

# Physics I - Physical Sciences

## PHY A10 - Winter 2023

Tuesday 3:00 pm - 5:00 pm SW 128  
Thursday 1:00 pm - 2:00 pm IC 220

**Instructor:** Johann Bayer

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**Office:** SW 503B

**Phone Number:** 416-287-7327

**Course Website:** q.utoronto.ca

### Office Hours (Tentative)

Tuesday	9:30 am - 11:30 am
Tuesday	12:30 pm - 1:30 pm
Thursday	9:30 am - 11:30 am

### Course Description and Requirements

In this first course for many of the Specialist and Major Programs in Physical and Environmental Sciences, we will provide an introduction to the concepts, approaches, and tools the physicist uses to describe the physical world while laying the foundation for classical and modern mechanics. Topics will include: the mathematics of physics, energy and work, momentum and conservation laws, kinematics and dynamics, Newtonian gravity, rigid-body motion, oscillatory motion, and wave phenomena.

By the end of the course you will be able to:

- Identify and define the vocabulary used in Physics to describe types of motion and their causes.
- Use techniques for analytical and numerical problem solving that go beyond “plug-in-the-formula”.
- Interpret and give examples of the laws of Nature governing the field of Newtonian mechanics.
- Using mathematics as the basic scientific language, employ techniques of single-variable calculus to model, simplify, and solve physical problems.
- Recognize and apply the fundamental laws describing wave and oscillatory phenomena.
- Employ individual and group problem-solving skills to the analysis of physical systems, in the form of: experiments, conceptual and phenomenological questions, and multi-concept detailed problems.
- Identify the main ideas and core physical principles studied throughout the course, and demonstrate their knowledge through deliberate time management and reflective judgement of the questions and problems in online homework, practical worksheets, tests, and the final exam.
- Self-assess the level of confidence in the acquired knowledge of the core concepts and ideas presented in the course through the decision-making process associated with the allocation of resources during tests and the final exam.
- Recognize the existence of a basic model for the study of Physics, and translate this model into tools and learning skills useful in other disciplines.

**Course Corequisite:** Calculus I (MATA30 or MATA31)

**Course Pre-requisites:** Advanced Functions (MHF4U), Calculus & Vectors (MCV4U), Physics (SPH4U)

## Required Materials

- **Textbook:** *Fundamentals of Physics* by Halliday, Resnick, & Walker (Wiley, 12th Ed.)

The textbook and associated resources can be purchased through the UofT Bookstore or as a digital-only version available following the WileyPLUS Course Resources link in the course website.

The schedule provided at the end of this document indicates the readings you must complete **before** each lecture. The reading quizzes and in-class participation will be based on these assigned readings. Your first time reading the assigned material does not need to be highly detailed. Focus on the main concepts, read one or two examples, and browse quickly thorough any derivations. This first reading will be the assumed starting point for all lectures. Therefore, failing to complete the readings and associated reading quizzes will impair your ability to understand our lecture discussions.

The textbook also provides the conceptual questions and detailed problems that will be the subject of the weekly online homework, practical activities, and group quizzes. To complete the online homework you will need access to **WileyPLUS**, available at the UofT Bookstore, either bundled with the textbook or as a digital-only resource. Once you have completed your purchase at the bookstore follow any WileyPLUS link on the course website to finish your registration and get access to the resources.

- **Automated Student Response System:** *iClicker* or *iClicker+* by Macmillan

You will need a clicker remote to answer the in-class participation quizzes. The device can be purchased through the UofT Bookstore or alternate vendors. To receive the participation mark you must register your clicker by **Tuesday, January 24** using the link labelled i>clicker registration on the course website.

Note that in order to receive this participation mark you must be present with your clicker during the lecture discussions. Having somebody else use your clicker in your place or using somebody else's clicker in their place is a serious academic offence that could have you facing expulsion from the university.

- **Calculator:** A **scientific, non-programmable, and non-graphing** calculator is required.

**Casio:** FX-260, FX-300\*

**Texas Instruments:** TI-30X IIS, TI-30XS

**Sharp:** EL-520\*, EL-531\*, EL-W535\*

For the course, any **scientific, non-programmable, and non-graphing** calculator will be required. The models listed above are some of those available at the bookstore that satisfy the course requirements. The asterisk “\*” indicates that any sub-model within that specific model designation is also accepted.

## Grading Scheme

Component	%	Due Date
Reading Quizzes	5	Ongoing (Pre-Lecture)
Participation	7.5	Ongoing (Lecture)
Online Homework	7.5	Ongoing (Weekly)
Practical Activities	10	Ongoing (Weekly Practicals)
Formal Lab Reports	10	Week 8 & Week 11
Test #1	5	Week 5 (Tentative)
Test #2	15	Week 10 (Tentative)
Final Examination	40	Exam Period (April 13 - 27)

## Grade Components

### Reading Quizzes (7.5%)

Before each Tuesday lecture and on the course website you will be asked a set of questions from the assigned textbook readings for that week. You will have until **11:55 am** on Tuesday to submit your answers. Each quiz is worth **5 points**, and your final grade is the total sum of all quizzes up to a maximum of **50 points**. Use the **Class Schedule** to prepare for the lectures and reading quizzes.

### Participation (7.5%)

During each lecture we will work on clicker questions from the textbook readings and the lecture presentation. During each lecture **1 point** can be earned by answering at least **75%** of the questions asked. The total sum of all lecture points makes up your participation grade up to a maximum of **20 points**. In addition, after each lecture one participation question will be selected for a performance bonus. An extra **1%** will be awarded to those students that correctly answer **50%** or more of the performance questions.

### Online Homework (5%)

Deployed through the WileyPLUS system, these assignments will be a weekly set of questions based on the textbook reading material and lecture discussions of the week just ending. Each homework is worth **10 points**, and your final grade is the average of the **best 10** results. A mix of conceptual questions and applied problem-solving exercises will be included. Do **not** spend more than two hours on each homework.

### Practical Sessions (20%)

In these three-hour weekly sessions you will work in groups to discuss examples on the concepts introduced in your textbook readings and lecture presentations. Groups will apply these concepts and principles, in order to develop skills useful in scientific conceptual analysis and general problem-solving. Further work will focus on the development of experimental techniques related to Physics and the Scientific Method. The grade will depend on group quizzes (2%), notebook-recorded group activities (8%), and two experiment-based formal lab reports (1% and 9%) written in collaboration with your assigned group.

Attendance to the practicals is **mandatory** and a deduction to your final practical grade would be applied should you miss a session. This deduction will be a percentage equal to the cube (third power), of the number of absences. More information will be provided during your first practical session (second week of classes) and on the course website.

### Test #1 (5%)

The first test will be scheduled during **Week 5** and it will be **1 hour** long. This test will feature the material from the lectures and textbook readings up to and including the discussions of Week 4. The questions will also be based on the practical activities and online homework up to and including material due on Week 4. The format includes only multiple-choice questions. The only aids allowed are your course-approved calculator, and a hand-written, double-sided, and letter-sized aid sheet. Photocopies or computer printouts are not allowed.

### Test #2 (15%)

The second test will be scheduled during **Week 10** and it will be **2 hours** long. This test will feature the material from the lectures and textbook readings up to and including the discussions of Week 9. The questions and problems will also be based on the practical activities and online homework up to and including material due on Week 9. The format includes multiple-choice questions as well as detailed problems. The only aids allowed are your course-approved calculator, and a hand-written, double-sided, and letter-sized aid sheet. Photocopies or computer printouts are not allowed.

### **Final Examination (40%)**

The final examination will be scheduled during the exam period of **April 13 - 27**. Material for the final examination will include all the topics discussed in the assigned textbook readings, lecture presentations, online homework, and practical sessions. The final examination will be **3 hours** long and the format includes multiple-choice questions as well as detailed problems. The only aids allowed are your course-approved calculator, and a hand-written, double-sided, and letter-sized aid sheet. Photocopies or computer printouts are not allowed.

## **Class Policies and Course Support**

### **Copyright Notice**

Please note that all course materials, including all assignments and various assessment instruments, belong to your instructor, the University, and/or other sources depending on the specific facts of each situation, and are protected by copyright. Do not download, copy, or share any course materials or videos without the explicit permission of the instructor. In addition, please note that recording or the use of any form of screen capture on the content of any assessment instrument is not permitted and constitutes both a breach of copyright, also known as copyright infringement, and a violation of the University of Toronto's *Code of Behaviour on Academic Matters*.

### **Name and Student Number**

Any work you hand in must clearly indicate your name and student number, this includes practical activities, formal reports, tests, and the final exam. Any work you submit that fails to meet this requirement will be penalized with a 10% deduction, provided we are able to identify the work as yours. If we are unable to identify the work as yours, a grade of zero will be awarded.

### **In-class Conduct**

- Class starts 10 min past the hour and ends sharp on the hour. Late arrival or early departure from class is inappropriate and will negatively affect your participation grade.
- Regarding anything that you want to use in the classroom: if you are not using it to perform a task specifically related to what we are doing in class at that very moment, you must put it away. This includes but is not limited to cell phones, laptop computers, tablets, and other electronic devices.
- Consumption of food or drinks in the classroom during lectures or practicals is not permitted. Eating or drinking in the classroom is against current policies and regulations, and it further creates unwanted distractions that negatively affect the learning environment. Be considerate to your peers.

### **Email Communications**

If you want to ask a question via email, please first check the various threads in the PepperR section of the course website. Quite likely, you are not the only person with that same question, and if that question has already been asked, you will find the answer there. If the question has not been asked, go ahead and post it yourself instead of sending it by email. This way you will also help other students facing the same issue. These discussions are monitored regularly by the course instructor and your peers, making it the best way of communicating for various queries of a diverse nature.

However, if the electronic forums are not the best place for your specific concern, make sure to send your email from an official **utoronto.ca** address (e.g., your UTmail+ account), as all other addresses will be filtered out automatically. For a quicker response time include the code **PHYA10** in the subject line of your message. While I rarely reply to emails during weekends, during weekdays I will reply to all emails within a period no greater than 24 hours.

## Absences

In order to ensure fairness in the assessment of all students, there will be no default makeup options for any term work. In the case of a **valid** and **documented** problem that supports an absence to a practical session, the grade will be calculated on the basis of all other submitted work. In the case of a **valid** and **documented** problem that supports an absence to the first test, the second test will have its weight increased accordingly. In the case of a valid and documented problem that supports an absence to the second test, the final examination will have its weight increased accordingly. Exceptional circumstances requiring a makeup test would be reviewed on a case-by-case basis. Any resulting makeup tests will be scheduled as oral examinations to be conducted in-person or via Zoom, depending on the latest UTSC Regulations.

All valid and documented absences must be declared through **both** the Absence Declaration in ACORN **and** the DPES Self-declaration Absence Form, and the onus is fully on the student to contact promptly the course instructor. Additionally, absences that are the result of a non-COVID health-related problem must be documented with a completed Verification of Illness or Injury form. Please note that you might be required to provide additional supporting documentation to your instructor.

## Academic Integrity and Respect for the Academic Endeavor

Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto's *Code of Behaviour on Academic Matters*:

<https://governingcouncil.utoronto.ca/media/15068/view>

outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to:

- In papers and assignments: Using someone else's ideas or words without appropriate acknowledgment; submitting your own work in more than one course without the permission of the instructor; making up sources or facts; obtaining or providing unauthorized assistance on any assignment; using someone else's clicker or multiple clickers for participation grades; posting course materials to external sites or accessing answers from online repositories or paid-for-solution sites.
- On tests and exams: Using or possessing unauthorized aids; looking at someone else's answers during an exam or test; misrepresenting your identity; posting course materials to external sites or accessing answers from online repositories or paid-for-solution sites.
- In academic work: Falsifying institutional documents or grades; falsifying or altering any documentation required by the University, including (but not limited to) doctor's notes.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the *Code of Behaviour on Academic Matters*. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources (see <https://www.utsc.utoronto.ca/vpdean/academic-integrity>).

## PeppeR on Quercus

The course website supports electronic forums useful for questions and discussions on course content, conceptual and detailed problems, textbook readings, as well as any issues relating to administrative aspects of the course such as deadlines and scheduling. It is recommended that you check the threads on a regular basis to keep on top of current issues. You can subscribe to the various threads in order to receive email notifications when new posts are available.

## Lecture Videos and Lecture Notes

The lecture discussions will **not** be recorded and there will **not** be any previously recorded lecture videos available. The slides from the lectures will be made available on the course website after each lecture. To prepare for a lecture you should read the assigned textbook materials.

## AccessAbility

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the AccessAbility Services Office as soon as possible. I will work with you and AccessAbility Services to ensure you can achieve your learning goals in this course. Enquiries are confidential. The UTSC AccessAbility Services staff (located in AA142) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations. Contact by phone (416) 287-7560 or email at ability@utsc.utoronto.ca

## Class Schedule

This schedule is **tentative** and might change during the term in order to accommodate for variations in the lecture discussionss in response to student performance and understanding of the various topics. Please note that it is your responsibility to read the assigned sections and chapters **before** each lecture. The lecture discussions will **not** be a direct repetition of the basic material found in the textbook. Failing to complete the readings before each lecture will hinder your ability to understand the class discussions as a minimum understanding of the basic concepts will be assumed from the assigned reading.

Week # Date	Tuesday Lectures 3pm - 4pm / 4pm - 5pm	Thursday Lecture 1pm - 2pm
<b>Week 01</b> Jan. 09	<b>Introduction</b> Ch.1: 1 - 3 <b>Position &amp; Velocity</b> Ch.2: 1 - 3	<b>Acceleration</b> Ch.2: 4 - 6
<b>Week 02</b> Jan. 16	<b>Vectors &amp; Coordinates</b> Ch.3: 1 - 4 <b>2D Position &amp; Velocity</b> Ch.4: 1 - 2	<b>2D-Kinematics</b> Ch.4: 3 - 4
<b>Week 03</b> Jan. 23	<b>Circular Motion</b> Ch.4: 5 <b>1D Relative Motion</b> Ch.4: 6	<b>2D Relative Motion</b> Ch.4: 7
<b>Week 04</b> Jan. 30	<b>Newton's Laws</b> Ch.5: 1 <b>Forces</b> Ch.5: 2	<b>Using Newton's Laws</b> Ch.5: 3
<b>Week 05</b> Feb. 06	<b>Friction Forces</b> Ch.6: 1 <b>Drag Forces</b> Ch.6: 2	<b>Circular Motion Dynamics</b> Ch.6: 3
<b>Week 06</b> Feb. 13	<b>Work &amp; Kinetic Energy</b> Ch.7: 1 - 2 <b>Forces &amp; Work</b> Ch.7: 3 - 4	<b>Work &amp; Power</b> Ch.7: 5 - 6
<b>Week RW</b> Feb. 20	<b>Reading Week</b>	<b>Reading Week</b>
<b>Week 07</b> Feb. 27	<b>Potential Energy</b> Ch.8: 1 <b>Energy Conservation</b> Ch.8: 2 - 3	<b>Work &amp; Conservation</b> Ch.8: 4 - 5
<b>Week 08</b> Mar. 06	<b>Linear Momentum</b> Ch.9: 1 - 3 <b>Momentum &amp; Impulse</b> Ch.9: 4 - 5	<b>Conservation of Momentum</b> Ch.9: 6 - 8
<b>Week 09</b> Mar. 13	<b>Rotational Motion &amp; Inertia</b> Ch.10: 1 - 5 <b>Torque &amp; Energy</b> Ch.10: 6 - 8	<b>Rolling Motion &amp; Torque</b> Ch.11: 1 - 8
<b>Week 10</b> Mar. 20	<b>Equilibrium</b> Ch.12: 1 - 2 <b>Energy &amp; Springs in SHM</b> Ch.15: 1 - 2	<b>Pendula as SHM</b> Ch.15: 4
<b>Week 11</b> Mar. 27	<b>Transverse Waves</b> Ch.16: 1 - 2 <b>Wave Interference</b> Ch.16: 5 - 6	<b>Standing Waves</b> Ch.16: 7
<b>Week 12</b> Apr. 03	<b>Sound Waves &amp; Interference</b> Ch.17: 1 - 3 <b>Intensity &amp; Instruments</b> Ch.17: 4 - 5	<b>Beats &amp; Doppler Effect</b> Ch.17: 6 - 7