



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

PHYS-141-002
Physics for Science/ENGR 2
Winter 2020

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	Stephanie Ingraham	
(b) Office hours	Mon, Tues, Thurs: 11:30 am -12:20 pm, Wed: 1:30- 2:20 pm, Fri: 12:30-1:20 pm (or by appointment)	
(c) Location	F346C	
(d) Phone	250-370-3513	Alternative: _____
(e) E-mail	IngrahamS@camosun.bc.ca	
(f) Website	D2L (online.camosun.ca)	

2. Intended Learning Outcomes

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

1. Examine common physical systems subject to periodic motion and study the propagation of waves on strings and in air columns.
 - a. Identify defining features of systems undergoing Simple Harmonic Motion and solve technical problems for such systems.
 - b. Define and describe the following properties of waves: period, frequency, wave speed, and amplitude.
 - c. State the principal of superposition and understand the properties of waves undergoing constructive and destructive interference.
 - d. Compare and contrast wave propagation on strings and in air columns including wave speed dependence on medium characteristics.
 - e. Solve problems involving the Doppler effect.
 - f. 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.
2. Investigate laws of geometric optics and use them to understand and characterize image formation in mirrors and lenses.
 - a. State laws of reflection and refraction and apply laws to calculate paths of light rays at interfaces between materials.
 - b. Solve technical problems involving dispersion and total internal reflection as special applications of refraction.
 - c. Solve technical problems involving image formation with spherical mirrors, lenses and simple optical devices, including ray diagrams.

3. Apply the wave model of light to study and describe physics optics experiments involving interference and diffraction of light.
 - a. Solve technical problems associated with the effects of light interference.
 - b. Study experiments and applications that rely on interference of light including Young's double-slit, diffraction gratings, thin film interference and the Michelson Interferometer.
 - c. State and explore the First and Second Laws of Thermodynamics through investigations into heat transfer, calorimetry and analyses of heat engines.
Solve technical problems involving linear and volume expansion of solids and liquids in response to temperature changes.
 - d. Apply concepts of specific and latent heat to solve technical calorimetry problems including systems undergoing phase changes.
 - e. Describe fundamental mechanisms of heat transfer.
 - f. Apply the Ideal Gas Law and the First Law of Thermodynamics to analyze simple heat engines.
 - g. Apply the concept of entropy and the Second Law of Thermodynamics to describe limits to the efficiency of heat engines.
4. Examine and solve problems using key theories of modern physics including relativity, the structure of matter, and radioactivity.
 - a. Outline the key principles of Einstein's Theory of Special Relativity. Solve technical problems involving coordinate transformations, relativity of length and time intervals, relativistic energy and momentum.
 - b. Outline key ideas of quantum theory including wave-particle duality and the Heisenberg uncertainty principle.
 - c. Solve technical problems involving the photoelectric effect, Compton scattering and pair production and the Heisenberg Uncertainty Principle.
 - d. Describe the Bohr model of the atom and the nature of radioactivity.
5. Examine the validity of key physical principles through the use of practical experimental techniques.
 - a. Assemble experimental apparatus using written instructions.
 - b. Observe and record data including sources of error and estimate the range of uncertainty in results.
 - c. Interpret meaning of experimental results in the context of the experimental objectives.
 - d. Write scientific reports in correct format.

3. Required Materials

- (a) Texts: Physics for Scientists and Engineers, 4th Edition, Knight, R.D. (Optional)
- (b) Other: Physics 140/141 Laboratory Manual, Scientific Calculator, Ruler

4. Course Content and Schedule

Mon., Tue., Wed., Thu.:	Lecture: 10:30 AM – 11:20 AM	Fisher 316
Thu.:	Lab: 1:30 PM – 3:20 PM	Fisher 316

Tests are scheduled for the following dates and will be held in the lab period:

Test #1: Thursday, January 30th

Test #2: Thursday, February 27th

Test #3: Thursday, March 26th

5. Basis of Student Assessment (Weighting)

- (a) Homework: 10 %
- (b) Quizzes: 5 %
- (c) Labs: 25 %
- (d) Term Tests: 30%
- (e) Final: 30%

COURSE SPECIFIC POLICIES

- Homework problems for a particular week will be marked for completeness. They will be due at the **beginning of the lab** on the Thursday of each week. Any time after this will be considered late. See below for late policies.
- Short, five minute multiple choice quizzes will be delivered at the start of each Monday's lecture class. These will be based on the previous week's material and the corresponding multiple choice questions found online through D2L.
- Labs for a particular week will be due by the beginning of the lab one week following the lab. Any changes in due dates or timelines will be posted on the D2L news feed.
- Each student is allowed one "dropped" or "missed" lab.

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.
- Students will complete a minimum of 9 laboratory experiments including 3 formal reports (with full uncertainty calculations) and at least at least one lab using technology to perform data analysis.

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.

Tentative Class Schedule

Note that the lecture topics may vary by one or two days. Any changes to scheduled labs will be posted on D2L.

Date	Lecture Topic: P141-002
WEEK #1	
Monday, Jan. 6 th	1.1: Mathematical Description of SHM
Tuesday, Jan. 7 th	1.1: Mathematical Description of SHM
Wednesday, Jan. 8 th	1.2: Energy in SHM 1.3: Other Examples of SHM
Thursday, Jan. 9 th	1.3: Other Examples of SHM / 1.4 Damping, Forced HM, Resonance
Lab	LAB: Uncertainties and Repeated Measurements
WEEK #2	
Monday, Jan. 13 th	2.1: Types of Wave Motion
Tuesday, Jan. 14 th	2.2: Mathematical Description of a Wave
Wednesday, Jan. 15 th	2.3: Speed of Waves
Thursday, Jan. 16 th	2.4: Reflection, Transmission & Interference
Lab	LAB: Simple Harmonic Motion
WEEK #3	
Monday, Jan. 20 th	2.5: Standing Waves on a String.
Tuesday, Jan. 21 st	2.5: Standing Waves on a String.
Wednesday, Jan. 22 nd	3.1: Sound Waves
Thursday, Jan. 23 rd	3.2: Standing Sound Waves
Lab	LAB: Standing Waves on a String
WEEK #4	
Monday, Jan. 27 th	3.2: Standing Sound Waves
Tuesday, Jan. 28 th	3.3: Beats and the Doppler Effect
Wednesday, Jan. 29 th	4.1: Nature of Light / 4.2: Reflection & Refraction
Thursday, Jan. 30 th	4.2: Reflection and Refraction of Light
Lab	Test 1- Modules 1 and 2
WEEK #5	
Monday, Feb. 3 rd	4.3: Total Internal Reflection
Tuesday, Feb. 4 th	5.1: Plane Mirrors
Wednesday, Feb. 5 th	5.2: Images formed by Spherical Mirrors
Thursday, Feb. 6 th	5.2: Images formed by Spherical Mirrors
Lab	LAB: Standing Waves in an Air Column
WEEK #6	
Monday, Feb. 10 th	5.3: Images formed by Thin Lenses
Tuesday, Feb. 11 th	5.4: Selected Lens Combinations
Wednesday, Feb. 12 th	6.1: Interference & Young's Double Slit Experiment
Thursday, Feb. 13 th	6.1: Interference & Young's Double Slit Experiment
Lab	LAB: Properties of Refraction
WEEK #7	
Monday, Feb. 17 th	No Class- Family Day
Tuesday, Feb. 18 th	Reading Break
Wednesday, Feb. 19 th	Reading Break
Thursday, Feb. 20 th	Reading Break
Friday, Feb. 21 st	Reading Break
WEEK #8	

Monday, Feb. 24 th	6.2: Diffraction Gratings
Tuesday, Feb. 25 th	6.3: Single-Slit Diffraction
Wednesday, Feb. 26 th	6.3: Single-Slit Diffraction
Thursday, Feb. 27 th	6.4: Thin Film Interference
Lab	Test 2- Modules 3, 4, and 5
WEEK #9	
Monday, Mar. 2 nd	6.4: Thin Film Interference
Tuesday, Mar. 3 rd	6.5: The Michelson Interferometer
Wednesday, Mar. 4 th	7.1: Temperature, Internal Energy and Heat
Thursday, Mar. 5 th	7.2: Specific Heat and Calorimetry
Lab	LAB: Image Formation with a Single Lens or Mirror
WEEK #10	
Monday, Mar. 9 th	7.3: Latent Heat; 7.4: Thermal Expansion
Tuesday, Mar. 10 th	7.4: The Ideal Gas Law
Wednesday, Mar. 11 th	7.5: Ideal Gas Processes
Thursday, Mar. 12 th	7.6: The First Law of Thermodynamics
Lab	LAB: Interference of Sound Waves
WEEK #11	
Monday, Mar. 16 th	7.7: Work and Heat in Ideal Gas Processes
Tuesday, Mar. 17 th	7.8: Heat Engines
Wednesday, Mar. 18 th	7.8: Heat Engines / 7.9: Refrigerators
Thursday, Mar. 19 th	7.10: Entropy and the 2 nd Law of Thermodynamics
Lab	LAB: Electrical Energy and the Specific Heat of Water
WEEK #12	
Monday, Mar. 23 rd	8.1: Reference Frames and Galilean Relativity
Tuesday, Mar. 24 th	8.2: Einstein's Principle of Special Relativity
Wednesday, Mar. 25 th	8.3: Time Dilation
Thursday, Mar. 26 th	8.4 Length Contraction
Lab	Test 3- Modules 6 and 7
WEEK #13	
Monday, Mar. 30 th	8.5 The Lorentz Transforms
Tuesday, Mar. 31 st	8.6 Relativistic Momentum and Energy
Wednesday, April 1 st	9.1: The Photoelectric Effect
Thursday, April 2 nd	9.2: Compton Scattering and Pair Production
Lab	LAB: The Balmer Series
WEEK #14	
Monday, April 6 th	9.3: Wave-Particle Duality and the Uncertainty Principle
Tuesday, April 7 th	9.4: Modern Theories of the Atom
Wednesday, April 8 th	9.5: Radioactivity
Thursday, April 9 th	Review
Lab	Review