COURSE SYLLABUS

COURSE TITLE: PHYS-141-Physics for Scientists and Engineers 2
CLASS SECTION: 002

TERM: 2024F

COURSE CREDITS: 3

DELIVERY METHOD(S): Synchronous, In-Person

Camosun College respectfully acknowledges that our campuses are situated on the territories of the Lək̓ʷəŋən (Songhees and Kosapsum) and WSÁNEĆ peoples. We honour their knowledge and welcome to all students who seek education here.

INSTRUCTOR DETAILS

NAME: Jean-Marc (JM) Miszaniec

EMAIL: MiszaniecJ@camosun.com

OFFICE: 365C

HOURS: T/W 10:30-11:20 AM

As your course instructor, I endeavour to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with me. Camosun College is committed to identifying and removing institutional and social barriers that prevent access and impede success.

CALENDAR DESCRIPTION

This calculus-based course is intended for students in Science or Engineering. Students will study periodic motion, travelling and standing waves, thermal physics, geometric optics, physical optics. Students will explore fundamental concepts modern physics, including relativity, the structure of matter and radioactivity. Students will explore how these fundamental principles apply in laboratory settings.

PREREQUISITE(S):

All of:

C in PHYS 140

CO-REQUISITE(S):

EQUIVALENCIES:

COURSE LEARNING OUTCOMES / OBJECTIVES

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

Examine common physical systems subject to periodic motion and study the propagation of waves on strings and in air columns.

Identify defining features of systems undergoing Simple Harmonic Motion and solve technical problems for such systems.

Define and describe the following properties of waves: period, frequency, wave speed, and amplitude.

State the principal of superposition and understand the properties of waves undergoing constructive and destructive interference.

Compare and contrast wave propagation on strings and in air columns including wave speed dependence on medium characteristics.

Solve problems involving the Doppler effect.

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.

Investigate laws of geometric optics and use them to understand and characterize image formation in mirrors and lenses.

State laws of reflection and refraction and apply laws to calculate paths of light rays at interfaces between materials.

Solve technical problems involving dispersion and total internal reflection as special applications of refraction.

Solve technical problems involving image formation with spherical mirrors, lenses and simple optical devices, including ray diagrams.

Apply the wave model of light to study and describe physics optics experiments involving interference and diffraction of light.

Solve technical problems associated with the effects of light interference.

Study experiments and applications that rely on interference of light including Young's double-slit, diffraction gratings, thin film interference and the Michelson Interferometer.

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.

Apply concepts of specific and latent heat to solve technical calorimetry problems including systems undergoing phase changes.

Describe fundamental mechanisms of heat transfer.

Apply the Ideal Gas Law and the First Law of Thermodynamics to analyze simple heat engines.

Apply the concept of entropy and the Second Law of Thermodynamics to describe limits to the efficiency of heat engines.

Examine and solve problems using key theories of modern physics including relativity, the structure of matter, and radioactivity.

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.

Outline key ideas of quantum theory including wave-particle duality and the Heisenberg uncertainty principle.

Solve technical problems involving the photoelectric effect, Compton scattering and pair production and the Heisenberg Uncertainty Principle.

Describe the Bohr model of the atom and the nature of radioactivity.

Examine the validity of key physical principles through the use of practical experimental techniques.

Assemble experimental apparatus using written instructions.

Observe and record data including sources of error and estimate the range of uncertainty in results.

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

Write scientific reports in correct format.

REQUIRED MATERIALS & RECOMMENDED PREPARATION / INFORMATION

Required materials:

- Scientific calculator
- Ruler
- Access to a computer with Microsoft Excel. (Students can access Excel through the Microsoft Office Suite available free to students here: https://legacy.camosun.ca/services/its/other-services.html.)
- Physics 105 Lab Manual

Optional material:

- Physics by Giancoli, 7th Edition (Copies available in Lansdowne Campus Library and the Bookstore)

COURSE SCHEDULE, TOPICS, AND ASSOCIATED PREPARATION / ACTIVITY / EVALUATION

The following schedule and course components are subject to change with reasonable advance notice, as deemed appropriate by the instructor.

WEEK	Activity	Due Dates
Week 1		
Monday, January 6		
Tuesday, January 7	Course Intro + Semester Prep	
Wednesday, January 8	1.1 Mathematical Description of Simple Harmonic Motion & LAB: Revision of Uncertainty and Experimental Analysis	
Thursday, January 9	1.1 Mathematical Description of Simple Harmonic Motion	
Friday, January 10	1.2 Energy in Simple Harmonic Motion	
Week 2		
Monday, January 13		
Tuesday, January 14	1.3 Other Examples of Simple Harmonic Motion	

Wednesday, January 15	2.1 Types of Wave Motion & 2.2 Mathematical Description of a Wave & LAB: Simple Harmonic Motion	Lab Deliverable Due EOD & HW due in Lab
Thursday, January 16	2.3 Speed of a Transverse Wave	
Friday, January 17	2.4 Reflection, Transmission, and Interference	
Week 3		
Monday, January 20		
Tuesday, January 21	2.5 Standing Waves	
Wednesday, January 22	3.1 Introduction to Sound Waves & 3.2 Standing Sound Waves, & **Test #1: Module 1 and 2**	HW due in Lab
Thursday, January 23	3.3 Beats and The Doppler Effect	Lab Deliverable Due EOD
Friday, January 24	3.3 Beats and The Doppler Effect	
Week 4		
Monday, January 27		
Tuesday, January 28	4.1 The Nature of Light and The Ray Approximation & 4.2 Reflection and Refraction	
Wednesday, January 29	4.2 Reflection and Refraction & 4.3 Total Internal Reflection and Dispersion, & LAB: Image Formation in Single Lens/ Mirror	HW due in Lab
Thursday, January 30	4.3 Total Internal Reflection and Dispersion	
Friday, January 31	5.1 Images Formed by Plane Mirrors	
Week 5		
Monday, February 3		
Tuesday, February 4	5.2 Spherical Mirrors	
Wednesday, February 5	5.3 Thin Lenses **& Test #2: Modules 3 and 4**	HW due in Lab
Thursday, February 6	5.3 Thin Lenses	Lab Deliverable Due EOD
Friday, February 7	5.4 Simple Optical Devices	
Week 6		
Monday, February 10		
Tuesday, February 11	6.1 Interference and Young's Double Slit Experiment	
Wednesday, February 12	6.2 Diffraction Gratings & Capstone #1 Performed: Interference of Sound	HW due in Lab
Thursday, February 13	6.3 Single Slit Diffraction	
Friday, February 14	6.4 Thin Film Interference-updated	
Week 7		

Monday, February 17	Reading week	College closed
Tuesday, February 18	Reading week	College closed
Wednesday, February 19	Reading week	College closed
Thursday, February 20	Reading week	College closed
Friday, February 21	Reading week	College closed
Week 8		
Monday, February 24		
Tuesday, February 25	6.4 Thin Film Interference- updated & 6.5 The Michelson Interferometer	
Wednesday, February 26	7.1 Temperature, Thermal Energy, and Heat **& Test #3: Modules 5 and 6**	HW due in Lab
Thursday, February 27	7.2 Specific Heat and Calorimetry	**Capstone #1 Due EOD**
Friday, February 28	7.3- Latent Heat	
Week 9		
Monday, March 3		
Tuesday, March 4	7.4 Thermal Expansion	
Wednesday, March 5	7.5 The Ideal Gas Law and Ideal Gas Processes & LAB: Electric Energy and Specific Heat of Water	HW due in Lab
Thursday, March 6	7.6 The First Law of Thermodynamics	
Friday, March 7	7.7 Work and Heat in Idea Gas Processes	
Week 10		
Monday, March 10		
Tuesday, March 11	7.7 Work and Heat in Idea Gas Processes	
Wednesday, March 12	7.8 Heat Engines & LAB: TBD	HW due in Lab & Lab Deliverable Due EOD
Thursday, March 13	7.9 Ideal Gas Refrigerators & LAB: TBD	
Friday, March 14	7.10 The Second Law of Thermodynamics	
Week 11		
Monday, March 17		
Tuesday, March 18	8.1 Reference Frames and Galilean Transformations	
Wednesday, March 19	8.1 Reference Frames and Galilean Transformations **& Test #4: Module 7**	HW due in Lab & Lab Deliverable Due EOD
Thursday, March 20	8.2 Einstein's Principle of Relativity	
Friday, March 21	8.3 Time Dilation	
Week 12		

Monday, March 24		
Tuesday, March 25	8.4 Length Contraction	
Wednesday, March 26	8.5 The Lorentz Transformations & Capstone #2 Perfomed: Standing Sound Waves in Air Column	HW due in Lab & Lab Deliverable Due EOD
Thursday, March 27	8.5 The Lorentz Transformations	
Friday, March 28	8.6 Relativistic Momentum and Energy	
Week 13		
Monday, March 31		
Tuesday, April 1	9.1 The Photoelectric Effect	
Wednesday, April 2	9.1 The Photoelectric Effect & LAB: Photoelectric Effect	HW due in Lab
Thursday, April 3	9.2 Compton Scatter and Pair Production	Lab Deliverable Due EOD
Friday, April 4	9.3 Wave Particle Duality and The Uncertainty Principle	
Week 14		
Monday, April 7	9.4 Atomic Line Spectra and Early Models of the Atom	
Tuesday, April 8		
Wednesday, April 9	9.4 Atomic Line Spectra and Early Models of the Atom & Lab: Review	HW due in Lab
Thursday, April 10	9.5 - The Structure of the Nucleus and Binding Energy	**Capstone #2 due**
Friday, April 11	9.6 - Radioactive Decay	
Week 15		
April 14 - April 25	**Final Exam Period**	

Students registered with the Centre for Accessible Learning (CAL) who complete quizzes, tests, and exams with academic accommodations have booking procedures and deadlines with CAL where advanced noticed is required. Deadlines can be reviewed on the CAL exams page. https://camosun.ca/services/academic-supports/accessible-learning/academic-accommodations-exams

EVALUATION OF LEARNING

	WEIGHTING
Weekly Homework	10%
Labs	25%
Tests (4)	25%
Capstone Lab Reports (2)	10%

Final	30%
TOTAL	100%

COURSE GUIDELINES & EXPECTATIONS

Course content will be posted daily on d2L.

- Course content, announcements, and important class information will be posted on d2L. Students must check d2L regularly.

Homework

- Homework is due in the first 30 minutes of the lab period
- Homework is marked for completion. Criteria for completion must be met.
- Self-Assessments must be completed.
- Late homework is not accepted.

Tests

- Tests are to be completed during lab periods. Students will be given 1.5 hours to complete the tests.
- Students are allowed calculators on tests
- Formula sheets are provided by instructor

Labs

- Lab reports are due latest 11:59 PM one week after experiment is performed. Any changes in due dates or timelines will be posted on the D2L calendar.
- Labs will be submitted as a group fulfilling the specified requirements.
- Groups will switch every two lab sessions.
- Labs submitted one day late will obtain a maximum score of 60%. Additional late days decreases the max score by 10 percentage points.

Capstone Lab Reports

- The capstone lab reports are individual efforts
- The capstone report entails a formal lab report including all necessary and required sections of a formal lab.

PHYSICS DEPARTMENT GUIDELINES REGARDING TESTING AND GRADING:

- 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 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.

Missed Labs Guidelines:

- Laboratory activities are in-person activities; attendance and participation are required. Reports will
- not be accepted from students who did not attend the lab period.
- If you arrive more than 30 minutes late to the lab, you may be recorded as absent.
- Students who will miss a laboratory session have an obligation to seek out concessions directly from their instructor in a timely manner, BEFORE the lab period occurs. In the event of unforeseen circumstances, lab instructors must be notified within 24 hours of the missed lab period, or concessions will not be available.
- If you miss up to three (3) laboratory sessions, you are still eligible to meet the Learning Outcomes for the course, though missed labs may receive a zero grade.
- If you miss a total of four (4) or more labs for any reason including, but not limited to: life circumstances, illness, family or pet obligations, planned vacations, milestone family events, work commitments, competitive athletic event., you will be unable to meet the learning outcomes for the class and will receive a failing grade (F) in the entire course, regardless of marks received on graded lab and lecture components. Exceptions will only be considered through an academic concession granted by the instructor or Dean/Associate Dean.
- Please note that if you are suffering from a serious medical illness that prevents you from participating in this course, Camosun College has a Compassionate Medical Withdrawal Policy (https://camosun.ca/services/forms#medical)

SCHOOL OR DEPARTMENTAL INFORMATION

- **Students must obtain an overall grade of 50% or higher in the laboratory component of the course order to obtain credit for the course.**
- 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

STUDENT RESPONSIBILITY

Enrolment at Camosun assumes that the student will become a responsible member of the College community. As such, each student will display a positive work ethic, assist in the preservation of College property, and assume responsibility for their education by researching academic requirements and policies; demonstrating courtesy and respect toward others; and respecting expectations concerning attendance, assignments, deadlines, and appointments.

SUPPORTS AND SERVICES FOR STUDENTS

Camosun College offers a number of services to help you succeed in and out of the classroom. For a detailed overview of the supports and services visit camosun.ca/services.

Support Service	Website
Academic Advising	camosun.ca/services/academic-supports/academic-advising
Accessible Learning	camosun.ca/services/academic-supports/accessible-learning
Counselling	camosun.ca/services/health-and-wellness/counselling-centre
Career Services	camosun.ca/services/co-operative-education-and-career-services
Financial Aid and Awards	camosun.ca/registration-records/financial-aid-awards
Help Centres (Math/English/Science)	camosun.ca/services/academic-supports/help-centres
Indigenous Student Support	camosun.ca/programs-courses/iecc/indigenous-student-services
International Student Support	camosun.ca/international
Learning Skills	camosun.ca/services/academic-supports/help-centres/writing-centre-learning-skills
Library	camosun.ca/services/library
Office of Student Support	camosun.ca/services/office-student-support
Ombudsperson	camosun.ca/services/ombudsperson
Registration	camosun.ca/registration-records/registration
Technology Support	camosun.ca/services/its
Writing Centre	camosun.ca/services/academic-supports/help-centres/writing-centre-learning-skills

If you have a mental health concern, please contact Counselling to arrange an appointment as soon as possible. Counselling sessions are available at both campuses during business hours. If you need urgent support after-hours, please contact the Vancouver Island Crisis Line at 1-888-494-3888 or call 911.

COLLEGE-WIDE POLICIES, PROCEDURES, REQUIREMENTS, AND STANDARDS

Academic Integrity

Students are expected to comply with all College policy regarding academic integrity; which is about honest and ethical behaviour in your education journey. The following guide is designed to help you understand your responsibilities: https://camosun.libguides.com/academicintegrity/welcome

Please visit https://camosun.ca/sites/default/files/2021-05/e-1.13.pdf for Camosun's Academic Integrity policy and details for addressing and resolving matters of academic misconduct.

Academic Accommodations for Students with Disabilities

Camosun College is committed to achieving full accessibility for persons with disabilities. Part of this commitment includes arranging appropriate academic accommodations for students with disabilities to ensure they have an equitable opportunity to participate in all of their academic activities. If you are a student with a documented disability and think you may need accommodations, you are strongly encouraged to contact the Centre for Accessible Learning (CAL) and register as early as possible. Please visit the CAL website for more information about the process of registering with CAL, including important deadlines: https://camosun.ca/cal

Academic Progress

Please visit https://camosun.ca/sites/default/files/2023-02/e-1.1.pdf for further details on how Camosun College monitors students' academic progress and what steps can be taken if a student is at risk of not meeting the College's academic progress standards.

Course Withdrawals Policy

Please visit https://camosun.ca/sites/default/files/2021-05/e-2.2.pdf for further details about course withdrawals. For deadline for fees, course drop dates, and tuition refund, please visit https://camosun.ca/registration-records/tuition-fees#deadlines.

Grading Policy

Please visit https://camosun.ca/sites/default/files/2021-05/e-1.5.pdf for further details about grading.

Grade Review and Appeals

Please visit https://camosun.ca/sites/default/files/2021-05/e-1.14.pdf for policy relating to requests for review and appeal of grades.

Medical / Compassionate Withdrawals

Students who are incapacitated and unable to complete or succeed in their studies by virtue of serious and demonstrated exceptional circumstances may be eligible for a medical/compassionate withdrawal (see Medical/Compassionate Withdrawals policy). Please visit https://camosun.ca/services/forms#medical to learn more about the process involved in a medical/compassionate withdrawal.

Sexual Violence

Camosun is committed to creating a campus culture of safety, respect, and consent. Camosun's Office of Student Support is responsible for offering support to students impacted by sexual violence. Regardless of when or where the sexual violence occurred, students can access support at Camosun. The Office of Student Support will make sure students have a safe and private place to talk and will help them understand what supports are available and their options for next steps. The Office of Student Support respects a student's right

to choose what is right for them. For more information see Camosun's Sexualized Violence Policy: https://camosun.ca/sites/default/files/2021-05/e-2.9.pdf and camosun.ca/services/sexual-violence-support-and-education.

To contact the Office of Student Support: oss@camosun.ca or by phone: 250-370-3046 or 250-370-3841

Student Misconduct (Non-Academic)

Camosun College is committed to building the academic competency of all students, seeks to empower students to become agents of their own learning, and promotes academic belonging for everyone. Camosun also expects that all students to conduct themselves in a manner that contributes to a positive, supportive, and safe learning environment. Please review Camosun College's Student Misconduct Policy at https://camosun.ca/sites/default/files/2021-05/e-2.5.pdf to understand the College's expectations of academic integrity and student behavioural conduct.

Looking for other policies?

The full suite of College policies and directives can be found here: https://camosun.ca/about/camosun-college-policies-and-directives

Changes to this Syllabus: Every effort has been made to ensure that information in this syllabus is accurate at the time of publication. The College reserves the right to change courses if it becomes necessary so that course content remains relevant. In such cases, the instructor will give the students clear and timely notice of the changes.