# PHY 132H1S
## Introduction to Physics II
## Winter 2021

Updated 1/6/21
Course website: https://q.utoronto.ca/courses/203036

### Course Description

Welcome! In this course, we will practice a scientific approach to making sense of the universe, building on concepts and abilities from Introduction to Physics I. This includes observing patterns, imagining possible explanations, devising tests that can tell us which explanations work best, and applying well-tested explanations to make better predictions. The topics in this second-semester university physics course include optics, waves, electricity, magnetism, and special relativity.

### Online Platforms

This course will make use of multiple platforms for asynchronous and synchronous engagement.

- Quercus – course website, announcements, pre-practical activities, tests (uses Canvas learning management software)
    - Piazza – discussion forum, questions & answers (may be accessed via Quercus)
    - Team Up! – synchronous, collaborative questions during class, also available to complete after class (accessed via Quercus)
- Zoom – online classes, office hours, help centre (UTORid for login)
- Teams Meetings – practicals (UTORid for login)
- OLI Canvas – hosting eText and homework, requires accepting invitation sent to your mail.utoronto.ca email address and creating a login password
    - Perusall – eText, reading assignments, and homework (accessed via OLI Canvas)
    - Bazaar – synchronous collaborative chat-based activities during class, or during an alternate time by signing up for a group (accessed via OLI Canvas)

### Contact Information

**Email**: phy132winter@physics.utoronto.ca
**Piazza Q&A Forum:** piazza.com/utoronto.ca/winter2021/phy132h1sallsections

Course Administrator: Ms. April Seeley
voice landline: 416-946-053, email: phy132winter@physics.utoronto.ca

Professor: Dr. Carolyn Sealfon
office hours: TBD based on Piazza poll, email: phy132winter@physics.utoronto.ca

Practicals Coordinator: Dr. Roya Ghahreman
office hours: by appointment, email: phy132winter@physics.utoronto.ca

Please use the Piazza forum to post content-related or general logistical questions.

If you have a question specific to you (such as about your marks or to schedule an office hour appointment), please email the above email address. (Please do **not** send messages via Quercus to course instructors.)

## Required Prequisites and Corequisites

The required prerequisite for PHY132H1 is either PHY131H1 or PHY151H1 or course equivalent from another college/university (e.g. PHYA10, PHYA11, PHY136H1, Physics 1L03 (McMaster)). MAT136H1/137Y1/157Y1 is a recommended co-requisite and may be a required prerequisite in 2nd year Physics courses.

## Important Dates

### Classes and Classwork:

- **Classes begin**: Monday, January 11
  - Classes meet Mondays, Wednesdays, and Fridays, 11:10am-12pm EST online on Zoom. The link will be provided on the course website for those participating synchronously. If you are unable to participate regularly during class time, opportunities will be provided for comparable engagement outside of class. The last class will meet on April 12.
  - There are no classes Feb. 15-19 nor Apr. 2 due to Reading Week and Good Friday.

### Practicals:

- **Practicals begin**: Wednesday, January 20
  - Students must register for a Practical section. Practicals meet online synchronously once every week for two hours. See the course website for more information.

### Term Tests:

- **Term Tests:** Wednesdays, 11:10am-12:00pm Toronto time, on the following dates:
  - Test 1: January 20, 11:10am
  - Test 2: February 3, 11:10am
  - Test 3: February 24, 11:10am
  - Test 4: March 10, 11:10am
  - Test 5: March 24, 11:10am
  - Test 6: April 7, 11:10am
- **Final assessment**: To be scheduled by the Faculty of Arts & Science during the final assessment period, April 13-23

## Course Learning Goals

In this course, you will further develop your abilities to…

- Make meaning out of physics and mathematics
  - Interpret, generate, and translate among multiple representations of physics concepts, including
    - diagrams
    - graphs
    - mathematical equations
    - written explanations
- Solve qualitative and quantitative physics problems
  - Apply appropriate simplifications

    - Apply multiple representations (e.g. diagrams, graphs, equations)
    - Apply physics concepts to new situations or contexts
- Make and evaluate scientific arguments
    - Identify assumptions
    - Apply hypothetico-deductive reasoning
    - Design, conduct, and interpret experiments to test proposed explanations
- Demonstrate resiliency in solving problems and making meaning out of new ideas
    - Apply strategies to overcome common anxieties related to math/physics/tests/performance
- Identify, read and comprehend relevant instructions

## Course Materials

**Required Course Materials:**

- ✓ University technical requirements for online learning:
    - Minimum Technical Requirements
    - Internet Connectivity
    - Video Camera (may be part of computer, webcam, or phone camera)*
    - Microphone
    - Speakers or headphones
    - University of Toronto student Zoom license: https://utoronto.zoom.us/
    - Latest version of the Zoom desktop client (you *can* use the web version, but the experience is inferior)
    - Latest version of the Teams desktop client

  * Note: **Bursaries are available** for this equipment if needed; contact your College Registrar.
- ✓ Low-cost equipment:
    - For Winter 2021, in-person Practicals will not be held and students are asked to acquire some necessary materials on their own. The Physics Department has made arrangements to have a credit of $40 placed in your ROSI account to offset the associated costs. In the case of students who drop the course prior to a certain date, this credit will be adjusted or reversed; details on the timing and proportion of this adjustment are still to be confirmed with the offices assisting in this process. See the course website for more information, including the list of necessary materials.
- ✓ Online access to the required textbook, *College Physics: Explore and Apply*, by Etkina, Planinsic, and Van Heuvelen, ©2019 by Pearson Education, Inc., will be provided to all registered students for Winter 2021. You may wish to purchace a paper copy, as many students find a hardcopy helpful.

**Recommended Course Materials:**

- ✓ A ruler.
- ✓ A protractor.
- ✓ String.
- ✓ Coloured pencils or pens: Some students find these useful for diagrams in this course.
- ✓ *MasteringPhysics* online license (for extra practice only; no homework credits will be assigned via *MasteringPhysics*).
- ✓ Natural curiosity and wonder: please bring your curiosity to every class and practical session.

For more information about course materials, please see the course website on Quercus.

## Marking Scheme

Your mark in this course will be based on your performance in the following categories of assessment.

| | |
|---|---|
| ► **Classwork*** | ***x*%**<br>(where 0 < x% < 12 depends on earned classwork credits throughout the semester) |
| ► **Practicals** | **20%** |
| ► **Term Tests and Final Assesement** | **(80-*x*)%** |

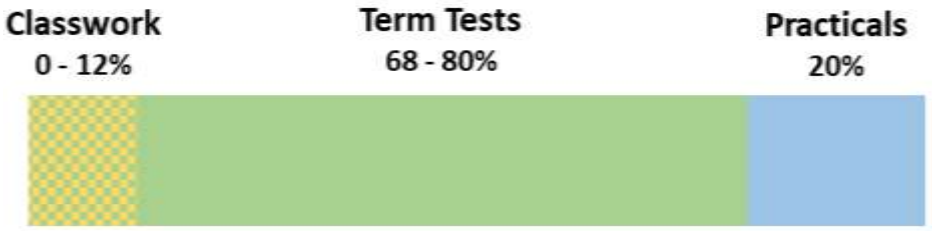


Figure 1: PHY 132H1S Introduction to Physics II Winter 2021

***** Opportunities to earn classwork credits include reading and engaging with Perusall online homework, completing collaborative Bazaar activities, pre-course and post-course surveys, posting helpful responses to physics questions on Piazza, and answering "Team Up!" questions in or after class. Each classwork credit is worth 0.04% of your final mark and you may earn up to a maximum of 300 classwork credits throughout the semester. You can never lose any credit on classwork, you can only accumulate credits which will reduce the weight of your tests. The more classwork credits you earn, the lower the weight of your test average, down to a minimum of 68%. See the course website for more details.

## Tentative Schedule of Class Content

- Module 1: Light rays, reflection and refraction, Jan. 11-20
- Module 2: Mirrors and lenses, Jan. 22-Feb. 3
- Module 3: Wave optics, Feb. 5-12 & 22-24
- Module 4: Electric interactions and fields, Feb. 26-Mar. 10
- Module 5: Electric circuits, Mar. 12-24
- Module 6: Magnetism and electromagnetism, Mar. 26-Apr. 7
- Module 7: Introduction to special relativity, Apr. 9-12

## Course Learning Components

### ► Classwork (worth up to 12%)

- **Classes** on zoom, MWF 11:10am-12pm:
  - Logistics: Link will be provided on the course website. Content will be recorded or otherwise made available after class.
  - Time allocation: 50 minutes per class, 3 classes per week.
  - Primary purposes: View and explain observational experiments; introduce and test conceptual models; introduce and practice problem-solving abilities; discuss and motivate learning.

        - Assessment and feedback: In-class polls and Team Up! activities, which may be completed collaboratively or individually and are due by 24 hours after class.
        - Academic intergrity: You may collaborate on Team Up! questions, and you are encouraged to ensure you understand the answers for yourself before they are submitted.
    - **Perusall** homework, due online every MWF by 8am:
        - Logistics: Assignments will be available one week in advance to accommodate varied schedules and include textbook reading. Access is provided via the OLI Canvas site (more info on course website).
        - Time allocation: About 90 minutes of homework per class, 3 classes per week.
        - Primary purposes: Develop, discuss, and practice applying physics concepts and scientific abilities.
        - Assessment and feedback: Automatically marked online based on participation and engagement.
        - Academic intergrity: You may discuss and build on each other's ideas, however your annotations and comments should be your own ideas, your own work, and in your own words. If you agree with another student's work or comments, please upvote it rather than repeat it.
    - Collaborative **Bazaar** assignments:
        - Time allocation: Part of class time
        - Logistics: If you cannot attend Monday classes, you will need to sign up for an alternate time to complete these online activities with a group of peers prior to class time. Access is provided via the OLI Canvas site (more info on course website). There will be a Bazaar assignment during the Monday class before each Term Test.
        - Primary purposes: Intergrate understanding from each module; develop, discuss, and practice applying physics concepts and scientific abilities at a level similar to term tests.
        - Academic integrity: You may discuss and build on each other's ideas, however your comments and uploads should be your own ideas and your own work. If you contribute an image or quote from the internet or another source in your conversation, be sure to cite it.
    - Piazza discussion forum:
        - Primary purposes: Learn to ask better questions, learn better through explaining your ideas to others, receive intructor answers to questions
        - Please be sure to read Piazza's Privacy Policy and Terms of Use carefully and make sure you are comfortable with what they say.
    - Prof. Sealfon's Office Hours: See course website for times and link
        - Primary purposes: Get to know your professor better, meet classmates, increase the efficiency of your learning.
    - PHY132 Help Centre: See course website for times and link
        - Primary purposes: Get to know the class TA, meet classmates, increase the efficiency of your learning.

## ► Term Tests (worth 68-80%)

- Time: every-other Wednesday during class, 11:10am-12:00pm Toronto time
- You may reduce the amount tests are worth by earning classwork credits.
- Logistics
    - There will be two quizzes for each of the first 6 modules.
        - The first quiz will be called Quiz A and the second Quiz B.
    - Each quiz will:
        - Have all questions based on an image or context, which you will be provided on Quercus about two days in advance of the quiz to allow you time to think and prepare.

        - Consist of about 6 closed-answer questions on Quercus, at least one of which will be quantitative.
        - Have a time limit of 25 minutes.
        - Be worth 6 points.
    - Test 1 will consist of only one quiz: Quiz A for Module 1
    - Subsequent term tests will consist of two quizzes:
        - Test 2: Quiz A for Module 2 & Quiz B for Module 1
        - Test 3: Quiz A for Module 3 & Quiz B for Module 2
        - Test 4: Quiz A for Module 4 & Quiz B for Module 3
        - Test 5: Quiz A for Module 5 & Quiz B for Module 4
        - Test 6: Quiz A for Module 6 & Quiz B for Module 5
        - Final Assessment: Quiz B for Module 6, plus about three questions on Module 7 and five cumulative conceptual questions from Modules 1-5 (14 points total)
    - If your score on Quiz B for a given module is better than your score on Quiz A, your Quiz B score will replace your Quiz A score for that module.
        - Quiz A may be viewed as a "practice quiz" that will count if you score well on it.
        - Your Quiz B score counts for every module.
    - In the event that you must miss a term test for medical reasons, declare your absence on ACORN (under the Profile and Settings menu) and email PHY132 to ensure your excused absence is recorded. In this case:
        - Your future Quiz B score (on the subsequent term test) will replace your missed Quiz A score. You will have access to Quiz A online after the test for studying.
        - The missed Quiz B will not count as long as you have completed the previous term test with Quiz A for that module.
    - If you need to miss two or more Term Tests in a row, be sure to connect with your College Registrar as well as email PHY132 to determine the best course of action.
- Time allocation: 1-2 hours to study each image/context for each quiz prior to the test.
- Primary purposes: Sythethesize physics concepts and skills, apply abilities to new situation, collaboratively aniticipate interesting questions, individually demonstrate understanding and ability to apply ideas
- Academic integrity:
    - **Prior to** the test (prior to 11:00am on test days), you are encouraged to study collaboratively with your peers to:
        - brainstorm possible questions about the image/context and the approaches and reasoning needed to answer them
        - discuss and develop your understanding of the image/context
        - create an aid sheet to consolidate your understanding and save you time during the test
    - **During** each test you must answer each question individually with no communication with peers or anyone else (except for Prof. Sealfon). You may use your textbook, notes, online non-interactive resources, and materials from your Practicals kit as helpful.

- Recommended resources:
    - Study groups:
        - You may find it helpful to lead or participate in a Registered Study Group.
        - Logistics: Sign up at uoft.me/recognizedstudygroups and receive Co-Curricular Credit.
        - Primary purposes: Deepen your learning of course material and lifelong skills, get to know your classmates, give feedback to Prof. Sealfon, help improve the student experience
    - Vic Tutoring: All PHY132 students are welcome to attend free Vic Tutoring hours.

### ► Practicals (worth 20%)

- See the Practical Syllabus on course website for more information.
- Time allocation: 2-3 hours per week
- Primary purposes: Design and conduct experiments; observe new phenoma and uncover patterns; apply and test concepts from class; practice scientific abilities
- Note that sometimes practicals will introduce phenomena you will not yet have seen in class, so that we can use your direct experience in practical when we discuss the phenomena in class.

## Mental Health and Wellness

As a university student, you may experience a range of health and/or mental health issues that may result in significant barriers to achieving your personal and academic goals. The University of Toronto offers a wide range of free and confidential services and programs that may be able to assist you. We encourage you to seek out these resources early and often.

Mental Health Portal: mentalhealth.utoronto.ca

If, at some point during the year, you find yourself feeling distressed and in need of more immediate support, visit the Feeling Distressed Webpage for more campus resources. Immediate help is available 24/7 through Good2Talk, a post-secondary student helpline at 1-866-925-5454.

Finally, almost every student experiences stress and/or anxiety at some point, commonly before tests and exams. If this triggers mental blocks, it can reduce test performance. Fortunately, your mind is part of your body, so noticing and releasing needless tension in your body will also help open your mind, improving academic performance. Again, the student life website might be helpful.

If you find that personal or health issues are interfering with your academic commitments, please connect with an advisor in your College Registrar's office. They may be able to provide you with a College Registrar's letter of support to give to your instructors, and importantly, connect you with other resources on campus for help with your situation.

## Accommodations

If you have a learning need requiring an accommodation the University of Toronto recommends that students immediately register at Accessibility Services at http://www.studentlife.utoronto.ca/as.
Location: 4th floor of 455 Spadina Avenue, Suite 400
Voice: 416-978-8060 Fax: 416-978-5729
Email: accessibility.services@utoronto.ca

The University of Toronto supports accommodations of students with special learning needs, which may be associated with learning disabilities, mobility impairments, functional/fine motor disabilities, acquired brain injuries, blindness and low vision, chronic health conditions, addictions, deafness and hearing loss, psychiatric disabilities, communication disorders and/or temporary disabilities, such as fractures and severe sprains, recovery from an operation, serious infections or pregnancy complications.

As the instructor of this course, you are also invited to communicate with me at any time about your learning needs. Confidentiality of learning needs is respectfully and strictly maintained.

## Video and Audio Recording of Class

Please note that classes will be videorecorded. Students should note that their participation may be recorded. Please speak to the instructor if this is a concern for you. Recordings will only be available to participants in PHY132 via the Quercus website, and will not be made publically available.

Students may create their own audio recordings of the lectures for their personal use only. Recordings are intended to permit review so as to enhance understanding of the topics presented. Recordings are not substitutes for attending class.

Students agree to the following terms when creating or accessing recordings of lectures:

- Recordings are not to be distributed via the Internet, using social media such as Facebook, peer-to-peer file sharing such as One Drive or Dropbox, or other distribution channels.
- Recordings are not to be shared with anyone else without written permission of the instructor.

Non-compliance with these terms violates an instructor's intellectual property rights and the Canadian Copyright Act. Students violating this agreement will be subject to disciplinary actions under the Code of Student Conduct.

## Equity, Diversity, and Excellence

The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. U of T does not condone discrimination or harassment against any persons or communities.

In this class, we will take some time to explore the demographics of who does physics and why in Canada and beyond, using materials adapted from underrep.com. Learning about a field naturally involves learning about the culture of a field, and these ideas reach across disciplines. Whether or not you go on to study physics, having an understanding of how people end up doing what they do (and, more broadly, how our society functions) is a critical aspect of learning and thinking critically. In both society and science, the ability to recognize and work in diverse settings is increasingly valuable.

Scientists have long recognized that their ranks do not match the broader population; specifically, science in Canada is skewed more male and more white than the country as a whole. Numerous explanations have been offered to explain this disconnect and, while research has discredited the possible explanation of a lack of aptitude in underrepresented groups, the problem remains complex and enormously consequential.

As a student at the University of Toronto, you are part of a diverse community that welcomes and includes students and faculty from a wide range of cultural and religious traditions. Further to University Policy, if you anticipate being absent from a test or Practicals due to a religious observance, please email PHY132 as early in the course as possible and with sufficient notice (at least two to three weeks) so that we can work together to make alternate arrangements.

We believe that excellence flourishes in an environment that embraces the broadest range of people, that helps them to achieve their full potential, that facilitates the free expression of their diverse perspectives through respectful discourse, and in which high standards are maintained for students and staff alike. An equitable and inclusive learning environment creates the conditions for our student body to maximize their creativity and their contributions, thereby supporting excellence in all dimensions of the institution. For more information please see http://about.hrandequity.utoronto.ca/.

## Acknowledgement of Traditional Lands

We wish to acknowledge this land on which the University of Toronto operates. For thousands of years it has been the traditional land of the Huron-Wendat, the Seneca, and most recently, the Mississaugas of the Credit River. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we aregrateful to have the opportunity to work on this land.

## Academic Integrity

Academic integrity is fundamental to learning and scholarship at the University of Toronto. Participating honestly, respectfully, responsibly, and fairly in this academic community ensures that the U of T degree that you earn will be valued as a true indication of your individual academic achievement, and will continue to receive the respect and recognition it deserves. Familiarize yourself with the University of Toronto's Code of Behaviour on Academic Matters (http://www.governingcouncil.utoronto.ca/policies/behaveac.htm). It is the rule book for academic behaviour at the U of T, and you are expected to know the rules.

See above and in the Practical Syllabus for academic integrity details for this class.

Tips for productive collaboration on homework:

- Try to make progress on a problem on your own. If you cannot, seek help from other resources to overcome a specific hurdle, and then try to make further headway on your own. Once you have solved the problem, be honest with yourself about how much intellectual input came from you, and try to improve next time. Rewrite the problem solution without reference to any notes, explaining the steps as you go, as you would to a novice problem-solver. Once you have done this, you will have generated a unique solution and one that will have taught you something about what you really understand. Do not be discouraged if you find that some problems require hints and help all the way through. If you are able to explain previously solved problems coherently, you are making good progress.
- A good test of your understanding is to explain a problem to someone else. Be conscious of your role in a collaboration. If it is clear that you have mastered the problem and your collaborator is a novice, limit your help to putting the person on the track to solving the problem alone. Do not give too much help. Conversely, if you are seeking help from an expert, don't allow the expert to guide you all the way through. If the exchange is between people of a similar level of understanding, keep challenging one another, asking questions and providing answers, going beyond the limits of the problem. This is the fun part of physics - endless discussion about interesting problems! (Please note that I do not mean to categorize students as "weak" or "strong". Expert and novice can refer to two students of equal talent and ability - but one happens to have already solved the problem!)
- If you find that you have worked on a problem for 1/2 hour without making any progress, it would be a good idea to stop and seek help. (*These tips are courtesy of William Warren.)*