



PHYS 2903 PHYSICS TOWARDS THE FUTURE

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



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Office Hours: Tuesday 7:30pm – 8:30pm
Friday 10:30am – 10:30am

OVERVIEW

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

This course is only available on-line via CuLearn.

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 lives based on basic physics principles
4. Explain our position in the solar system, our galaxy and the universe
5. Briefly describe several recent advances in physics research

TEXTBOOK

The optional textbook for the course is “Physics Beyond the Comfort Zone” by Peter Watson. This textbook has a number of relevant sections relating to material for this course, but does not cover some areas. The lectures and supplementary materials are intended to cover the course with this textbook as a useful but optional additional aid. 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://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, to create a musical performance?

2. Light and Colour

What is light exactly? What are electromagnetic waves? 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 an x-ray? How does it “see” through our body? What is MRI? Why do doctors prefer to order MRI instead of x-ray if you have a joint pain? How does an ultrasound scan work?

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

Thematic Modules	Expected completion dates of lecture videos	Physics topics Covered
1. Sound and Music	July 8	amplitude, velocity, wavelength, and frequency of sound waves, resonance, interference, harmonics, standing waves
2. Light and Colour	July 15	radiation as wave, electromagnetic wave, optical lenses and its application, human eyes, wavelength and color, color perceptions, radio waves and communication.
3. Cell Phone	July 22	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. Solar System and Beyond	July 29	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. Medical Physics	Aug 5	gravity, momentum, energy, circular motion, orbits, time dilation
6. Recent Advances	Aug 12	neutrinos, Higgs particle, gravitational waves, dark energy and dark matter

EVALUATION

1. (40%) Module quizzes

At the end of each thematic module, there will be an online quiz of 15 multi-choice questions. **You have four days after the end of each thematic module to finish the quiz except for the final quiz which must be completed by August 14th.** *It is strongly recommended that the quizzes be completed some days before the deadline to avoid difficulties associated with technical issues.*

Thematic Module	Module quiz due date
1. Sound and Music	Jul. 12, 23:55 pm
2. Light and Colour	Jul. 19, 23:55 pm
3. Cell Phone	Jul. 26, 23:55 pm
4. Solar System and Beyond	Aug. 2, 23:55 pm
5. Medical Physics	Aug. 9, 23:55 pm
6. Recent Advances	Aug. 14, 23:55 pm

2. (40%) Two writing projects

Each thematic module has suggested essay topics and/or a lab you can perform using materials or devices that are easily available. 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 one of the four modules (Cell Phone, Medical Physics, Solar System and Beyond, or Recent Advances).

The due dates are listed in this table:

	Thematic Modules	Module essay or lab report due dates
Lab Must pick one of the two topics	1. Sound and Music	The Lab report is due on July 29, 23:55pm
	2. Light and Colour	
Essay Must pick one of the four topics	3. Cell Phone	The Essay is due on Aug 14 , 23:55pm
	4. Medical Physics	
	5. Solar System and Beyond	
	6. Recent Advances	

For the lab report, a write-up template is provided. The essay must 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 before the deadline given above.

3. (20%) Final online exam

During the final exam period, there will be an online final exam of multiple-choice questions that cover all the content of the course.

COPYING, PLAGIARISM AND OTHER ACADEMIC OFFENCES

The attention of all students is drawn to section E.12 of the Academic Regulations of the University: <http://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/academicintegrity/>

Such offences will normally result in a mark of zero on the work in question. In addition, a report will be sent to the Assoc. Dean of the student's Faculty, for possible further disciplinary action.

ACADEMIC ACCOMMODATIONS

Requests for Academic Accommodation

You may need special arrangements to meet your academic obligations during the term. For an accommodation request, the processes are as follows:

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: 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: 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 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. carleton.ca/pmc

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 its 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: 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.

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

You can visit the Equity Services website to view the policies and to obtain more detailed information on

academic accommodation at carleton.ca/equity/ .

Assistance for Students:

Academic and Career Development Services: <http://carleton.ca/sacds/>

Writing Services: <http://www.carleton.ca/csas/writing-services/>

Peer Assisted Study Sessions (PASS): <https://carleton.ca/csas/group-support/pass/>

Math Tutorial Centre: <https://carleton.ca/math/math-tutorial-centre/>

Science Student Success Centre: <https://sssc.carleton.ca/> Important Information:

Additional Information:

- Student or professor materials created for this course (including presentations and posted notes, labs, case studies, assignments and exams) remain the intellectual property of the author(s). They are intended for personal use and may not be reproduced or redistributed without prior written consent of the author(s).
- Standing in a course is determined by the course instructor subject to the approval of the Faculty Dean. This means that grades submitted by the instructor may be subject to revision. No grades are final until they have been approved by the Dean.
- Carleton University is committed to protecting the privacy of those who study or work here (currently and formerly). To that end, Carleton's Privacy Office seeks to encourage the implementation of the privacy provisions of Ontario's Freedom of Information and Protection of Privacy Act (FIPPA) within the university.
- In accordance with FIPPA, please ensure all communication with staff/faculty is via your Carleton email account. To get your Carleton Email you will need to activate your MyCarletonOne account through Carleton Central. Once you have activated your MyCarletonOne account, log into the MyCarleton Portal. For more information on academic accommodation, please contact the departmental administrator or visit: students.carleton.ca/course-outline