



CAMOSUN COLLEGE
School of Arts & Science
Department of Physics & Astronomy

PHYS-295-X01A/B
Physics (Engineering Bridge)
2019 Winter

COURSE OUTLINE

The course description is available on the web @ <http://camosun.ca/learn/calendar/current/web/phys.html>

Ω Please note: This outline will not be kept indefinitely. It is recommended students keep this outline for their records, especially to assist in transfer credit to post-secondary institutions.

1. Instructor Information

(a) Instructor	Ed Nelson
(b) Office hours	M 1:30 – 2:20 pm; T 12:30 – 2:20 pm; F 11:30 – 1:20 pm
(c) Location	TECH 218
(d) Phone	250 370 4435 Alternative: _____
(e) E-mail	nelson@camosun.bc.ca
(f) Website	online.camosun.bc.ca

2. Intended Learning Outcomes

Upon completion of this course students will be able to:

1. Describe the operation of several temperature sensors including the function and temperature calculations for a constant volume gas thermometer.
2. Solve problems involving thermal expansion in one and three dimensions. and derive from first principles the expressions required to solve these problems.
3. Solve problems involving the transfer of thermal energy with regard to specific heat capacity, latent heat and change of phase.
4. Solve problems involving the displacement wave function for transverse and longitudinal waves in elastic media with attention to wave number angular frequency, phase constant, and wave and particle velocities.
5. Derive the pressure wave function for sound waves and solve related problems.
6. Derive from first principles, the wave equation, the solution, and the expression for the wave velocity.
7. Derive the expressions for the interference of two or more waves including the phenomena of beats and standing waves.
8. Derive the expressions for, and solve problem involving the Doppler Effect.
9. Derive the expressions for, and solve problems involving physical optics phenomena including: double and multiple slit interference, thin films, diffraction and resolution of images.
10. Solve problems in geometrical optics including lenses, mirrors, prisms, and total internal reflection.
11. Use Coulomb's Law to solve problems in electrostatics for two or more charges.
12. Solve problems involving electric fields, electric potential, and potential difference for discrete charges and continuous charge distributions.
13. Analyze series and parallel electric circuits.
14. Solve problems involving magnetic flux density and magnetic forces on charges including forces on current carrying wires and torques on current loops.
15. Assemble experimental apparatus using written instructions.

16. Observe, record, organize and display data in tables, graphs or charts.
17. Analyze linear graphs (determine area, slope, intercept, etc.).
18. Observe and record sources of error and estimate the range of uncertainty in results.
19. Interpret meaning of experimental results in the context of the experimental objectives.
20. Write scientific reports in an acceptable, traditional format.

3. Required Materials

- (a) University Physics (Pearson) Young and Freedman, 14th edition
- (b) PHYS 295 Lab Manual

4. Course Content and Schedule

X01 A/B: LEC M 11:30 – 12:20; T 4:30 – 5:20 TECH 110
 X01 A/B LEC F 10:00 – 10:50 CBA 101
 X01 A LAB Th 8:30 – 10:20 TECH 222
 X01B LAB Th 11:30 – 1:20 TECH 222

5. Basis of Student Assessment (Weighting)

- | | |
|-------------------|-----|
| (a) Midterm exams | 30% |
| (b) Lab Reports | 20% |
| (c) Final Exam | 50% |

PHYSICS DEPARTMENT GUIDELINES REGARDING TESTING AND GRADING:

- The final exam will cover the entire course and will be 3 hours long. As stated in the current college calendar, “students are expected to write tests and final exams at the scheduled time and place.” Exceptions will only be considered due to emergency circumstances as outlined in the calendar. Holidays or scheduled flights are not considered to be emergencies.
- Students must write quizzes, tests, midterm tests, etc., on the date and time assigned by the instructor. Missed exams normally receive a zero grade. Instructors are not required to provide make-up tests. At their discretion, instructors may waive a test in exceptional circumstances such as medical issues or a documented illness.
- Any outstanding homework or labs must be submitted prior to the last day of classes, and will be graded according to the late policy outlined by the instructor.
- Refer to your instructor’s information page for any additional policies regarding testing and grade calculation.

PHYSICS DEPARTMENT GUIDELINES REGARDING LABS:

- Students must obtain an overall grade of 50% or higher in the laboratory component of the course order to obtain credit for the course.
- Attendance is mandatory & you may be required to “sign in” at the beginning of each lab period. A lab may be waived or made up at a later time only in the case of documented illness or other extenuating circumstances. If you will be absent from a lab period due to illness it is your responsibility to notify your instructor.
- Unless otherwise stated by your instructor late penalties are as follows: For overdue labs (or assignments), a late penalty of 1 mark per day (10%) will be assessed for the first five days following the due date. After this date a complete report is still required and earns a maximum mark of 50%.
- At the discretion of the instructor, a student who is repeating this Physics course with a laboratory grade of 70% or higher may apply for lab exemption.

6. Grading System

- Standard Grading System (GPA)
- Competency Based Grading System

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

8. College Supports, Services and Policies



Immediate, Urgent, or Emergency Support

If you or someone you know requires immediate, urgent, or emergency support (e.g. illness, injury, thoughts of suicide, sexual assault, etc.), **SEEK HELP**. Resource contacts @ <http://camosun.ca/about/mental-health/emergency.html> or <http://camosun.ca/services/sexual-violence/get-support.html#urgent>

College Services

Camosun offers a variety of health and academic support services, including counselling, dental, disability resource centre, help centre, learning skills, sexual violence support & education, library, and writing centre. For more information on each of these services, visit the **STUDENT SERVICES** link on the College website at <http://camosun.ca/>

College Policies

Camosun strives to provide clear, transparent, and easily accessible policies that exemplify the college's commitment to life-changing learning. It is the student's responsibility to become familiar with the content of College policies. Policies are available on the College website at <http://camosun.ca/about/policies/>. Education and academic policies include, but are not limited to, Academic Progress, Admission, Course Withdrawals, Standards for Awarding Credentials, Involuntary Health and Safety Leave of Absence, Prior Learning Assessment, Medical/Compassionate Withdrawal, Sexual Violence and Misconduct, Student Ancillary Fees, Student Appeals, Student Conduct, and Student Penalties and Fines.

A. GRADING SYSTEMS <http://camosun.ca/about/policies/index.html>

The following two grading systems are used at Camosun College:

1. 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		1
0-49	F	Minimum level has not been achieved.	0

2. Competency Based Grading System (Non GPA)

This grading system is based on satisfactory acquisition of defined skills or successful completion of the course learning outcomes

Grade	Description
COM	The student has met the goals, criteria, or competencies established for this course, practicum or field placement.
DST	The student has met and exceeded, above and beyond expectation, the goals, criteria, or competencies established for this course, practicum or field placement.
NC	The student has not met the goals, criteria or competencies established for this course, practicum or field placement.

B. 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 <http://camosun.ca/about/policies/index.html> for information on conversion to final grades, and for additional information on student record and transcript notations.

Temporary Grade	Description
I	<i>Incomplete:</i> 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	<i>In progress:</i> 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	<i>Compulsory Withdrawal:</i> 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.

OUTLINE:

1. Thermal Energy

- 1.1. Review of Temperature
 - 1.1.1 Temperature Scales
 - 1.1.2 Thermal Equilibrium
- 1.2. Thermal Expansion
 - 1.2.1 Linear expansion
 - 1.2.2 Volume expansion
 - 1.2.3 Capacity problems
- 1.3. Heat
 - 1.3.1 Heat and thermal energy
 - 1.3.2 Specific heat capacity
 - 1.3.3 Change of Phase
 - 1.3.4 Latent heat of fusion and vaporization
 - 1.3.5 Calorimetry

2. Mechanical Waves

- 2.1. Periodic Waves
 - 2.1.1 Wave velocity, frequency, period, wavelength
 - 2.1.2 Transverse and longitudinal waves
 - 2.1.3 Traveling waves in space and time
- 2.2. The wave function
 - 2.2.1 Wave number, angular frequency, phase constant, phase difference
- 2.3. Wave velocity in an elastic medium – Transverse waves in a string
- 2.4. Particle velocity and acceleration
- 2.5. The wave equation and solution
- 2.6. Energy in waves – Power and Intensity
- 2.7. Interference of waves
 - 2.7.1 Constructive and destructive interference
 - 2.7.2 Combined Wave function - Effect of frequency, amplitude and direction
 - 2.7.3 Standing waves – Standing wave function
 - 2.7.4 Standing waves in a string
 - 2.7.5 Standing waves in air columns
 - 2.7.6 Beats – Superposition of the two wave functions
- 2.8. Sound
 - 2.8.1 Nature of pressure waves – Displacement wave function and pressure wave function

3. Physical Optics

- 3.1. Conditions for stable interference of light waves
 - 3.1.1 Coherence
 - 3.1.2 Monochromaticity
- 3.2. Young's double slit experiment
 - 3.2.1 Conditions for interference
 - 3.2.2 Interference pattern and the wave function
 - 3.2.3 Intensity distribution – Intensity as a function of angle and distance

4. Electrostatics

- 4.1. Electric Charges
 - 4.1.1 Types of charges
 - 4.1.2 First law of electrostatics
 - 4.1.3 Conductors and insulators
 - 4.1.4 Coulomb's law
- 4.2. Electric field
 - 4.2.1 Concept
 - 4.2.2 Due to point charges
 - 4.2.3 Due to distributed charge
 - 4.2.4 Electric field lines
- 4.3. Electric potential
 - 4.3.1 Electric potential energy
 - 4.3.2 Potential difference
 - 4.3.3 Potential near a point charge
 - 4.3.4 Potential due to discrete charges and distributed charges
 - 4.3.5 Equipotentials
 - 4.3.6 Potential gradient and the electric field - Potential in a uniform field

5. Electric Circuits

- 5.1. Parts of a circuit
 - 5.1.1 Types of sources
 - 5.1.2 Types of loads
 - 5.1.3 Electric Current
- 5.2. Resistance
 - 5.2.1 Ohm's law
 - 5.2.2 Factors affecting resistance
 - 5.2.3 Temperature dependence
 - 5.2.4 Internal resistance of sources
 - 5.2.5 Superconductors
- 5.3. Series circuits
 - 5.3.1 Description
 - 5.3.2 Characteristics
- 5.4. Parallel circuits
 - 5.4.1 Description
 - 5.4.2 Characteristics
- 5.5. Series-parallel circuits
- 5.6. Kirchhoff's Rules
 - 5.6.1 Junction (current) rule
 - 5.6.2 Loop (voltage) rule

6. Magnetic Fields

- 6.1. Description
- 6.2. Force on a charge
 - 6.2.1 Characteristics
 - 6.2.2 Magnetic flux density
 - 6.2.3 Generator principle
- 6.3. Magnetic force on a conductor
 - 6.3.1 In a uniform field
 - 6.3.2 Torque on a loop
 - 6.3.3 Motor principle
- 6.4. Electromagnetic Induction and Faraday's Law