

**Land Acknowledgement:** Here at Carleton University, it is important that we acknowledge that the land on which we gather is the traditional and unceded territory of the Algonquin nation.

# PHYS 3007, Fall 2024

## Course Instructors:

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Note: If you have a question or would like to talk with us, you can send an email, visit us during student hours, or approach us after labs.

**Class Times:** Monday & Wednesday, 8:35am-11:25am

**Teaching Assistant**

([BryceNorman@cmail.carleton.ca](mailto:BryceNorman@cmail.carleton.ca))

**Student Hours:** Tuesdays, 11:30-12:30am or by appointment

### What are 'Student Hours'?

*Student hours are dedicated times through the week for the course instructor and TAs to meet with YOU. Pop in to introduce yourself, ask questions about the course, or discuss content from the course.*

*Note: If these times don't work for you, email us and we can arrange an alternate time to meet.*

## Welcome to this Lab course!

The major goal of this laboratory course is to help students enhance their ability to work independently in solving experimental problems, to learn new data analysis methods, and develop oral and written presentation skills. Standard experimental methods and procedures that are used in research laboratories will be introduced, and therefore certain new material will be presented that is not normally encountered in first- and second-year laboratories.

Students will work independently completing the hands-on setup and data collection in a group of two. The most important component is experiential learning through trial and error.

At the end of the third-year laboratory course students will be able to:

- Apply theoretical knowledge to complex physics experiments
- Demonstrate knowledge of the underlying physics principles for each experiment
- Solve technical problems encountered in experiments independently
- Develop modeling and designing skills for each experiment
- Apply various software packages in data analysis
- Demonstrate knowledge of safety procedures in the laboratory environment
- Use analysis techniques independently
- Select and apply error analysis methods based on each experiment requirements
- Develop skills of using a logbook for data collection and experiments preparation
- Produce lab reports complying with scientific journal formats
- Enhance oral communication skills through presentations

These objectives will be reinforced with discussions, questions, tests, laboratory reports, oral presentations, and logbook records. The laboratory sessions will be held in person on campus and are mandatory.

All students in the class, the instructors, and any TAs should be treated with respect during all interactions. Please feel free to contact the instructors via email or in person to let them know about any experiences you have had related to this class that have made you feel uncomfortable.

## Organization

- Link to the course material: [Logbook Submissions - PHYS3007B Third Year Physics Lab I \(LAB\) Fall 2024 \(carleton.ca\)](#)
- All the lab sessions will be held in person in HP3160 and HP3130.
- Students will do experiments in pairs. The groups and experiments are pre-assigned and they will be discussed during the first lab session.
- You are expected to come to the lab on time each lab period. If you are unable to come to the lab (or will be late) on a certain day, inform the instructors as soon as possible. If the reason for missing the lab is accepted by the Lab instructors, then arrangements to make up for the lost time may be made. One missed lab session (with a self-declaration form to explain absence) should be re-done within the following 2 labs sessions. The second missed lab session (again, with an SDF to explain absence) would require a conversation with the Registrars' Office / Student Care and Support Team). If a student were to miss a third lab session (or more), the student may not be granted permission to continue with the course.
- During the introductory lab periods, statistical analysis will be shown, and a data set will be collected and analyzed. This introductory work will be graded.
- Each student will complete one short and two long experiments. The duration of each experiment is indicated in the lab schedule posted on Brightspace. Complete individual lab reports are expected by the due dates indicated in the lab schedule. While the data is shared between the partners, the analysis must be done individually.
- An outline of each experiment's details, measurements, and analysis is posted on Brightspace.
- Each student will keep an electronic Logbook Record using OneNote or other type of electronic record keeping notebook. The progress of the record keeping will be formally evaluated.
- Read the materials prior to each experiment and write notes in the logbook. The completeness of the records and data will be checked periodically in your logbook. Be prepared to answer questions about the experimental procedure during the first period scheduled for each experiment.
- You are expected to work on the experiments and analysis during the scheduled lab period. Working outside lab hours is possible, but this work is additional to the scheduled lab sessions and up to the student. Students working on other courses during the lab sessions will be asked to leave and the session will need a make-up.
- All the lab reports are due at the time of the start of a new experiment, before the lab starts that day (the due dates are indicated in the lab schedule). Late penalties will be applied as soon as the due date and time has passed. All the lab reports are to be submitted online via Brightspace drop-box.
- Each group will give a 10-minute presentation to the rest of the class (the time limit will be strictly enforced) for each experiment. These presentations are intended to be practice for future seminars and presentations at meetings and conferences, and should be formatted accordingly. All the presentations will be given in person in the lab.

- To pass the lab course, all components of the experimental work must be completed and a lab report for each experiment must be submitted.
- The final grade is a weighted average of the introductory work, the written reports, the oral presentations, the logbook record and your performance during the lab sessions.

<b>Lab work due dates</b>		
<b>Short experiment 1</b>	<b>23-Sep</b>	submitted before class
<b>Short experiment 2</b>	<b>6-Nov</b>	submitted before class
<b>First lab:</b>	<b>28-Oct</b>	submitted before class
<b>Second lab:</b>	<b>4-Dec</b>	submitted at the end of class

<b>Logbook due dates</b>		
<b>Logbook 1: Sept 25 at the end of lab period</b>		
<b>Logbook 2 and theory: October 9 at the end of lab period</b>		
<b>Logbook 3: November 11 at the end of lab period</b>		
<b>Logbook 4 and theory: November 20 at the end of lab period</b>		

## Assessment in this Course

**Experimental Preparation:** The students must study physics literature to the extent that they acquire an understanding of the theory and instrumentation relevant to their experiment. Notes of the related theory recorded in the logbook together with question answers will be graded for each experiment. During the lab sessions, groups will discuss the experiments, and will ask and answer questions. This is a component of the class work.

**Presentations:** The last two experiments will require a 10-minute presentation. This is practice to develop some skills on how to give a talk and help you prepare for the presentation at the end of the course. It will be presented to the rest of the group.

**Electronic Logbook Record:** The completeness, precision, and clarity of the records will be considered for each experiment. Logbook records will be graded by TAs every two weeks.

**Lab reports:** Reports must be carefully edited and follow the instructions for write-ups (provided as a separate document).

Late reports will incur a penalty of 10% for every 24 hours after the due date and time. Reports that are more than two weeks late will not be graded (they still must be submitted to show that the experiment was performed and it is required for the student to pass the course).

## Grade Breakdown

COMPONENT	GRADE VALUE
EXPERIMENTAL CLASSWORK	15% (attendance and in-lab work 10%, logbook record worth 5%)
SHORT EXPERIMENT	15% (Matlab plotting of data completed on an individual basis in class)
LAB REPORTS	50% (two lab reports completed on an individual basis, each worth 25%)
ORAL PRESENTATIONS	20% (two presentations, each worth 10%, each student will be assessed separately)

## Experimental Classwork

- **Attendance and in-lab work**

Attendance of the lab sessions is mandatory. During these sessions the experiments will be discussed, the work done during the sessions will be evaluated answers to questions will be checked. For every missed lab session that is not made up, 10% of the final grade will be deducted. Each late lab arrival of 15min or more will result in 5% deduction of the final grade. TAs will keep a record of your arrival and dismissal time, your work during the lab sessions, ask you questions about your experiment.

- **Electronic Logbook Record**

The electronic logbook is a record of your work for each experiment. OneNote can be used or any other software that you are comfortable with and allows for continuous entries. For each experiment, it should include:

- objectives of the experiment (described in your own words)
- underlying physics, including references for later use
- tasks as they are completed
- new tasks and questions for next week
- results and calculations as the progress of the experiment is followed
- reflections of how well the equipment works, and difficulties encountered while working with the apparatus or during data analysis

The log entries should be uploaded on Brightspace as per the schedule. They will be checked, marked, and discussed during the scheduled lab sessions (deadlines for the logbook records will be posted on the lab schedule). The logbook record keeping should make sense if you come back in a few months. There should be enough information that allows you to complete the experiment analysis and a write up as if starting again. The logbook record will help with the contribution to the group presentation.

## Lab Reports

Each experiment requires a formally written report. The lab report format should follow the guidelines that will be discussed during the lab time. The weight for both experiments is equal.

## Oral presentations

The presentation at the end of each experiment should be prepared in Powerpoint. Before all the presentations start, please have your presentation file uploaded on Brightspace. Include the following slides:

- Title, author, and an outline specific to the experiment; 2 slides, one for the title page and one for the outline
- Introduction (15%), should include short history, the interest and practical applications, with a focus on the underlying physics; 3-4 slides
- Body of the talk (50%), experimental set-up and method, data collection, data analysis (graphs, tables), sources contributing to statistical and systematic uncertainties; 4-6 slides
- Results (30%), results and uncertainties, interpretation of results, connection of experiment with theory; 2-3 slides
- Short conclusion and a discussion on the method and errors (5%); 1 slide
- Diagrams should be used when appropriate to clearly illustrate the experimental setup and the underlying physics that is being addressed.

The talk should be 10 minutes plus about 3 minutes for questions. Presentations will be delivered to the rest of the class. If you are unable to give a talk at the scheduled time, communicate promptly with the lab instructors.

## Learning Materials

Textbooks and useful websites:

- Barford, N.C., *Experimental Measurements: Precision, Error and Truth*, John Wiley and Sons, 1985
- Bevington, P., *Data Reduction and Error Analysis for the Physical Sciences*, New York, McGraw-Hill., 1992
- Melissinos, A. C., *Experiments in Modern Physics*, Academic Press, 1966
- Evans, *The Atomic Nucleus*, 1955, free download is available here:  
<http://archive.org/details/atomicnucleus032805mbp>
- Haken, H., Wolf, H. C., *The physics of the atoms and quanta*, Springer, 2004
- Dunlap, R.A., *Experimental Physics*, Oxford University Press, 1988
- Dietz, E.R., Preston, D.W., *The Art of Experimental Physics*, John Wiley and Sons, 1991
- Knoll, Glenn, *Radiation Detection and Measurement*, John Wiley and Sons, 1999  
free download is available here:  
<http://archive.org/details/RadiationDetectionAndMeasurementGlennF.Knoll3rdEd1999>
- <http://mathworld.wolfram.com/LeastSquaresFitting.html>

## Experimental Procedures

When performing an experiment there are several aspects to factor in; how to use the equipment in the best possible way to give you accurate results, what techniques to use for the analysis, and how to communicate to the reader that your results are meaningful.

Follow these steps when approaching the experiment or provided data:

- Read and understand what the goals of the experiment are before turning any equipment on and taking any measurements. Read the instruction materials and discuss the safety handling of the equipment with the lab instructors.
- Write down questions that you have about the equipment and the set-up. Discuss the apparatus with the lab instructors/staff members. These questions should be addressed for the data analysis experiments as well.
- Work out a technique for taking all the measurements (or ask questions about the details of already collected data). Write the process in your Logbook Record, it will help you when you write the procedure in the report later. Think of ways to double-check your results and ensure that you are not making mistakes.

## Online Social Platforms and Plagiarism

With the growing use of social platforms (e.g., Discord) on campuses, it is important to keep in mind that university codes of conduct still apply to the behaviours of students on campus and online. Please be considerate and respectful while engaging with peers and remember that we are all humans, and that your words matter. If any student witnesses or experiences harassment, I encourage you to reach out to the instructors. Alternatively, you can contact [Ombuds Services](#) or [Carleton Equity and Inclusive Communities](#).

Online communities can be highly beneficial to students and can help to facilitate learning within the course. We encourage people to ask questions, learn from one another, and have discussions about experiments outcome. That said, any acts of academic misconduct (i.e., cheating) will not be tolerated and will result in serious consequences ranging from a grade reduction to expulsion (see [academic integrity violations](#)).

- Examples of appropriate peer-to-peer sharing/learning vary from course to course. In this course appropriate peer-to-peer sharing includes: identifying an incorrect or missing step in your lab partner's work, brainstorming potential reasons behind the results of the experiment with your lab partner, suggesting helpful modifications to improve the outcome of your experiment with your lab partner
- Examples of unacceptable peer-to-peer sharing: Collaborating to write up reports with your lab partner or members of another group, sharing the experiment measurements, results, calculations, and analysis with other lab groups either in person or posting any of the above on social media platforms/homework help websites, sharing any part of your written report with your lab partner and other groups in person or posting any of it online

Here are some extracts from the Carleton University Academic Integrity Policy: "Students are responsible for being aware of and demonstrating behavior that is honest and ethical in their academic work. Such behavior includes:

- Following the expectations articulated by instructors for referencing sources of information and for group work.
- Submitting original work, citing sources fully, and respecting the authorship of others.
- Asking for clarification of expectations as necessary. Students who are in doubt as to whether an action on their part may be viewed as a violation of the standards of academic integrity should ask their instructors, lab assistant and/or advisers.
- Identifying testing situations that may allow copying.
- Preventing their work from being used by others, e.g. protecting access to computer files, etc.
- Adhering to the principles of academic integrity when conducting and reporting research."

It is normal to consult with others during an experiment; this is one reason why students work in pairs. Nevertheless, all sources of information must be stated, and both the substance and text of scientific reports must be one's own. Sometimes you will get things wrong because of an error in the manipulation of apparatus or malfunction of the equipment. The lab supervisor will help you figure out the problem or in the case that you cannot get your own data, you may use someone else's (with the permission of the lab supervisor), provided you acknowledge it. Fabrication and falsification of data or using results of another student's work without acknowledgment is a serious plagiarism offense. In some cases, this can lead to the loss of academic status and will be assessed in a case-by-case manner. "Plagiarism includes reproducing or paraphrasing portions of someone else's published or unpublished material, regardless of the source, and presenting these as one's own without proper citation or reference of the original source." In this course, any lab report copied in whole or in part from another source will automatically receive a grade of zero. In the case that two students present reports where parts have evidently been copied from one another, both reports will receive a grade of zero.

If you are concerned, confused, or conflicted over something, please reach out to a TA or us through email for help. Let's do our best to support one another in this class and keep the online experience a safe, inclusive, and positive experience for everyone.

## Feeling Sick?

If you feel unwell (e.g., fever, chills, stomach upset) do not come to class or campus. Make sure to notify the lab instructor and make arrangements to catch up on missed material.

## Mental Health

If you are struggling, please do not hesitate to reach out. I am happy to listen, and/or direct you to resources that might help. In terms of class, if you need extra help or missed a lesson, don't stress! Email us and we will set a time to meet and discuss how to catch up on the missed work.

## 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 University is committed to providing access to the educational experience in order to promote academic accessibility for all individuals.

Academic accommodation refers to educational practices, systems and support mechanisms designed to accommodate diversity and difference. The purpose of accommodation is to enable students to perform the essential requirements of their academic programs. At no time does academic accommodation undermine or compromise the learning objectives that are established by the academic authorities of the University.

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

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

## Academic Accommodations for Students with Disabilities

If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or [pmc@carleton.ca](mailto:pmc@carleton.ca) for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made. For more details, visit the [Paul Menton Centre website](#).

## Addressing Human Rights Concerns

The University and all members of the University community share responsibility for ensuring that the University's educational, work and living environments are free from discrimination and harassment. Should you have concerns about harassment or discrimination relating to your age, ancestry, citizenship, colour, creed (religion), disability, ethnic origin, family status, gender expression, gender identity, marital status, place of origin, race, sex (including pregnancy), or sexual orientation, please contact the [Department of Equity and Inclusive Communities](#) at [equity@carleton.ca](mailto:equity@carleton.ca).

## Religious Obligations

Please contact me with requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, please review the [Student Guide to Academic Accommodation \(PDF, 2.1 MB\)](#).

## Survivors of Sexual Violence

As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and where survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more 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/>

## Accommodations for Missed Work

Carleton recognizes that students may experience unexpected, temporary incapacitation (i.e., illness, injury, or extraordinary circumstances outside of a student's control). As a result, Carleton has put into place a protocol for students to apply for accommodations using a self-declaration form in the event of missed work. The form can be found at: <https://carleton.ca/registrar/wp-content/uploads/self-declaration.pdf> Note that these forms should be used for short-term concerns related to missed work; if you are experiencing chronic, ongoing challenges which necessitate a broader solution, I recommend reaching out to the Paul Menton Centre and/or the Care Support team.

## For Pregnancy

Please contact me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, please review the [Student Guide to Academic Accommodation \(PDF, 2.1 MB\)](#).

## Accommodation for Student Activities

Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, see the [Senate Policy on Accommodation for Student Activities \(PDF, 25KB\)](#).

## 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.

## Assistance for Students

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/>

Math Tutorial Centre: <https://carleton.ca/math/math-tutorial-centre/>

Science Student Success Centre: <https://sssc.carleton.ca/>