

PHYA10S-2022: Physics I for the Physical Sciences

Asynchronous online Lectures & Synchronous Practicals

“I think nature’s imagination is so much greater than man’s, she’s never going to let us relax” – Richard Feynman”

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Office Hours: Tuesday 13.00-14.00 and Thursday 11.00-12.00

Course website: <https://www.uts.utoronto.ca/projects/quercus/>

Course Description:

This is the first course for many of the Specialist and Major programs in Physical and Environmental Sciences. The course introduces the concepts, mathematical tools, and above all, methods of reasoning and problem-solving that physicists use to understand and describe the physical world, which are also used in many other areas of science, technology, and engineering. Topics include the mathematical description of motion (i.e., kinematics and dynamics), Newton’s laws, energy and work, momentum, conservation laws, rigid-body rotation, oscillatory motion, and wave phenomena. By the end of the course, you should have considerable experience in using all these tools and concepts to solve problems and you should be fluent not only in employing the abstract language of physics but in relating those abstractions to the real world which they are designed to help interpret and describe.

Course Prerequisites: Calculus and Vectors (MCV4U), Physics (SPH4U)

Corequisite: Calculus I (MATA30 or MATA31)

Required materials:

Textbook: **Physics for Scientists and Engineers by Randall D. Knight (Pearson, 4th ed.) & Mastering Physics.**

Students who are familiar with the textbook

Fundamentals of Physics by Halliday, Resnick, & Walker (Wiley, 11th Ed.), still can use it. The chapters’ numbers listed in the **Tentative Schedule Winter-2022 section** below corresponds to the book by Knight, which can be easily matched to those listed by the another book.

Non-Programmable Scientific Calculator: Some suitable models include Casio FX-260, FX-300, Texas Instruments TI-30X IIS, TI-30XS, Sharp EL-520, EL-531, EL-W535, or similar.

Grading Scheme

Component	Points	Due Date
Quizzes	04	In practicals
Practical Activities	12	Weekly (practical sessions, including Quizzes)
Formal Lab Reports	06	Week 8 & 11 (tentative)
Midterm Test 1	14	Possibly Week 5 TBA
Midterm Test 2	14	Possibly Week 10 TBA
Final Examination	50	Exam Period April (Registrar decision)

HomeWorks

You are encouraged to do problems from the end chapters problems in the textbook, we suggest to be selective and do problems that are not similar. How many? It is probably impossible to answer this as it depends on the student and the topic at hand. I will try to select a number of questions to be posted on Quercus, based on the previous week's textbook reading and lecture material. I suggest you should spend about 3 hours doing each HW. No grade is associated with these HW, however, you are encouraged to do it for practicing problem solving and for better understanding.

Practical Sessions (4%+12%+6%=22%)

In these 3-hour weekly sessions you will work in groups to discuss examples based on the concepts introduced in the lecture and textbook readings. There will also be experimental work (Video & data files will be provided) to develop skills in experimental technique and data analysis. The practical grade will depend on quizzes (4%), practical group activities (12%) and two experiment-based formal lab reports written in collaboration with your assigned group **for the first report (2%) & individually for the second (4%)**. Your TA will provide you with more information about the **practical organization and the students groups** to be formed.

Midterm Test #1 & Test #2 (12% & 12%)

The first test will be 1.5 hour long, scheduled by the Registrar office online. It will cover material discussed in lecture, readings, and practical sessions up to the previous week. The only aids allowed are a non-programmable calculator and a **hand-written**, double-sided, letter-sized aid sheet which you prepare individually beforehand, which includes maximum of 25 equations with no solved problems, graphs, or explanation. Do not include constants as those are given. ***You will need to upload the used formula sheet with your test & Exam paper for both tests & Exam.***

Test#2 will also be scheduled online. It will cover material discussed in lecture, readings, and practical sessions up to the previous week. It will be cumulative and may include material covered since the beginning of the course but with an emphasis on material covered from weeks 5-9. The only aids allowed are a non-programmable calculator and a **hand-written**, double-sided, letter-sized aid sheet which you prepare individually beforehand, which includes maximum of 35 equations with no solved problems, graphs, or explanation. Do not include constants as those are given.

Final Examination (50%)

The final examination will be scheduled during the exam period in April and will cover material from the entire course. It will be a cumulative 3 hours long and online. The only aids allowed are a non-programmable calculator and a **hand-written**, double-sided, letter-sized aid sheet which you prepare individually beforehand, which includes maximum of 40 equations with no solved problems, graphs, or explanation. Do not include constants as those are given.

Technical Requirements for Remote and Online Learning:

Please review the Recommended Technology Requirements for Remote/Online Learning located on the following UofT webpage.

<https://www.viceprovoststudents.utoronto.ca/covid-19/tech-requirements-online-learning/>

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.

Submitting PDF files

Working weekly in the practicals, or during tests & Exam you will need to submit your file in PDF format, and you need to follow the following format in naming the file. The completed file should be digitized using a scanner, a mobile phone or other photographic devices. **Make sure it is properly focused and readable**. Name the file in the format **lastname_initial_test-1.pdf**. For example, my full name is Tawfiq Salam, so the filename for test-1 should be **Tawfiq_S_test-1.pdf**. Please submit your scripts as a **single file** in pdf format. To submit your answers, you could navigate to **Grades >> Test-1 >> Attach File >> Browse >> Save >> Submit Assignment**. Make sure that you can preview your submission afterwards, and whether the words are legible. Be sure to submit your work **before the deadline**, otherwise the work will be considered late and will not be accepted. Your TAs will be strict on this and will not accept any late or other non pdf format, i.e. you could get a ZERO. Please be diligent and prepare your weekly practical, Tests and Exam **single files in time, in pdf format and named properly**.

e-mail

If you want to ask a question via e-mail, please first check the electronic forums in the Discussion Board 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 e-mail. This way you will also help other students facing the same issue. The forums in the discussion board 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 query, please send your e-mail from an official utoronto.ca address (e.g., your UTmail+ account), as other addresses might create problems with automatic filtering. Include the course code PHYA10 somewhere in the subject line of your message to ensure a quicker response time. I make no iron-clad guarantees, but I will generally try to respond to e-mails within about 36 hours, possibly excepting weekends.

Absences

To ensure fairness and reduce scheduling chaos, there will be no makeup options for practical

activities, formal lab reports, or midterm tests. In the case of a valid and documented problem that supports an absence from a practical session, the grade will be calculated based on all other submitted work. In the case of a valid and documented problem that supports an absence from 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 from the second test, the final examination will have its weight increased accordingly. If the problem is health-related you must use the official form available on the Registrar's Website.

Academic Integrity

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 Behavior on Academic Matters:

<http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>

outlines the behaviors 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. You should familiarize yourself with the University's standards of conduct. 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 <http://sites.utoronto.ca/academicintegrity/resourcesforstudents.html>).

Additional Resources

Physics Study Centre (PSC)

The Environmental and Physical Sciences students' Association (EPSA) and the Department of Physical and Environmental Sciences (DPES) are offering 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 <https://www.myepsa.ca/tutoring/physics-centre/>

Accessibility

Students with diverse learning styles and needs are welcome in this course. If you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the *accessibility* Services Office as soon as possible. I will work with you and *accessibility* Services to ensure you can achieve your learning goals in this course. Enquiries are confidential. The UTSC *accessibility* Services staff (located in SW302) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations (416) 287-7560 or <https://www.utsc.utoronto.ca/ability/welcome-accessability-services>

Discussion Board

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 details of the course such as deadlines, future topics, and scheduling. It is recommended that you check the forums on a regular basis to keep on top of current issues. You can subscribe to the various forums to receive email notifications when new posts are available, and there are also options for posting anonymously.

Lecture Slides

Slides from the lectures will be made available on the course website after each lecture. These are intended to assist with review and reference and are *not* intended to replace participation in lecture. They should not necessarily be viewed as a full transcript of what was discussed.

Tentative Schedule Winter-2022:

Note that the following schedule might possibly change during the term to accommodate variations in the pace of lecture discussions. The dates of term tests are tentative subject to Registrar's schedule and will be confirmed after the beginning of the semester. You should read the assigned chapters *before* each lecture to ensure a basic familiarity with the topics to be discussed, and subsequently use them as a reference while working on homework, preparing for tests, etc.

Dates		
Week-1	Introduction & Dimensional Analysis	Position, Velocity & Acceleration
Week-2	1D Kinematics	1D Kinematics Ch.2: 6-7
Week-3	Vectors and Coordinates Ch.3: 1-4 2D Kinematics Ch.4: 1-2	2D Kinematics Ch.4: 3
Week-4	2D Kinematics Ch.4: Review	Newton and Forces Ch.5: 1, 4-6
Feb Week-5	Newton and Forces Ch. 5: 2-3,7 1D Dynamics Ch.6: 1-6	Newton's 3 rd Law Ch. 7: 1-3
Feb Week-5 TBA	Test 1: Ch. 1-5	
Week-6	Newton's 3 rd Law Ch.7: 4-5 2D Dynamics Ch. 8 1-3	2D Dynamics Ch. 8: 4-5
Week-7	Reading Week	
Week-8	Work and Kinetic Energy Ch. 9: 1-6 Potential Energy Ch.10: 1-3	Energy Conservation Ch.10: 1-3
Week-9	Impulse and Momentum, Momentum Conservation Ch.11: 1-2	Collisions and Explosions Ch.11: 3-6
Week-10	Rotation, Torque, Rotational Dynamics Ch. 12: 1-2, 4-6	Rotational Energy, Angular Momentum Ch. 12: 3, 7-12
Mar Week-	Simple Harmonic Motion Ch.15: 1-5	The Pendulum Ch.15: 6
Week-11 TBA	Test 2: Ch. 1-12	
Week-12	1D Waves Ch. 16: 1-3 Sound and Light Ch.16: 4-5	Intensity, the Doppler Effect Ch.16: 7-9
Week-13	Standing Waves Ch.17: 1-4 Time permitting	
Apr 10-27 TBA	Final Exam	