CAMOSUN COLLEGE	**School of Arts & Science** **PHYSICS DEPARTMENT** **PHYS 151** **Technical Physics 2** **2016 Q2**

COURSE OUTLINE

The course description is online @ http://camosun.ca/learn/calendar/current/web/phys.html

Ω *Please note: the College electronically stores this outline for five (5) years only.*
*It is **strongly recommended** you keep a copy of this outline with your academic records.*
You will need this outline for any future application/s for transfer credit/s to other colleges/universities.

1. Instructor Information

(a)	Instructor:	Ed Nelson		
(b)	Office Hours:	M through F 10:30 – 11:20 am		
(c)	Location:	TECH 218		
(d)	Phone:	250 370 4435	Alternative Phone:	
(e)	Email:	nelson@camosun.bc.ca		
(f)	Website:	D2L – online.camosun.bc.ca		

2. Intended Learning Outcomes

(No changes are to be made to these Intended Learning Outcomes as approved by the Education Council of Camosun College.)

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.
11. Assemble simple experimental apparatus using written instructions.
12. Observe, record, organize and display data in tables, graphs or charts.
13. Analyze linear graphs (determine area, slope, intercept, etc.).

14. Interpret meaning of experimental results in the context of the experimental objectives.

3. Required Materials

(a) Physics 151 Course Materials Book (reprint of chapters from "Physics – 6th edition" (Pearson), Douglas Giancoli)

(b) Physics 151 Lab Manual

(c) Graph Paper (10mm x 10mm grid), drawing instruments, basic scientific calculator

4. Course Content and Schedule

Lecture MTWTh 11:30 – 12:20
Seminar "A" W 1:30 – 2:20; "B" W 2:30 – 3:20
Lab F 2:30 – 4:20 (TECH 222)

5. Basis of Student Assessment (Weighting)

(a) Weekly Assignments 5%

(b) Weekly Quizzes 5%

(c) Midterm Exams 40% (best 3 out of 4)

(d) Laboratory successful completion

(e) Final Exam 50%

6. Grading System

(No changes are to be made to this section unless the Approved Course Description has been forwarded through the Education Council of Camosun College for approval.)

Standard Grading System (GPA)

Percentage	Grade	Description	Grade Point Equivalency
90-100	A+		9
85-89	A		8
80-84	A-		7
77-79	B+		6
73-76	B		5
70-72	B-		4
65-69	C+		3
60-64	C		2
50-59	D	Minimum level of achievement for which credit is granted; a course with a "D" grade cannot be used as a prerequisite.	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 E-1.5 at **camosun.ca** for 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, due to design may require a further enrollment in the same course. No more than two IP grades will be assigned for the same course. *(For these courses a final grade will be assigned to either the 3rd course attempt or at the point of course completion.)*
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.

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 the College web site in the Policy Section.

OUTLINE:

1. **Mechanical waves**
   - 1.1 Properties of waves
   - 1.2 Wave types
   - 1.3 Wave speed in a string/in air
   - 1.4 Interference
     - 1.4.1 Constructive and Destructive interference
     - 1.4.2 Superposition principle
     - 1.4.3 Beats
   - 1.5 Standing waves
     - 1.5.1 Conditions
     - 1.5.2 Vibrating strings
     - 1.5.3 Harmonics

2. **Sound**
   - 2.1 Nature of sound waves
     - 2.1.1 Speed
     - 2.1.2 Dependence on medium
     - 2.1.3 Harmonics
     - 2.1.4 Pitch and loudness
   - 2.2 Vibrating air columns
     - 2.2.1 Open and closed pipes
     - 2.2.2 Harmonics
     - 2.2.3

3. **Kinematics**
   - 3.1 Review of one dimensional kinematics
   - 3.2 Motion in two dimensions
     - 3.2.1 Vectors and scalars
     - 3.2.2 Scaled diagrams
     - 3.2.3 Vector components
     - 3.2.4 Displacement and velocity
     - 3.2.5 Acceleration
   - 3.3 Relative velocity
   - 3.4 Projectile motion in two-dimensions
   - 3.5 Uniform circular motion

4. **Dynamics**

- 4.1 Concept of force and inertia
- 4.2 Newton's laws of motion
- 4.3 Applications of Newton's second law
  - 4.3.1 Component method
  - 4.3.2 Connected objects
  - 4.3.3 Uniform circular motion

5. **Equilibrium**
   - 5.1 First condition
     - 5.1.1 Forces in equilibrium
   - 5.2 Second condition
     - 5.2.1 Non-concurrent forces
     - 5.2.2 Torque
     - 5.2.3 Center of gravity
     - 5.2.4 Torques in equilibrium

6. **Light**
   - 6.1 Properties of light
     - 6.1.1 Wave/particle nature
     - 6.1.2 Electromagnetic spectrum
     - 6.1.3 Wave speed
   - 6.2 Reflection
     - 6.2.1 Law of reflection
     - 6.2.2 Images formed in flat mirrors
     - 6.2.3 Images formed in spherical mirrors
     - 6.2.4 Ray tracing
     - 6.2.5 Mirror equation
     - 6.2.6 Magnification
   - 6.3 Refraction
     - 6.3.1 Index of refraction
     - 6.3.2 Snell's law
     - 6.3.3 Total internal reflection
     - 6.3.4 Images formed by refraction
     - 6.3.5 Ray tracing
     - 6.3.6 Lens equation
     - 6.3.7 Magnification