

# Foundations of Physics I

## PHYS 1001 A

### Course Outline

*Fall 2024*

#### Course description and prerequisites

This course focuses on teaching you the basics upon which other - more complicated - physics is based on. This course will teach you equations and how to get the right answers for problems and strives to begin to change how you think about the world around you. The reality of how the world works is mysterious and beautiful, and it is necessary to think about it critically to develop deep understanding.

This calculus-based course on classical mechanics covers kinematics, dynamics, gravitation, and oscillatory motion. This is a specialist course for students intending to take further courses in physics.

**Prerequisites:** Before taking this course, you should have taken Grade 12 Mathematics: Advanced Functions and Grade 12 Mathematics: Calculus and Vectors or equivalent, plus one of MATH 1004 or MATH 1002 or MATH 1052 (the MATH course may be taken concurrently); or permission of the Physics Department. Grade 12 Physics is strongly recommended. Please see me if you don't have Grade 12 physics.

**Lectures:** Three hours a week, **September 04 to December 06, 2024.**

#### Instructor and course information

- **Section Type:** IN-PERSON
- **Time:** Tuesday and Thursday 08:35 - 09:55
- **Instructor:** Dr. Wafia Bensalem  
Office: Herzberg 3313  
e-mail: [wafiabensalem@cunet.carleton.ca](mailto:wafiabensalem@cunet.carleton.ca)
- **Office Hours:** Tuesday from 10 AM to 12 AM or by appointment
- **Website:** <https://brightspace.carleton.ca>

*Please ensure all communication with staff/faculty is via your Carleton email account.*

## Learning Materials

**Textbook:** Fundamentals of Physics, 12th Edition, Halliday, Resnick and Walker.  
You will use this text for PHYS1002 also, so the perpetual license is recommended.

**Internet capable device:** We will use Poll Everywhere during class, so you will need an internet enabled device (smartphone, laptop, tablet, etc) to participate.

To participate to in-class quizzes, go to: <https://vevox.app/#/m/145211473>

**WileyPlus:** Through purchasing the textbook, you gain access to the WileyPlus service from the textbook publisher. This service is great for providing practice problems on subjects you wish to study as well as videos of fully worked out problems for extra study.

## Course philosophy, objectives and learning outcomes

We are learning physics to understand our universe and to perceive it in a comprehensible, enjoyable, and fascinating way. Physics is based on critical thinking and helps you become an expert problem solver, develop a critical mind, in addition to analytical, communication and mathematical skills.

No one learns physics by simply reading about it or listening to someone talk about it. You learn physics by making the **effort** to understand the course material, by **doing work** outside of class, **thinking** about and **interacting** with the course material and by **solving problems** using the principles learned.

At the end of the course, students will be able to recall and utilize foundational knowledge in calculus-based classical mechanics, including kinematics, dynamics, gravitation, and oscillatory motion. In more details, the students will be able to:

- Analyse motion using calculus and linear algebra (vectors).
- Understand Newton's laws of motion and be able to apply them to solve simple problems with constant force such as friction forces, tension forces, normal forces and gravitational forces.
- Be able to solve problems using the concept of conservation of energy and momentum.
- Be able to analyze rotational motion using angular coordinates.
- Be able to analyze rotational motion using conservation of angular momentum.
- Be able to analyze oscillatory motion such as the motion produced by a spring.

Students will have developed basic problem-solving skills in calculus-based mechanics and will be able to use appropriately the tools of physics, calculus, and algebra. In the lab, students will be able to generate justifiable uncertainty estimates for experimental results. Students will have developed basic written communication skills for reporting lab work and their analysis of solved problems.

## Course Organization

This course is delivered in person, in form of lectures. The main ideas will be summarized on slides and posted on Brightspace, and details and calculations will be explained using the blackboard ('chalk-and-talk').

*You are encouraged to ask questions, discuss ideas, and engage with the material during the lectures.*

It is essential that you read the textbook sections, ideally before the corresponding material is covered in the lectures.

*These lectures are intended to be the primary method of course delivery and it is highly recommended that you attend these sessions.*

## Copyright

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 specific course material web sites.

## Important Dates

<https://calendar.carleton.ca/academicyear>

<https://carleton.ca/registrar/registration/dates/>

## Course Content

- Ch 1: Measurement
- Ch 2: Motion in One Dimension
- Ch 3: Vectors
- Ch 4: Motion in Two and Three Dimensions
- Ch 5-6: Force and Motion
- Ch 7: Kinetic Energy and Work
- Ch 8: Potential Energy and Conservation of Energy
- Ch 9: Center of Mass and Linear Momentum
- Ch 10: Rotation
- Ch 11: Rolling, Torque and Angular Momentum
- Ch 12: Equilibrium and Elasticity
- Ch 13: Gravitation
- Ch 15: Oscillations

## Course Evaluation

- **Reading quizzes** will be multiple choice conceptual questions and will be given through Brightspace. You will be notified in advance of any quiz.
- **Assignments** will be distributed roughly each week throughout the term and will generally be due one week after distribution. The assignments and their schedule will be provided on Brightspace. Your **solutions must be posted as pdf files** to Brightspace; they can be scanned versions of hand-written solutions. **Assignments must be handed in by the indicated due date or they will not be graded and receive a mark of zero.** The lowest assignment grade will not be included in the overall assignment grade calculation.
- **Laboratories and Tutorials:** There are six labs to be completed as shown on Brightspace (see your lab instructor for more details). On five of the weeks where there is no lab to complete, the laboratory time will be given as tutorial sessions where students will complete problems with assistance of the lab staff and TAs. Ahead of these Tutorials, you must complete a short quiz on Brightspace. The results of these quizzes will help the TAs guide the topics that need focus during the Tutorials. You will be given marks for the completion of the pre-quiz as well as participation in the Tutorials.
- The **midterm exam** will occur on **October 17<sup>th</sup>** during the class time and will cover material discussed in class up to that point. It will be closed-book and closed-notes and a formula sheet will be provided (to be posted on Brightspace in advance). The midterm exam is not optional and must be attempted to successfully pass the course.
- The **final exam** will occur during the final exam period as scheduled by the university. It will be closed-book and closed-notes. A formula sheet will be provided (to be posted on Brightspace in advance). The final exam is not optional and must be attempted in-person to successfully pass the course.

***All marks will be posted on Brightspace. Contact the instructor immediately if you think there is an error in the Brightspace gradebook.***

Assessment	Grade value
Reading quizzes	5 %
Assignments	20 %
Lab experiments	30 %
Tutorials	15% (7.5% pre-tutorial quiz, 7.5% tutorial participation)
Exams	30% (10% midterm, 20% final)

## University policies

### ***Letter Grades***

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

ABS = Student absent from final exam

DEF = Deferred

FND = (Failed, no Deferred) = student could not pass even with 100% on final exam

### ***Academic Regulations***

University rules regarding registration, withdrawal, appealing marks, and anything else you might need to know, can be found on the university's website, here:

<http://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/>

### ***Academic Accommodations for Students with Disabilities***

The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or [pmc@carleton.ca](mailto:pmc@carleton.ca) for a formal evaluation.

If you are already registered with the PMC, contact your PMC coordinator to send your *Letter of Accommodation* at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (*if applicable*).

<https://carleton.ca/pmc/>

### ***Academic Accommodations for Religious Obligations***

You should make a formal, written request to the instructor during the first two weeks of class, or as soon as possible - after the need for accommodation is known to exist-, but no later than two weeks before the compulsory event.

### ***Pregnancy:***

Pregnant students requiring academic accommodations are encouraged to contact an Equity Advisor in Equity Services to complete a letter of accommodation. The student must then make an appointment to discuss her needs with the instructor at least two weeks prior to the first academic event in which it is anticipated the accommodation will be required.

### ***Survivors of Sexual Violence***

For information about the services available at the university and to obtain information about sexual violence and/or support, visit:

<https://carleton.ca/sexual-violence-support/>

### **Assistance for students**

The following resources might be useful:

- Academic and Career Development Services:  
<http://carleton.ca/sacds/>
- Writing Services:  
<http://www.carleton.ca/csas/writing-services/>
- Peer Assisted Study Sessions (PASS):  
<https://carleton.ca/csas/group-support/pass/>
- Science Student Success Centre:  
<https://sssc.carleton.ca/>
- Math Tutorial Centre:  
<https://carleton.ca/math/math-tutorial-centre/>