Course Outline: PHYS 1003 A Fall 2025

Mechanics and Thermodynamics

Fundamental of Physics – Part 1

PHYS1003 - Course description and prerequisites

This calculus-based course is an introduction to mechanics and thermodynamics with emphasis on mastering the physics concepts required by students in the engineering programs. Chapters 1 through 11, Chapter 15, and Chapters 18 through 20 of the textbook will be covered. **Emphasis will be given to Chapters 2-11**; an overview of the mathematical tools will take place during the first week of class. The course content is defined by the lectures as well as the textbook. References to many applications and real-world examples are used frequently. The associated laboratory and tutorial sessions alternate each week and provide an essential complement to the lectures. Student evaluations are based on labs, tutorial tests and quizzes, in addition to a final exam which is formally scheduled. Students are required to obtain a satisfactory grade in the laboratory component, as well as overall to pass this course.

This course is intended for students who have already taken in high school Advanced Functions, Physics, and one of Calculus and Vectors. This course is an excellent foundation and preparation for PHYS1004 (electromagnetism and wave motion).

Note: *Lectures are three hours per week, and laboratory or tutorial sessions are an additional three hours per week. Students are also* ***expected*** *to* ***read selected chapters*** *in the* ***textbook*** *and exercise, including by* ***solving*** *the* ***suggested problems*** *in the textbook and the required* ***weekly quizzes***.

Instructors and contact information

Alain Bellerive	Lecture section A instructor	alainbellerive@cunet.carleton.ca
Jesse Lock	Lab & tutorial groups coordinator	jesselock@cunet.carleton.ca

Material for the lectures, labs and tutorials is available on the course Brightspace page. It is very important that ***each student identifies their lab & tutorial group***. Student hours are posted on Brightspace. The Brightspace websites should be consulted carefully and frequently.

Email communications must be done using your Carleton University account. Email early about any possible issues. Please keep copies of all exchanges until the end of the term.

Textbook

Fundamentals of Physics, *12th Edition*, ***Halliday, Resnick & Walker***, John Wiley & Sons Canada Ltd. The textbook can be bought ($153.95) at the Carleton bookstore. It is advised to purchase Volumes 1 & 2 since Volume 1 is the reference for PHYS1003 and Volume 2 for PHYS1004.

Course philosophy and objectives

Physics provides an ideal opportunity to learn the art of quantitative thinking, i.e. learning how to successfully turn an abstract concept into a concrete calculation or measurement. To solve a problem, you must critically examine the information available in a given situation; determine an effective method to obtain the solution and carry through with confidence, including a critical examination of the final answer. These skills will serve you throughout your future career. This course is a good step towards that end. Physics is based on critical thinking, and hence helps to develop independence and free thinking. Learning physics is not a spectator sport. To learn physics, you must do work outside of class thinking about, and interacting with, the course material. ***No one ever learns physics by simply reading about it or listening to someone talk about it. You learn by making the effort to understand the course material and by solving problems using the principles learned.*** *The standard at university is that you spend one hour outside of class for every hour in class.*

Course delivery

This course is delivered in person as a mixture of lectures, tutorials, labs and student hours, as well as asynchronous activities (quizzes and slides). The specific dates and activities are described below. The asynchronous activities are intended to provide flexibility to students. Students are expected to remain up to date with the deadlines and due dates as provided by the instructors. In practice, this course requires internet access and a computer. Lectures are in-person and synchronous, and the lecture slides will be made available on Brightspace. This enables access for students that occasionally might have conflicting commitments or in case of any unforeseen emergency. ***Please note this is not a remote virtual course and in-person attendance for lecture, labs and tutorials is mandatory.***

Also, please note that course materials are protected by copyright. These are for your own educational use, but you are not permitted to publish to third party sites, *e.g.* social media sites or any course material websites. ***All solutions and answers to any quiz or exam in this course must be your own work.***

Lectures

This course is divided into 25 lectures. Each lecture is an in-person 80-minute traditional lecture. The instructor posts on Brightspace the lecture material and announces in in-class guidelines specific to a given lecture section. In addition, the instructor has student hours, as detailed on Brightspace. Below is the list of the topics that will be covered within each week, as well as the corresponding textbook sections recommended for reading. The table below also details the concepts of the lectures and clearly identifies the subject matters of each weekly quiz.

Week	Subject	Textbook chapter	Quiz due
1	Tooling Up (*week of Sept 1*) Applications	**Chap 3:** Vectors	Sept 10
2	Derivatives & integrals (*week of Sept 8*) Speed and acceleration	**Chap2:** Linear motion	Sept 17
3	Vector calculus (*week of Sept 15*) Motion at constant acceleration	**Chap 4:** Motion in 2D and 3D	Sept 24
4	Kinematics (*week of Sept 22*)	**Chap 4 & 5:** Motion in 2D and 3D	Oct 1
5	Newton's law (*week of Sept 29*)	**Chap 5 & 6:** $\vec{F} = m\vec{a}$	Oct 8
6	Friction, circular motion (*week of Oct 6*)	**Chap 6:** Force and motion	Oct 15
7	Work is an integral (*week of Oct 13*)	**Chap 7:** Kinetic energy and work	Oct 29
Reading week			
7	Conservative systems (*week of Oct 27*)	**Chap 8 & 9:** Potential energy and linear momentum	Nov 10
8	Pendulum, spring and oscillation (*week of Nov 3*)	**Chap 8 & 15:** System with stored energy (kinetics & potential)	Nov 12
9	Rotation (*week of Nov 10*)	**Chap 10:** Angular displacement	Nov 19
10	Rolling objects (*week of Nov 17*)	**Chap 11:** Torque & Angular momentum	Nov 26
11	Heat & gas – in brief (*week of Nov 24*)	**Chap 18-19-20:** Thermodynamics	Dec 5
12	Review (*week of Dec 1*)	Preparation final exam	

Weekly quizzes

Each week, there is a quiz administered through Brightspace. These are due in the middle of the week (Wednesday at midnight). You have two attempts to complete each quiz, and plenty of time to complete each attempt (two hours). The best scoring attempt will be used for grade calculations.

The best 10 of 12 quizzes will count towards your final mark.

Please report any issues with quizzes directly to Dr. A. Bellerive. ***If there is any discrepancy between the marks posted on Brightspace and your calculated values, notify the instructor immediately.***

Multiple choice answers

When answering a question requires a calculation: perform the calculation on a separate booklet and enter the answer. All quizzes will be multiple choice questions.

Labs and tutorials

All labs and tutorials will be held in person. No online alternatives will be offered.

Labs and tutorials start the week of **September 8, 2025,** with an introduction and lab measurement review. ***It is imperative that all students attend the first lab session!*** You can attend only the section that you are registered in. ***All the changes (e.g. exemptions) must be arranged with the Lab Coordinator, Mr. Jesse Lock at the start of term.*** Lab exemptions will only be considered for students that have previously taken the course and completed all the labs. You are not automatically given a lab exemption - you must apply for it no later than **September 19th**. To apply for a lab exemption, please contact the Lab Coordinator, Mr. Jesse Lock (jesselock@cunet.carleton.ca). Lab exemptions will be considered on a case-by-case basis at the discretion of the Lab Coordinator.

The grade for each lab will be based on a lab report. All lab reports count towards your total lab grade for the course. ***No lab grades will be dropped.*** All lab reports must be completed and submitted one week after the beginning of each lab session (at the begin of the following tutorial). **Late submissions will be accepted up to the assignment end date with an automatic 20% penalty (end dates are stated on Brightspace for each lab assignment). No lab reports will be accepted after the end date and a grade of zero will be given.**

If you miss a lab, contact Mr. Jesse Lock (lab supervisor) immediately for make-up lab.

Week of	Experiment	Assessment Format
Sept 8th, 2025	Introduction Session: Measurements, errors, and graphical analysis	In-class activity
Sept 15th, 2025	Lab 1: Reaction Time	Lab Report
Sept 22nd, 2025	Tutorial 1	Test #1
Sept 29th, 2025	Lab 2: Motion on Inclines	Lab Report
Oct 6th, 2025	Tutorial 2	Test #2
Oct 13th, 2025	Thanksgiving on Monday (No labs/tutorials for entire week)	
Oct 20th, 2025	Reading Week (No labs/tutorials for entire week)	
Oct 27th, 2025	Lab 3: Spring Constant	Lab Report
Nov 3rd, 2025	Tutorial 3	Test #3
Nov 10th, 2025	Lab 4: Atwood's Machine	Lab Report
Nov 17th, 2025	Tutorial 4	Test #4
Nov 24th, 2025	Lab 5: Thermocouple	Lab Report
Dec 1st, 2025	Make-up Labs	

Tutorial test #1: Linear motion and physical interpretation of vectors

Tutorial test #2: Motion in 2D, 3D and $\vec{F} = m\vec{a}$

Tutorial test #3: Newton's laws (force and motion) and work

Tutorial test #4: Conservation of energy (linear and rotational energies)

There will be a tutorial on each alternating week with the labs. A formula sheet will be provided. The formula sheet will be identical to the one posted on Brightspace. The structure of the tutorial is as follows.

At the start of the tutorial session, each student will be asked to answer two multiple choice questions. Then, the Teaching Assistants will demonstrate solving some of recommended practice problems and answering questions about the tutorial problem set. **The last hour of the tutorial will be a closed-book test consisting of two long-answer problems. One of the long problems will be taken from the recommended problems.**

The grade for the tutorial test long questions and the multiple-choice question will be combined to provide the final Tutorial Test grade for each of the 4 tutorial sessions this semester. Students must attend the tutorial only in the lab section to which they belong.

The three highest test grades will be used to determine the final Tutorial Test score. There will be no make-up tutorial test and there will be no differed tutorial test.

Final exam

There is no mid-term examination in this course. **We regard the four tutorial tests, the suggested problems, the recommended problems in the textbook and the weekly quizzes, as the main avenues for providing performance feedback and guidance to the students in this course.** If you do not perform to your own satisfaction, it is imperative to discuss this with your instructors during student hours or by email. Do not leave this consultation until the end of the course. Effective assistance is best obtained sooner than later.

The final examination will be formally scheduled during the regular December final exam period and announced toward the end of the term. The course formula sheet will be provided with the exam. **The final exam will cover Chapters 2-11.** ***It is the responsibility of the students to be present during the final exam period; in particular, holiday travel arrangements must not be made before the final exam date is known. The final exam may include questions related to the material contained within the lab portion of the course. Please note that attending the final exam is mandatory.***

Grade distribution

Weekly quizzes (best 10 out of 12)	20%
Tutorials (best 3 out of 4)	20%
Labs (all 5 count)	35%
Final examination	25%
TOTAL	**100%**

Attending all labs and tutorials is mandatory. Also, students must obtain at least 50% of the lab component (that is 17.5/35), as well as at least 50% (i.e. 32.5/65) on the theory component (weekly quizzes, tutorials and final exam), to pass this course.

Student Hours (office hours for students – Herzberg 3316)

Wednesday & Friday: 13:00 – 14:00

Mental Health

If you are struggling, please do not hesitate to reach out to your instructors. We are happy to listen, and/or direct you to resources that might help. We will work with you. Remember that Carleton also offers an array of mental health and well-being resources, which can be found here.

University Policies

In accordance with the Carleton University Undergraduate Calendar Regulations, the letter grades assigned in this course will have the following percentage equivalents:

A+ = 90-100	B+ = 77-79	C+ = 67-69	D+ = 57-59
A = 85-89	B = 73-76	C = 63-66	D = 53-56
A- = 80-84	B- = 70-72	C- = 60-62	D- = 50-52

F = <50
WDN = Withdrawn from the course

DEF = Deferred

Academic Accommodations, Regulations, Plagiarism, Etc.

Carleton is committed to providing academic accessibility for all individuals. You may need special arrangements to meet your academic obligations during the term. The accommodation request processes are outlined on the Academic Accommodations website:

https://students.carleton.ca/course-outline/

- **Deferred/missed term work for short-term accommodation (5 days or less)**: Email your instructor.
- **Deferred/missed term work for longer term incapacitation (5 days or longer):** If you require accommodations for this course that are longer than the 5-day (short-term) period, please email your instructor to discuss how/whether accommodation needs could be met for this course.
- **Paul Menton Centre for Students**: The Paul Menton Centre (PMC) is the designated department at Carleton University coordinating disability services on campus. https://carleton.ca/pmc/

Statement on Chat GPT/Generative AI usage

AI Use in this course: Students may use AI tools for basic word processing and formatting functions, including:

- Grammar and spell checking (e.g., Grammarly, Microsoft Word Editor)
- Basic formatting and design suggestions (e.g., Microsoft Word's formatting tools, PowerPoint Design editor)

Documenting AI Use: It is not necessary to document the use of AI for the permitted purposes listed above. If you have questions about a specific use of AI that isn't listed above, please consult your instructor.

Usage of AI: Do not use IA (*e.g.* ChatGPT) to solve your quiz or recommended problems! Why? It is not a clever way of using new technologies. One needs to learn critical thinking.

Why have we adopted this policy? This policy ensures that student voices and ideas are prioritized and authentically represented, maintaining the integrity of the work produced by students while allowing basic support to enhance clarity, correctness, layout, and flow of ideas. The goal of adopting a limited use of AI is to help students develop foundational skills in writing and critical thinking by practicing substantive content creation without the support of AI.

Academic Integrity

Academic Integrity is upholding the values of honesty, trust, respect, fairness, responsibility, and courage that are fundamental to the educational experience. Carleton University provides supports such as academic integrity workshops to ensure, as far as possible, that all students understand the norms and standards of academic integrity that we expect you to uphold. Your teaching team has a responsibility to ensure that their application of the Academic Integrity Policy upholds the university's collective commitments to fairness, equity, and integrity.
(Adapted from Carleton University's Academic Integrity Policy, 2021).

Examples of actions that do not adhere to Carleton's Academic Integrity Policy include:

- Plagiarism
- Accessing unauthorized sites for assignments or tests
- Unauthorized collaboration on assignment and exams
- Using artificial intelligence tools such as ChatGPT when your assessment instructions say that it is not permitted

Please review the checklist linked here to ensure you understand your responsibilities as a student with respect to academic integrity and this course.

Sanctions for Not Abiding by Carleton's Academic Integrity Policy

A student who has not upheld their responsibilities under Carleton's Academic Integrity Policy may be subject to one of several sanctions. A list of standard sanctions in science can be found here.

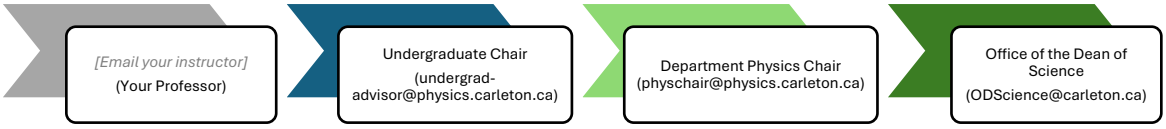
Additional details about this process can be found on the Faculty of Science Academic Integrity website. Students are expected to familiarize themselves with and follow the Carleton University Student Academic Integrity Policy. The Policy is strictly enforced and is binding on all students.

Student Rights & Responsibilities

Students are expected to act responsibly and engage respectfully with other students and members of the Carleton and the broader community. See the 7 Rights and Responsibilities Policy for details regarding the expectations of non-academic behaviour of students. Those who participate with another student in the commission of an infraction of this Policy will also be held liable for their actions.

Student Concerns

If a concern arises regarding this course, **your first point of contact is your instructor**: Email or drop in during student hours and I will do my best to address your concern. If I am unable to address your concern, the next points of contact are (in this order):



Note: You can also bring your concerns to Ombuds services.