CAMOSUN COLLEGE	***School of Arts & Science*** ***PHYSICS DEPARTMENT*** **PHYS 151-001** **Technical Physics 2** **2007Q3**

COURSE OUTLINE

The Approved Course Description is available on the web @ _____

Ω *Please note: this outline will be electronically stored for five (5) years only. It is strongly recommended students keep this outline for your records.*

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

1. Instructor Information

(a)	Instructor:	Wilf Nienaber		
(b)	Office Hours:			
(c)	Location:	TC 218		
(d)	Phone:	370-4435	Alternative Phone:	
(e)	Email:	nienaber@camosun.bc.ca		
(f)	Website:			

2. Intended Learning Outcomes

(No changes are to be made to this section, unless the Approved Course Description has been forwarded through EDCO for approval.)

Upon completion of this course the student will be able to:

1. Define vectors and scalars. Resolve a vector into components using either a scale diagram or trigonometry. Add and subtract vectors using either a scale diagram or the component method.
2. Use the kinematic equations to solve two-dimensional problems involving uniformly accelerated motion. Analyze accelerations and average velocities for two-dimensional problems. Calculate the trajectories for projectiles with initial horizontal motion. Solve problems involving relative velocities.
3. Making use of Newton's Laws, construct free-body diagrams, and solve two-dimensional dynamics problems involving normal forces, friction, tension, and applied forces.

4. Construct free-body diagrams for objects undergoing uniform circular motion, and calculate centripetal forces and accelerations. Answer conceptual problems for systems undergoing circular motion.
5. State the two conditions of equilibrium. Solve problems involving concurrent forces in equilibrium. Define torques (moment of a force) and answer related conceptual problems. Define and describe the centre-of-mass of an object. Solve equilibrium problems involving non-concurrent forces in which the forces are perpendicular to the lever arms.
6. Define and describe the following properties of waves: period, frequency, wave speed, and amplitude. Identify whether a particular wave is transverse or longitudinal. State the principal of superposition and sketch the properties of waves undergoing constructive and destructive interference. Calculate beat frequencies.
7. Define and describe the following properties of sound waves: pitch, loudness, speed, type of wave. Calculate the speed of sound in various media. State the conditions for standing waves and identify nodes and anti-nodes. Solve problems of vibrating strings and air columns, including fundamental nodes and harmonics.
8. Describe the properties of light, including the electromagnetic spectrum, wave/particle nature, and speed. Define the incident, reflected, and refracted rays for light at an interface.
9. State the law of reflection. Complete ray-tracing diagrams to locate the image for plane, convex, and concave mirrors. Calculate quantities using the mirror and magnification equations, including the sign conventions for the focal length and image and object distances. Describe spherical aberration and the difference between spherical and parabolic mirrors.
10. State the law of refraction. Solve problems involving Snell's Law and total internal reflection. Complete ray-tracing diagrams to locate the image for converging and diverging lenses. Calculate quantities using the lens and magnification equations, including the sign conventions for the focal length and image and object distances.

3. 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)

4. Course Content and Schedule

(Can include: class hours, lab hours, out of class requirements and/or dates for quizzes, exams, lectures, labs, seminars, practicums, etc.)

<u>DEPARTMENT POLICIES REGARDING LABS:</u>

1. Lab exercises will be done on a bi-weekly basis during the scheduled lab period. Attendance is mandatory and you will be required to "sign in" at the beginning of each one. As you complete the exercise your instructor will discuss your results with you and mark your work.

2. 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 required for all lab exercises at the scheduled times. A lab may be made up at a later time only in the case of documented illness or other extenuating circumstances.

3. 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.

5. Basis of Student Assessment (Weighting)
(Should be linked directly to learning outcomes.)

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. Excursions, holidays or scheduled travel flights are not accepted.

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%

6. Grading System
(No changes are to be made to this section, unless the Approved Course Description has been forwarded through EDCO for approval.)

Standard Grading System (GPA)

Percentage	Grade	Description	Grade Point Equivalency
95-100	A+		9
90-94	A		8
85-89	A-		7
80-84	B+		6
75-79	B		5
70-74	B-		4
65-69	C+		3
60-64	C		2
50-59	D		1

0-49	F	Minimum level has not been achieved.	0

Temporary Grades

Temporary grades are assigned for specific circumstances and will convert to a final grade according to the grading scheme being used in the course. See Grading Policy at **camosun.ca** or information on conversion to final grades, and for additional information on student record and transcript notations.

Temporary Grade	Description
I	*Incomplete*: A temporary grade assigned when the requirements of a course have not yet been completed due to hardship or extenuating circumstances, such as illness or death in the family.
IP	*In progress*: A temporary grade assigned for courses that are designed to have an anticipated enrollment that extends beyond one term. No more than two IP grades will be assigned for the same course.
CW	*Compulsory Withdrawal:* A temporary grade assigned by a Dean when an instructor, after documenting the prescriptive strategies applied and consulting with peers, deems that a student is unsafe to self or others and must be removed from the lab, practicum, worksite, or field placement.

Temporary grades are assigned for specific circumstances and will convert to a final grade according to the grading scheme being used in the course. See Grading Policy E-1.5 at **camosun.ca** for information on conversion to final grades, and for additional information on student record and transcript notations.

7. Recommended Materials or Services to Assist Students to Succeed Throughout the Course

LEARNING SUPPORT AND SERVICES FOR STUDENTS

There are a variety of services available for students to assist them throughout their learning. This information is available in the College calendar, at Student Services or the College web site at camosun.ca.

STUDENT CONDUCT POLICY

There is a Student Conduct Policy **which includes plagiarism**.
It is the student's responsibility to become familiar with the content of this policy. The policy is available in each School Administration Office, at Student Services and on the College web site in the Policy Section.

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
        1.2.5. Vector components
    1.3. Relative velocity
    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
        2.3.2. Connected objects example – acceleration for glider and falling mass
    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 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