Physics I - Physical Sciences
PHY A10 - Fall 2021

"The most incomprehensible thing about the world is that it is comprehensible."
– Albert Einstein

Instructor: Johann Bayer **Email:** jbayer@utsc.utoronto.ca **Course Website:** q.utoronto.ca

Office Hours

Tuesday	1:00 pm - 2:00 pm
Thursday	10:00 am - 11:00 am
Thursday	1:00 pm - 2:00 pm

Course Description, Learning Outcomes, and Requisites

In this first course for most of the Specialist and Major Programs in Physical 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 problem-solving skills to the analysis of physical systems, in the form of 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 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

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

- **Textbook:** ***Fundamentals of Physics*** by Halliday, Resnick, & Walker (Wiley, 11th Ed.)

The schedule provided at the end of this document indicates the readings you must complete **before** watching each lecture video. The reading quizzes 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, browse briefly the derivations, and study the review & summary at the end of the chapter. This first reading will be the assumed starting point for all lecture videos. 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 a registration code for **WileyPLUS**, available at the UofT Bookstore, either as an access card bundled with the textbook or as a digital-only resource. Once you have a registration code, follow any WileyPLUS link on the course website to complete your registration.

- **Technical Requirements for Remote and Online Learning:**

Please review the minimum and recommended technical requirements for learning in the remote and online environment. Specifically for our course you will need a fast and reliable Internet connection. This is particularly important for all the scheduled synchronous course components, including practicals, tests, and the final exam. Use of a computer (laptop or desktop) instead of a mobile device (smartphone or tablet) will be critical during all electronic forms of assessment. Additionally, you should connect via wire (Ethernet) to your modem or router instead of using a wireless (WiFi) connection to ensure stability and reduce interference. Lastly, you will be required to produce scans of handwritten work in PDF format for your practicals, tests, and the final exam. This can be accomplished using a dedicated scanner or using the camera in your smartphone after installing a document scanner app. More details and suggestions will be provided in the course website.

Grading Scheme and Grade Components

Component	%	Due Date
Reading Quizzes	5	Ongoing (Pre-Lecture)
Online Homework	5	Ongoing (Weekly)
Practical Worksheets	10	Ongoing (Weekly Practicals)
Data Analysis	5 (⋆)	TBD
Test #1	10	Week 5 (Tentative)
Test #2	25	Week 10 (Tentative)
Final Examination	40 (⋆)	Exam Period (December 09 - 21)

Reading Quizzes (5%)
Before the release of each lecture video 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 lecture videos and reading quizzes.

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 Worksheets (10%)
Prior to each practical session you will have the opportunity to review a worksheet based on conceptual questions and detailed problems from the material of the week just ending. During the online synchronous practical session on Zoom you will have the opportunity to discuss the activities in the worksheet with your peers under the expert guidance of a practical leader. Additionally, during the practical session you will be able to discuss questions you might have about the lecture videos and the various suggested problems from the textbook.

After the end of the session each student will submit their individually-completed work on the activities from the worksheet. In order to submit answers to the worksheet activities you will be required to digitize completed work, either through the use of a scanner or by converting photos taken with a mobile device into acceptable PDF files. We strongly recommend the use of a document scanner app when converting photos taken with a mobile device. It is your responsibility to explore the available document scanner app options for your specific model and operating system. Your individual work will be graded for credit out of **10 points**, and your final grade is the average of the **best 10** results.

Data Analysis (5% (⋆))
These are a set of activities derived from three basic mechanics experiments. The data sets and videos associated with these experiments will form the basis of a guided set of questions focusing on the application of the scientific method to the tasks of data analysis. You will need to install in your computer SciDAVis, a free and powerful application for **Sci**entific **D**ata **A**nalysis and **Vis**ualization.

Given the challenges associated with the final design and deployment of these activities over the remote learning environment, after the deadline for the submission of the last activity, but before the grades from that activity are released, each student will be given the option of transferring the weight of all the **Data Analysis** assessments to the **Final Examination**.

Test #1 (10%)
The first test will be scheduled during **Week 5** and it will be **1 hour** long. This test will feature the material from the lecture videos and textbook readings up to and including Week 4. The questions will also be based on the practical worksheets and online homework up to and including material due on Week 4. The format includes only multiple-choice questions.

Test #2 (25%)
The second test will be scheduled during **Week 10** and it will be **2.5 hours** long. This test will feature the material from the lecture videos and textbook readings up to and including Week 9. The questions and problems will also be based on the practical worksheets and online homework up to and including material due on Week 9. The format includes multiple-choice questions as well as detailed problems.

Final Examination (40% (⋆))
The **4-hour** long final examination will be scheduled during the exam period of **December 09 - 21**. This examination will feature all the topics presented in the various course components, and the format includes multiple-choice questions as well as detailed problems. The listed weight reflects the default where a student elects to have their **Data Analysis** work counted without tranferring.

In order to submit work for the detailed problems in **Test #2** and the **Final Examination** you will be required to digitize completed work either through the use of a scanner or by converting photos taken with a mobile device into acceptable PDF files. We strongly recommend installing and exploring the use of a document scanner app when converting photos taken with a mobile device.

The only aids allowed for **Test #1**, **Test #2**, and the **Final Examination** are your non-programmable scientific calculator, and a hand-written, double-sided, and letter-sized aid sheet. Photocopies or computer printouts are not allowed.

Class Policies

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.
- On tests and exams: Using or possessing unauthorized aids; looking at someone else's answers during an exam or test; misrepresenting your identity.
- 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).

Email Communications
If you want to ask a question via email, please first check the various threads in the PeppeR 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 these electronic forums are not the best place for your specific concern, make sure you 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. I reply to emails within a period of 24 hours and I rarely reply to emails during weekends.

Copyright Notice
The lectures of this course will be recorded on video and will be available to students in the course for remote viewing. Course videos and all additional 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.

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 a missed assignment 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 via Zoom.

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 documentaiton to your instructor.

Course Support

Lecture Videos and Lecture Slides
Lecture videos will be available weekly on Tuesday afternoon and will expire the following week on Friday morning, approximately 10 days after being released. The slides used in these lecture videos will be made available on the course website after the release of each lecture video. Prior to watching the lecture videos you should read the assigned textbook materials and complete the associated reading quiz.

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.

Facilitated Study Groups (FSG)
Facilitated Study Groups are structured, weekly study groups for this class and other selected UTSC classes. Students share study strategies, compare notes and strategize for exams in a low-key, comfortable environment. FSG days and times will be announced in the course website. Everyone is welcome!

Physics Study Centre (PSC)
The Environmental and Physical Sciences students' Association (EPSA) and the Department of Physical and Environmental Sciences (DPES) are working to create an online tutoring environment. Selected outstanding volunteer students will be available to offer help with Physics questions and problems. More information will be available at http://www.myepsa.ca/tutoring/physics-centre/

Access*Ability*

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 Access*Ability* Services Office as soon as possible. I will work with you and Access*Ability* Services to ensure you can achieve your learning goals in this course. Enquiries are confidential. The UTSC Access*Ability* 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 lectures in response to student performance and understanding of the various topics. Please note that it is your responsibility to read the assigned sections **before** watching each lecture video and completing the respective reading quiz.

The lecture videos will **not** be a direct repetition of the basic material found in the textbook. Instead, we will concentrate on important and difficult aspects of the theory and concepts from your textbook readings. A minimum understanding of the basic concepts from the assigned readings will be the assumed starting point for each lecture video. As a result, failing to complete the textbook readings before watching each lecture video will significantly affect your ability to understand the material presented.

Week # Date	**Part I**	**Part II**
Week 01 Sep. 07	**Introduction** **Measurement** Ch.1: 1 - 3	**Position & Velocity** Ch.2: 1 - 3 **Acceleration** Ch.2: 4 - 6
Week 02 Sep. 14	**Vectors & Coordinates** Ch.3: 1 - 3 **2D Position & Velocity** Ch.4: 1 - 2	**2D Acceleration** Ch.4: 3 **Projectile Motion** Ch.4: 4
Week 03 Sep. 21	**Circular Motion** Ch.4: 5	**1D Relative Motion** Ch.4: 6 **2D Relative Motion** Ch.4: 7
Week 04 Sep. 28	**Newton's Laws** Ch.5: 1 **Forces** Ch.5: 2	**Using Newton's Laws** Ch.5: 3
Week 05 Oct. 05	**Friction Forces** Ch.6: 1 **Drag Forces** Ch.6: 2	**Circular Motion Dynamics** Ch.6: 3
Week RW Oct. 12	**Reading Week**	**Reading Week**
Week 06 Oct. 19	**Kinetic Energy** Ch.7: 1 **Work & Kinetic Energy** Ch.7: 2	**Forces & Work** Ch.7: 3 - 4 **Work & Power** Ch.7: 5 - 6
Week 07 Oct. 26	**Potential Energy** Ch.8: 1 **Energy Conservation** Ch.8: 2	**Energy Diagrams** Ch.8: 3 **Work & Conservation** Ch.8: 4 - 5
Week 08 Nov. 02	**Linear Momentum** Ch.9: 1 - 3 **Momentum & Conservation** Ch.9: 4 - 5	**Momentum & Energy** Ch.9: 6 **Collisions** Ch.9: 7 - 8
Week 09 Nov. 09	**Angular Acceleration** Ch.10: 1 - 3 **Rotational Energy & Inertia** Ch.10: 4 - 5	**Torque** Ch.10: 6 - 7 **Work & Rotational Energy** Ch.10: 8
Week 10 Nov. 16	**Rolling Motion** Ch.11: 1 - 3 **Torque** Ch.11: 4	**Torque & Angular Momentum** Ch.11: 5 - 6 **Angular Momentum** Ch.11: 7 - 8
Week 11 Nov. 23	**Equilibrium** Ch.12: 1 - 2 **Simple Harmonic Motion** Ch.15: 1 - 2, 4	**Transverse Waves** Ch.16: 1 - 2 **Interference & Standing Waves** Ch.16: 5, 7
Week 12 Nov. 30	**Sound Waves** Ch.17: 1 - 2 **Interfernce** Ch.17: 3	**Intensity & Instruments** Ch.17: 4 - 5 **Beats & Doppler Effect** Ch.17: 6 - 7