

# COURSE SYLLABUS



COURSE TITLE: PHYS-140: Physics for Scientists and Engineers 1

CLASS SECTION: 001

TERM: Fall 2021

COURSE CREDITS: 4

DELIVERY METHOD(S): Lecture

Camosun College campuses are located on the traditional territories of the Lək̓ʷəŋən and W̱SÁNEĆ peoples. We acknowledge their welcome and graciousness to the students who seek knowledge here.

Learn more about Camosun's [Territorial Acknowledgement](#).

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For COVID-19 information please visit <https://legacy.camosun.ca/covid19/index.html>.

*Camosun College requires mandatory attendance for the first class meeting of each course. If you do not attend, and do not provide your instructor with a reasonable explanation in advance, you will be removed from the course and the space offered to the next waitlisted student.*

## INSTRUCTOR DETAILS

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NAME: Chris Avis

EMAIL: [avisc@camosun.bc.ca](mailto:avisc@camosun.bc.ca)

OFFICE: Fisher 346D

HOURS: M: 6:30 PM – 7:20 PM (Online), T: 11:30 AM – 12:20 PM (In person), W: 6:30 PM -7:20 PM (Online)

Th: 11:30 AM – 12:20 PM (In person), F: 11:30 AM – 12:20 PM (In person)

*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

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This calculus-based course is intended for students in Science or Engineering. Students will study the mechanics of particles analyzing problems involving forces and equations of motion in multiple dimensions, conservation laws, rotational kinematics and dynamics. Students will further investigate electric fields and electric potential; DC circuits, and magnetic fields. Students will explore how these fundamental principles apply in laboratory settings.

### PREREQUISITE(S):

One of:

- C in Physics 12
- C in Camosun Alternative

### CO-REQUISITE(S):

All of:

- C in MATH 100

### EXCLUSION(S):

Not Applicable

## COURSE LEARNING OUTCOMES / OBJECTIVES

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

1. Apply techniques of vector algebra to solve problems where vectors sum to zero or calculate resultant vectors.

a. Perform coordinate system conversions.

b. Demonstrate operations of vector addition and subtraction using graphical, vector component and unit vector techniques.

c. Calculate and interpret scalar product and vector products.

2. Solve problems involving particle kinematics and dynamics for translational motion with non-constant force.

a. Apply kinematic equations to analyze motion of objects subject to constant acceleration.

b. Use calculus to analyze motion of objects with non-constant acceleration.

c. Use vector components to analyze motion in two and three dimensions.

d. Solve problems for objects undergoing uniform and non-uniform circular motion.

e. State and apply Newton's Laws to analyze systems subject to concurrent forces including friction, inclines and connected objects.

3. Analyze the rotational motion of rigid bodies.

a. Calculate the center-of-mass and moment-of-inertia for uniform objects including the parallel-axis theorem.

b. Perform calculations and answer conceptual questions using torques. Solve equilibrium problems for non-concurrent forces.

c. Define the rotational kinematic quantities; transform between linear and rotational quantities.

d. Use the rotational form of Newton's 2nd Law to solve dynamics problems.

e. Apply translational and rotational conditions of mechanical equilibrium.

4. Use work-energy theorem and other conservation laws to solve applied problems.

a. Solve problems involving work by constant and non-constant forces in two and three dimensions.

b. Calculate work, energy and power for rotational systems.

c. Perform calculations utilizing the conservation of momentum of isolated systems for elastic and inelastic collisions.

d. Perform calculations utilizing the conservation of angular momentum for rotating systems.

5. Apply concepts of dynamics, work and energy to analyze charged particles in electric and magnetic fields.

a. Calculate electric fields, forces, potential and potential energy for point charges and simple charge distributions.

b. Perform calculations for charged particles moving in uniform electric and magnetic fields; describe their motion and practical applications.

c. Solve problems for multi-branch direct current circuits using Ohm's Laws and Kirchhoff's Rules.

6. 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.

## REQUIRED MATERIALS & RECOMMENDED PREPARATION / INFORMATION

Students will require a scientific calculator, ruler, protractor and access to a computer with Microsoft Excel and the Tracker Video Analysis software. Both of these pieces of software are available in certain campus computer labs. Tracker is freely available here: <https://physlets.org/tracker/>. Students can access Excel through the Microsoft Office Suite available free to students here: <https://legacy.camosun.ca/services/its/other-services.html>.

The following **optional reference textbook** is available through the Camosun Bookstore. Links between the course lectures and textbook sections can be found on the course website.

*Physics for Scientists and Engineers: A Strategic Approach by Knight, 4<sup>th</sup> Edition*

## 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 or TOPIC	DUE DATES
<b>WEEK #1</b>		
Mon. Sept. 6 <sup>th</sup>	<b>LABOUR DAY – NO CLASS</b>	
Tues. Sept. 7 <sup>th</sup>	Introductory Class / Start of First Lab Intro	
Weds. Sept. 8 <sup>th</sup>	Lab #1: Measurement Uncertainties - Theory	
Thurs., Sept. 9 <sup>th</sup>	1.1: Unit Conversions	
Fri. Sept. 10 <sup>th</sup>	1.2: Vector Addition – Graphical	
<b>WEEK #2</b>		
Mon. Sept. 13 <sup>th</sup>	1.3: Vector Components / 1.4: Unit Vectors	
Tues. Sept. 14 <sup>th</sup>	1.5: Vector Products Part 1 – Dot Product	
Weds. Sept. 15 <sup>th</sup>	Lab #2: Measurement Uncertainties - Practical	HW #1 by 11:59 PM
Thurs., Sept. 16 <sup>th</sup>	1.5: Vector Products Part 2 – Cross Product	<i>Add/drop deadline</i>
Fri. Sept. 17 <sup>th</sup>	2.1: Displacement, time and average velocity	Lab #1 by 11:59 PM
<b>WEEK #3</b>		
Mon. Sept. 20 <sup>th</sup>	2.2: Instantaneous Velocity and Acceleration.	
Tues. Sept. 21 <sup>st</sup>	2.3: Average and Instantaneous Acceleration	
Weds. Sept. 22 <sup>nd</sup>	Lab #3: Vector Components	HW #2 by 11:59 PM
Thurs., Sept. 23 <sup>rd</sup>	2.4: Motion w/ Constant Acceleration.	
Fri. Sept. 24 <sup>th</sup>	2.5: Free-fall	Lab #2 by 11:59 PM
<b>WEEK #4</b>		
Mon. Sept. 27 <sup>th</sup>	2.6: Velocity and Position by Integration Part 1	
Tues. Sept. 28 <sup>th</sup>	2.6: Velocity and Position by Integration Part 2	
Weds. Sept. 29 <sup>th</sup>	Lab #4: Graphing and Lab Reports	HW #3 by 11:59 PM
Thurs., Sept. 30 <sup>th</sup>	<b>NATIONAL DAY FOR TRUTH AND RECONCILIATION – NO CLASS</b>	
Fri. Oct. 1 <sup>st</sup>	3.1: Kinematics in 2-D and 3-D	Lab #3 by 11:59 PM
<b>WEEK #5</b>		
Mon. Oct. 4 <sup>th</sup>	3.2: Projectile Motion	
Tues. Oct. 5 <sup>th</sup>	4.1: Review of Forces; 4.2: Newton's First Law	
Weds. Oct. 6 <sup>th</sup>	Test #1 (1.1 to 2.6 + Uncertainties)	HW #4 by 11:59 PM
Thurs., Oct. 7 <sup>th</sup>	4.3: Newton's Second Law	
Fri. Oct. 8 <sup>th</sup>	4.4: Dynamics w/ Inclines	

WEEK	ACTIVITY or TOPIC	DUE DATES
<b>WEEK #6</b>		
Mon. Oct. 11 <sup>th</sup>	<i>THANKSGIVING DAY – NO CLASS</i>	
Tues. Oct. 12 <sup>th</sup>	4.5: Problems Involving Friction	
Weds. Oct. 13 <sup>th</sup>	Lab #5: Kinematics with Tracker	HW #5 by 11:59 PM
Thurs., Oct. 14 <sup>th</sup>	4.6: Newton's 3 <sup>rd</sup> Law and Connected Objects	
Fri. Oct. 15 <sup>th</sup>	4.7: Dynamics of Circular Motion	Lab #4 by 11:59 PM
<b>WEEK #7</b>		
Mon. Oct. 18 <sup>th</sup>	5.1: The Work/ KE Theorem	
Tues. Oct. 19 <sup>th</sup>	5.2: Work and Energy w/ Variable Forces	
Weds. Oct. 20 <sup>th</sup>	Lab #6: Two-Dimensional Kinematics	HW #6 by 11:59 PM
Thurs., Oct. 21 <sup>st</sup>	5.3: Power ; 5.4: Potential Energy	
Fri. Oct. 22 <sup>nd</sup>	5.4: Potential Energy	Lab #5 by 11:59 PM
<b>WEEK #8</b>		
Mon. Oct. 25 <sup>th</sup>	5.5: Conservation of Energy with Non-Conservative Forces	
Tues. Oct. 26 <sup>th</sup>	7.1: Coulomb's Law	
Weds. Oct. 27 <sup>th</sup>	Lab #7: Atwood's Machine	HW #7 by 11:59 PM
Thurs., Oct. 28 <sup>th</sup>	7.2: Electric Fields (Part 1)	
Fri. Oct. 29 <sup>th</sup>	7.2: Electric Fields (Part 2)	Lab #6 by 11:59 PM
<b>WEEK #9</b>		
Mon. Nov. 1 <sup>st</sup>	7.3: Electrical Potential Energy	
Tues. Nov. 2 <sup>nd</sup>	7.3: Electrical Potential Energy / 7.4: Electric Potential	
Weds. Nov. 3 <sup>rd</sup>	Test #2 (Sections 3.1 to 5.5)	HW #8 by 11:59 PM
Thurs., Nov. 4 <sup>th</sup>	7.4: Electric Potential	
Fri. Nov. 5 <sup>th</sup>	8.1: Current, Resistance and EMF	
<b>WEEK #10</b>		
Mon. Nov. 8 <sup>th</sup>	8.2: Power and 8.3: Kirchoff's Rules	
Tues. Nov. 9 <sup>th</sup>	8.3: Kirchoff's Rules	<i>Last Day to Withdraw w/o Academic Penalty</i>
Weds. Nov. 10 <sup>th</sup>	Lab #8: Electric-Fields	HW #9 by 11:59 PM
Thurs., Nov. 11 <sup>th</sup>	<i>REMEMBRANCE DAY – NO CLASS</i>	
Fri. Nov. 12 <sup>th</sup>	9.1: Introduction to Magnetism	Lab #7 by 11:59 PM
<b>WEEK #11</b>		
Mon. Nov. 15 <sup>th</sup>	9.2: Forces on Charges in Magnetic Fields	
Tues. Nov. 16 <sup>th</sup>	9.3: Motion of a Charge in a Uniform B-Field	
Weds. Nov. 17 <sup>th</sup>	Lab #9: Kirchoff's Laws	HW #10 by 11:59 PM
Thurs., Nov. 18 <sup>th</sup>	6.1: Impulse and Momentum	
Fri. Nov. 19 <sup>th</sup>	6.2: Conservation of Momentum	Lab #8 by 11:59 PM
<b>WEEK #12</b>		
Mon. Nov. 22 <sup>nd</sup>	6.3: Centre of Mass	
Tues. Nov. 23 <sup>rd</sup>	10.1: Angular Acceleration and 10.2: Rotation with Constant Angular Acceleration	
Weds. Nov. 24 <sup>th</sup>	Test #3 (7.1 – 9.3)	HW #11 by 11:59 PM
Thurs., Nov. 25 <sup>th</sup>	10.3: Relating Angular and Linear Quantities	
Fri. Nov. 26 <sup>th</sup>	10.4: Moment of Inertia Calculations	

WEEK	ACTIVITY or TOPIC	DUE DATES
<b>WEEK #13</b>		
Mon. Nov. 29 <sup>th</sup>	10.5: Torque and Angular Acceleration	
Tues. Nov. 30 <sup>th</sup>	10.5: Torque and Angular Acceleration	
Weds. Dec. 1 <sup>st</sup>	Lab #10: Rotational Inertia	HW #12 by 11:59 PM
Thurs., Dec. 2 <sup>nd</sup>	10.6: Energy in Rotational Motion	
Fri. Dec. 3 <sup>rd</sup>	10.6: Energy in Rotational Motion;	Lab #9 by 11:59 PM
<b>WEEK #14</b>		
Mon. Dec. 6 <sup>th</sup>	10.7: Static Equilibrium	
Tues. Dec. 7 <sup>th</sup>	10.7: Static Equilibrium	
Weds. Dec. 8 <sup>th</sup>	Review / Catch up time	HW #13 by 11:59 PM
Thurs., Dec. 9 <sup>th</sup>	10.8: Angular Momentum	
Fri. Dec. 10 <sup>th</sup>	Review	Lab #10 by 11:59 PM

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 notice is required. Deadlines can be reviewed on the [CAL exams page](http://camosun.ca/services/accessible-learning/exams.html). <http://camosun.ca/services/accessible-learning/exams.html>

## EVALUATION OF LEARNING

DESCRIPTION	WEIGHTING
Homework	20 %
Labs	20 %
Tests (4 @ 15 % Each)	60 %
<b>TOTAL</b>	<b>100%</b>

If you have a concern about a grade you have received for an evaluation, please come and see me as soon as possible. Refer to the [Grade Review and Appeals](http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf) policy for more information.  
<http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf>

Dates for the first three tests are as follows:

**Test #1: Wednesday October 6<sup>th</sup>, 8:30 AM – 10:20 AM**

**Test #2: Wednesday November 3<sup>rd</sup>, 8:30 AM – 10:20 AM**

**Test #3: Wednesday November 24<sup>th</sup>, 8:30 AM – 10:20 AM**

The fourth test will occur during the final exam period; the date and time will be announced later in the term.

## COURSE GUIDELINES & EXPECTATIONS

### Homework

Homework problems are designed to help you master problem solving skills and prepare you for the term tests. Homework either be submitted in person at the end of class or online using the course's dropboxes. Homework assignments will be relatively short so that I can grade them and give you feedback and students are therefore encouraged to work through the additional practice problems available on the website to ensure that they've mastered the material.

Homework problems will be assigned at the beginning of a particular week and will be due by the end of the day (11:59 PM) on the Wednesday of the following week. (E.g. Week #1's HW will be due by the Wednesday of Week #2; Week #2's HW will be due by the Wednesday of Week #3, etc.).

### **Labs**

Detailed lab instructions will be posted on the website. Students may wish to review these ahead of the labs. Labs assigned in a particular week will be due by the end of the day (11:59 PM) on the Friday of the following week. (E.g. if Lab #1 occurs during week #1, it will be due the Friday of Week #2, etc.). Exceptions will apply in week when there are tests in which case students will have two weeks to work on a lab.

Students who are repeating Physics 140 and have a lab mark from the previous attempt at the course greater than 70% can apply for lab exemption and carry over their previous lab mark. Please contact me in the first week of the term with the name of your previous instructor if this applies to you.

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

### **Late Policies**

Students requiring an extension to labs or homework due to illness or other extenuating circumstances must contact me prior to the due dates. Otherwise, late penalties will apply as noted. For overdue labs (or assignments), a late penalty of 10 % per day will be assessed for the first five days following the due date. After this, a completed lab or homework assignment earns a maximum mark of 50%.

All late homework and lab assignments must be submitted by the last day of the term (11:59 PM on December 11<sup>th</sup>); after this point, outstanding assignments will receive a mark of zero.

### **Study Habits**

Physics 140 is a fast-paced, challenging course. You can anticipate spending around 10 hours a week outside of class to master the material. Lecture videos and notes developed for online teaching during COVID will be available to you as a resource on the course website, but I strongly recommend that you attend the face-to-face lectures to stay on pace with the material and be able to clarify any questions you might have. Students who have been successful in the course have also recommended forming study groups, accessing the Science Help Centre and regular (and early) visits to office hours.

## **STUDENT RESPONSIBILITY**

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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

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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 <http://camosun.ca/students/>.

Academic Advising	<a href="http://camosun.ca/advising">http://camosun.ca/advising</a>
Accessible Learning	<a href="http://camosun.ca/accessible-learning">http://camosun.ca/accessible-learning</a>
Counselling	<a href="http://camosun.ca/counselling">http://camosun.ca/counselling</a>
Career Services	<a href="http://camosun.ca/coop">http://camosun.ca/coop</a>
Financial Aid and Awards	<a href="http://camosun.ca/financialaid">http://camosun.ca/financialaid</a>
Help Centres (Math/English/Science)	<a href="http://camosun.ca/help-centres">http://camosun.ca/help-centres</a>
Indigenous Student Support	<a href="http://camosun.ca/indigenous">http://camosun.ca/indigenous</a>
International Student Support	<a href="http://camosun.ca/international/">http://camosun.ca/international/</a>
Learning Skills	<a href="http://camosun.ca/learningskills">http://camosun.ca/learningskills</a>
Library	<a href="http://camosun.ca/services/library/">http://camosun.ca/services/library/</a>
Office of Student Support	<a href="http://camosun.ca/oss">http://camosun.ca/oss</a>
Ombudsperson	<a href="http://camosun.ca/ombuds">http://camosun.ca/ombuds</a>
Registration	<a href="http://camosun.ca/registration">http://camosun.ca/registration</a>
Technology Support	<a href="http://camosun.ca/its">http://camosun.ca/its</a>
Writing Centre	<a href="http://camosun.ca/writing-centre">http://camosun.ca/writing-centre</a>

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

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### Academic Accommodations for Students with Disabilities

The College is committed to providing appropriate and reasonable academic accommodations to students with disabilities (i.e. physical, depression, learning, etc). If you have a disability, the [Centre for Accessible Learning](http://camosun.ca/services/accessible-learning/) (CAL) can help you document your needs, and where disability-related barriers to access in your courses exist, create an accommodation plan. By making a plan through CAL, you can ensure you have the appropriate academic accommodations you need without disclosing your diagnosis or condition to course instructors. Please visit the CAL website for contacts and to learn how to get started:

<http://camosun.ca/services/accessible-learning/>

### Academic Integrity

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.13.pdf> for policy regarding academic expectations and details for addressing and resolving matters of academic misconduct.

### Academic Progress

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/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 <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.2.pdf> for further details about course withdrawals. For deadline for fees, course drop dates, and tuition refund, please visit <http://camosun.ca/learn/fees/#deadlines>.

### Grading Policy

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.5.pdf> for further details about grading.

### Grade Review and Appeals

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf> for policy relating to requests for review and appeal of grades.

### Mandatory Attendance for First Class Meeting of Each Course

Camosun College requires mandatory attendance for the first class meeting of each course. If you do not attend, and do not provide your instructor with a reasonable reason in advance, you will be removed from the course and the space offered to the next waitlisted student. For more information, please see the "Attendance" section under "Registration Policies and Procedures" (<http://camosun.ca/learn/calendar/current/procedures.html>) and the Grading Policy at <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.5.pdf>.

### 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. Please visit <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.8.pdf> to learn more about the process involved in a medical/compassionate withdrawal.

### Sexual Violence and Misconduct

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 or misconduct 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 and Misconduct Policy: <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.9.pdf> and [camosun.ca/sexual-violence](http://camosun.ca/sexual-violence). To contact the Office of Student Support: [oss@camosun.ca](mailto:oss@camosun.ca) or by phone: 250-370-3046 or 250-3703841

### 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 <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.5.pdf> to understand the College's expectations of academic integrity and student behavioural conduct.

**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.