 35 | 5 | Images:<br>• real and virtual images, plane mirrors<br>• spherical mirrors, images from spherical mirrors<br>• spherical refracting surfaces<br>• thin lenses<br>• optical instruments |
| 16 | 4 | Oscillations:<br>• oscillations, simple harmonic motion<br>• force law and energy in SHM<br>• angular simple harmonic motion, pendulums, SHM and uniform circular motion<br>• damped SHM, forced oscillations and resonance |
| 17 | 4 | Waves I:<br>• waves and particles, types of waves, transverse and longitudinal waves, speed of a wave<br>• waves in a stretched string, superposition and interference<br>• phasors<br>• standing waves, resonance |
| 18 | 4 | Waves II:<br>• sound waves, speed of sound, traveling sound waves<br>• interference, beats<br>• intensity and sound level<br>• Doppler effect, supersonic speeds and shock waves |
| 36 | 2 | Interference:<br>• light as a wave, diffraction, double slit<br>• interference from thin films |
| 37 | 3 | Diffraction:<br>• single slit diffraction, diffraction by a circular aperture<br>• double slit<br>• diffraction grating |

## Problem Sets

| Set Number | Date Due | Problems |
|:---:|:---:|---|
| 1 | Sept. 21 | Chapter 34<br>36P, 46P, 47P, 50P, 57 |
| 2 | Oct. 3 | Chapter 35<br>8P, 10P(c, d, g), 13P, 16P, 26P |
| 3 | Oct. 10 | Chapter 35<br>30P, 34P, 37P<br><br>P1: Assume the near and far points of a normal eye are 25 cm and infinity, respectively. A nearsighted person has a normal near point but has a far point of only 2.0 m. What focal length of contact lens will allow this person to see very distant objects clearly? Is the lens converging or diverging? What is the effective near point when wearing the contact lenses?<br><br>P2: A farsighted person has a near point of 1.0 m but can focus very distant objects. Prescribe the type and power of corrective eyeglass lenses that will allow this person to focus objects at the normal near point. Assume the lenses are 1.5 cm in front of the eye lens. Can this person keep the eyeglasses on when viewing distant objects? |
| 4 | Oct. 19 | Chapter 16<br>12E, 16P, 20P, 30P, 39P |
| 5 | Nov. 7 | Chapter 17<br>18P, 25P, 30P, 44P, 51P |
| 6 | Nov. 14 | Chapter 18<br>6P, 14P, 28P, 29P, 34P |
| 7 | Nov. 21 | Chapter 18<br>40P, 41P, 45P, 52P, 57P |
| 8 | Nov. 30 | Chapter 36<br>9P, 22P, 29P, 39P, 44P |
| 9 | Dec. 7 | Chapter 37<br>11P, 22P, 32P, 45P, 51P |

## Laboratory Work

| Lab No. | Expt. No. | Date | Title |
|---------|-----------|------|-------|
| 1 | | Sept. 6/13 | Introduction to Lab, Microsoft Excel, Microsoft Word |
| 2 | 1 | Sept. 20/27 | Geometrical Optics |
| 3 | 2 | Oct. 4/11 | Oscillations of a Spring |
| 4 | 3 | Oct. 18/Nov1 | Standing Waves on String |
| 5 | 4 | Nov. 8/15 | Speed of Sound in Air |
| 6 | 5 | Nov. 22/29 | Interference of Light |