



# PHYS 2903 PHYSICS TOWARDS THE FUTURE

*An on-line course based on the*  
**Open Physics Education Module**



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**Office Hours:** Friday 10am - 11am via Big Blue Button, or by appointment.

## OVERVIEW

This course is intended for students with little or no background in Science. It introduces physics through a set of modules that closely connected to our everyday life and future.

**This course is only available on-line via CULearn. The course is delivered asynchronously, i.e., it does NOT have set lecture times. The students should take the online lessons following the course timeline (see Page 3).**

## COURSE LEVEL LEARNING OUTCOMES

By the end of the course, students should be able to:

1. Explain physics related phenomenon using basic physics principles and terminology
2. Perform basic calculation/estimations to solve simple physics related problems
3. Make correct judgement/decisions on physics related issues in their daily life based on basic physics principles
4. Explain our position in the solar system, our galaxy and the university
5. Briefly describe a couple recent advances in physics research

## REFERENCE

This course does **not** require a textbook. However, if you would like further your reading, you may have a look of “Physics Beyond the Comfort Zone” by Peter Watson. The book covers some basic physics such as mechanics, kinematics, heat and energy and electromagnetism. It also covers physics of sound and light. This is an e-text book available from Amazon or IBooks for \$9.99:

[https://www.amazon.ca/Physics-Outside-Comfort-Peter-Watson-ebook/dp/B01KYX3A5O/ref=sr\\_1\\_3?s=books&ie=UTF8&qid=1472130768&sr=1-3&keywords=comfort+zone](https://www.amazon.ca/Physics-Outside-Comfort-Peter-Watson-ebook/dp/B01KYX3A5O/ref=sr_1_3?s=books&ie=UTF8&qid=1472130768&sr=1-3&keywords=comfort+zone)

[https://itunes.apple.com/us/book/physics-beyond-comfort-zone/id902018641?mt=13&uo=4%22%20target=%22itunes\\_store%22%3EPhysics%20Beyond%20the%20Comfort%20Zone%20-%20Watson,%20Peter%3C/a%3E](https://itunes.apple.com/us/book/physics-beyond-comfort-zone/id902018641?mt=13&uo=4%22%20target=%22itunes_store%22%3EPhysics%20Beyond%20the%20Comfort%20Zone%20-%20Watson,%20Peter%3C/a%3E)

## CONTENT

The following thematic modules will be covered in this course. Each module will help you answer a series of questions listed below.

### 1. Sound and Music

In many ways, music might be viewed as one of the most human of inventions. What is the nature of sound and what are the relationships between pitch, loudness, musical scales and the fundamental properties of sounds? How are sounds generated, from different types of instruments, that create a musical performance?

### 2. Light and Colour

What is light exactly? What is radiation and electromagnetic wave? How do eyes and lenses work? How do we see colours? How do we communicate with EM waves?

### 3. Cell Phone

It has become commonplace, almost anywhere one travels in the world, to see people using cell phones for conversations, texting, accessing the internet, listening to music, and taking photos. What are the physics principles behind the manufacture and operation of cell phones?

### 4. Medical Physics

Medical physics is about using physical approaches to diagnose and treat diseases. What is x-ray? How does it “see” through our body? What is MRI? Why do doctors always order MRI instead of x-ray if you have a joint pain? How ultrasound scan works?

### 5. The Solar System and Beyond

The nature of the universe beyond our planet has always fascinated humans. How do we use rockets to place satellites in orbit and send missions out into the solar system? What is the structure of our solar system...of our galaxy...of the universe?

## 6. Recent Advances

Some of the most interesting questions in science are being tackled by physicists around the world. What are dark matter and dark energy? What are gravitational waves? Why is discovery of the Higgs particle important and what does it tell us? What are neutrinos and how do we observe them?

## MODULE COMPLETION DATES AND PHYSICS TOPICS COVERED

The pace of this course is about finishing one module in every two weeks: 10 days to complete one module lesson and 4 days to complete the module quiz. The following is the timeline.

<b>Thematic Modules</b>	<b>Expected completion dates of lecture videos</b>	<b>Physics topics Covered</b>
1. Sound and Music	Jan. 20	amplitude, velocity, wavelength, and frequency of sound waves, resonance, interference, harmonics, standing waves
2. Light and Colour	Feb. 3	Radiation as wave, electromagnetic wave, optical lenses and its application, human eyes, wavelength and color, color perceptions, radio waves and communication.
3. Cell Phone	Feb. 24	Semiconductors, diode and transistor, basic of logic gates and CPU, fabrication of integrated circuits, acceleration and accelerometer, rotation and gyroscope, light polarization and LCD screen.
4. Medical Physics	Mar. 10	x-ray properties and production, x-ray diffraction and imaging, Ionizing radiation dose, radiation therapy, linear accelerators, accurate delivery of radiation, nuclear magnetic resonance, magnetic resonance imaging principle and safety, ultrasound and its production, reflection of US, B-mode US imaging.
5. Solar System and Beyond	Mar. 24	gravity, momentum, energy, circular motion, orbits, time dilation
6. Recent Advances	April 7	neutrinos, Higgs particle, gravitational waves, dark energy and dark matter

## EVALUATION

### 1. (48%) Module quizzes

At the end of each thematic modules, there will be a one-hour online quiz of 15 questions. **You have 4 days at the end of each thematic modules to finish the quiz.** Each quiz account for 8% of the final mark.

Thematic Module	Module quiz due date
1. Sound and Music	Jan. 24, 23:59 pm
2. Light and Colour	Feb. 7, 23:59 pm
3. Cell Phone	Feb. 28, 23:59 pm
4. Medical Physics	Mar. 14, 23:59 pm
5. Solar System and Beyond	Mar. 28, 23:59 pm
6. Recent Advances	Apr. 11, 23:59 pm

### 2. (32%) Two writing projects

Each thematic module has suggested essay topics and/or a lab you can perform using materials or devices that are available in your home.

You are required to write one essay and one lab report on two of the five topics of your choice. The lab must be chosen from the first two thematic Modules (Sound and Music or Light and Colour). The essay must be chosen from the last four modules (Cell Phone, Medical Physics, Solar System and Beyond, or Recent Advances).

The due dates at listed in this table:

	Thematic Modules	Module essay or lab report due dates
Lab (16%) Must pick one of the two topics	1. Sound and Music	The Lab report is <b>due on Feb 21, 23:59pm</b> (at the end of reading week)
	2. Light and Colour	
Essay (16%) Must pick one of the three topics	3. Cell Phone	The Essay is <b>due on April 14, 23:59pm</b>
	4. Medical Physics	
	5. Solar System and Beyond	
	6. Recent Advances	

For the lab report, a write up template will be provided. The essay should be **800-1000 words**. Both the essay and lab reports must be written using word processing software. **Hand written essays will NOT be accepted and will be given zero mark.** Essays or lab reports should be uploaded via CULearn.

### 3. (20%) Final online quiz

During the final exam period, there will be an online quiz that covers all the content of the course.

# COPYING, PLAGIARISM AND OTHER FORMS OF CHEATING

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:

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

## ACADEMIC INTEGRITY

The University Senate defines plagiarism as “presenting, whether intentionally or not, the ideas, expression of ideas or work of others as one’s own.” This can include:

- **using online tutorial services (such as Chegg) or discussion forum/chats to solve quiz or exam problems.;**
- **collaborating on solving problems during a quiz or the exam;**
- 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 to the original source;
- submitting a take-home examination, essay, laboratory report or other assignment written, in whole or in part, by someone else;
- using ideas or direct, verbatim quotations, or paraphrased material, concepts, or ideas without appropriate acknowledgment in any academic assignment;
- using another’s data or research findings;
- failing to acknowledge sources through the use of proper citations when using another’s works and/or failing to use quotation marks;
- handing in “substantially the same piece of work for academic credit more than once without prior written permission of the course instructor in which the submission occurs.”

Plagiarism is a serious offence that cannot be resolved directly by the course’s instructor. The Associate Dean of the Faculty conducts a rigorous investigation, including an interview with the student, when an instructor suspects a piece of work has been plagiarized. Penalties are not trivial. They can include a final grade of “F” for the course.

## COURSE COPYRIGHT

Classroom teaching and learning activities, including lectures, discussions, presentations, etc., by both instructors and students, are copyright protected and remain the intellectual property of their respective author(s). All course materials, including PowerPoint presentations, outlines, and other materials, are also protected by copyright and remain the intellectual property of their respective author(s).

Students registered in the course may take notes and make copies of course materials for their own educational use only. Students are not permitted to reproduce or distribute lecture notes and course materials publicly for commercial or non-commercial purposes without express written consent from the copyright holder(s).

## ACADEMIC ACCOMMODATIONS

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.

### **Pregnancy Obligation:**

Please contact your instructor 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, visit the Equity Services website

<https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf>

### **Religious Obligation:**

Please contact your instructor 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, visit the Equity Services website

<https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf>

### **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 <https://carleton.ca/pmc>

- The deadlines for contacting the Paul Menton Centre regarding accommodation for final exams for the Fall exam period is **November 13, 2020** and for the Winter exam period is **March 12, 2021**.

### ***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>

### ***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 your instructor 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 policy at

<https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf>

For more information on academic accommodation, please contact the departmental administrator or visit: [students.carleton.ca/course-outline](https://students.carleton.ca/course-outline)