PHYSICS DEPARTMENT
COURSE OUTLINE

PHYS 151 TECHNICAL PHYSICS 2

This course bridges Physics 11 (or Physics 150 or Physics 060) to the first year of Engineering Technology programs. Students investigate the concepts of kinematics, dynamics, equilibrium, geometric optics, mechanical waves and sound with applications to various technologies. Emphasis is on the development of skills in problem solving, laboratory procedure and data analysis.

OFFERED:	Q2, Q3
CREDIT:	3
IN-CLASS WORKLOAD:	4 lecture, 2 lab, 1 seminar
PRE-REQUISITES:	Physics 150 or Physics 060 or Physics 11
PRE-/CO-REQUISITES:	Math 173

REQUIRED MATERIALS:

Physics 151 Course Material (2004, Physics Department, Camosun)
Physics 151 Lab Manual (2004, Physics Department, Camosun)
Scientific calculator
Graph paper (10 lines/inch or millimeter graph paper are recommended)

DEPARTMENT POLICIES REGARDING TESTING:

1. Students must write quizzes, tests, midterm tests, etc., on the date and time assigned by the instructor. Missed exams normally receive a zero grade. In exceptional circumstances such as medical issues or a documented illness, a make-up exam may be given or the test may be waived at the discretion of the instructor. The instructor should be notified prior to the exam.

2. The final exam will cover the entire course and will be 3 hours long. As stated in the current college calendar (p. 39) “students are expected to write tests and final exams at the scheduled time and place.” Exceptions will only be considered for emergency circumstances as outlined in the calendar. Holidays or scheduled travel flights are not accepted.

DEPARTMENT POLICIES REGARDING LABS:

1. All assigned laboratory exercises and reports must be completed with an overall grade of 60% in order to obtain credit for this course. Attendance is mandatory for all lab exercises. A lab may be made up at a later time only in the case of documented illness or other extenuating circumstances.

2. At the discretion of the instructor, a student who is repeating a Physics course may not have to complete the laboratory exercises a second time if an average lab grade of 70% or better was obtained.

STUDY TIME

It is recommended that between 5 and 10 hours per week (or more for students with a weak background) be spent studying for this course outside of class time.

GRADING

The standard mark distribution for this course is as follows:

Final Exam	50%
Midterms and other work	50%
Lab Reports (must be completed satisfactorily for course credit)	
Total	100%

OUTLINE:

1. **Kinematics**

    1.1. Review of one dimensional kinematics
        1.1.1. Definitions, constant acceleration problems
    1.2. Motion in two dimensions
        1.2.1. Vectors and scalars
        1.2.2. Scaled diagrams
        1.2.3. Displacement and velocity
        1.2.4. Acceleration
    1.3. Relative velocity with scaled diagrams
    1.4. Uniform circular motion
        1.4.1. Centripetal acceleration

2. **Dynamics**

    2.1. Concept of force and inertia
    2.2. Newton's laws of motion
        2.2.1. Concept of net force
        2.2.2. Review of I-D problems
    2.3. Applications of Newton's second law in 2-D
        2.3.1. Net force and acceleration in 2-D using scaled diagrams
        2.3.2. Connected objects example – acceleration for glider and falling mass only
    2.4. Uniform circular motion - Centripetal acceleration and the second law

3. **Equilibrium**

    3.1. First condition
        3.1.1. Concurrent Forces
        3.1.2. Scaled Diagrams
            3.1.2.1. Problems with one unknown
            3.1.2.2. Problems with two unknown magnitudes
            3.1.2.3. Problems with two unknown directions
    3.2. Second condition
        3.2.1. Non-concurrent forces
        3.2.2. Torques with forces perpendicular to lever
        3.2.3. Center of gravity for uniform symmetric objects (center of
            3.2.3.1. symmetry)
        3.2.4. Torques in equilibrium – problems with perpendicular forces

4. **Light**

    4.1. Properties of light
        4.1.1. Wave/particle nature
        4.1.2. Electromagnetic spectrum
        4.1.3. Wave speed

4.2. Light at an interface
  4.2.1. Incident ray , Normal
  4.2.2. Reflected and refracted rays
4.3. Reflection
  4.3.1. Law of reflection
  4.3.2. Ray tracing
    4.3.2.1. Images formed in flat mirrors
    4.3.2.2. Images formed in spherical mirrors – Concave and convex
  4.3.3. Mirror equation – sign convention for f and d's
  4.3.4. Magnification
  4.3.5. Spherical aberration, parabolic mirrors – description only
4.4. Refraction
  4.4.1. Index of refraction
  4.4.2. Snell's law
  4.4.3. Total internal reflection
  4.4.4. Ray tracing in a prism
  4.4.5. Ray tracing and Images formed by refraction in thin lenses
  4.4.6. Lens equation
  4.4.7. Magnification

5. **Mechanical waves**

5.1. Wave Characteristics – Period , frequency, wavelength, amplitude, speed
5.2. Wave types – transverse and longitudinal
5.3. Wave speed in terms of frequency and wavelength
5.4. Speed of waves in a string
5.5. Interference
  5.5.1. Superposition principle
  5.5.2. Constructive and Destructive interference
  5.5.3. Beats
5.6. Standing waves
  5.6.1. Formation, conditions, nodes and antinodes
  5.6.2. Vibrating strings
  5.6.3. Harmonics and modes of vibration

6. **Sound**

6.1. Nature of sound waves - longitudinal
  6.1.1. Speed of waves in air
  6.1.2. Speed in other media – briefly, examples
  6.1.3. Pitch and loudness – brief and descriptive
6.2. Vibrating air columns
  6.2.1. Open and closed pipes
  6.2.2. Harmonics