PHYS 2903
PHYSICS TOWARDS THE FUTURE

An on-line course based on the

Open Physics Education Module

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Office Hours: Tuesday and Thursday
11:30 p.m.- 12:30 p.m.

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 online via Brightspace.

Please note that Faculty of Science students may only take this course as a free elective.

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

TEXTBOOK

The optional text-book 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. If you have any difficulties purchasing the textbook, please contact me.

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 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. 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?

5. 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 does ultrasound scan work?

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. 4	Amplitude, velocity, wavelength, and frequency of sound waves, resonance, interference, harmonics, standing waves
2. Light and Colour	July. 11	Radiation as a wave, electromagnetic wave, optical lenses and their application, human eyes, wavelength and color, color perceptions, radio waves, and communication.
3. Cell Phone	July. 18	Semiconductors, diode and transistor, basic 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. 25	Gravity, momentum, energy, circular motion, orbits, time dilation
5. Medical Physics	Aug. 1	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.
6. Recent Advances	Aug 8	Neutrinos, Higgs particles, gravitational waves, dark energy, and dark matter

Please note that All the lecture videos are interactive with questions to be answered during the lecture. **You must achieve 75% or higher from the interactive video** before you can move on to the next lecture. The **skipping forward** on the video navigation bar **is disabled** in the first watch. Once you completed the lecture, you can rewatch the videos without any limits.

EVALUATION

1. (50%) Module quizzes

At the end of each thematic module, there will be an online quiz of 15 multi-choice questions. **Quizzes will always open on Thursdays and must be completed before Wednesday's midnight (11:59 pm).** Each quiz accounts for 8.3% of the final mark.

Thematic Module	Module quiz due date
1. Sound and Music	July. 10, 11:59 pm
2. Light and Colour	July. 17, 11:59 pm
3. Cell Phone	July. 24, 11:59 pm
4. Solar System and Beyond	July. 31, 11:59 pm
5. Medical Physics	Aug. 7, 11:59 pm
6. Recent Advances	Aug. 14, 11:59 pm

2. (30%) 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 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 Must pick one of the two topics	1. Sound and Music	The Lab report is **due on July 24,** 11:59 pm
	2. Light and Colour	
Essay Must pick one of the four topics	3. Cell Phone	The Essay is **due on Aug 14**, 11:59 pm
	4. Solar System and Beyond	
	5. Medical Physics	
	6. Recent Advances	

For the lab report, a write up template will be provided. The essay has to 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 Brightspace.

3. (20%) Final online quiz

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

COPYING, PLAGIARISM AND OTHER FORMS OF CHEATING

The attention of all students is drawn to section E.12 of the Academic Regulations of the University: https://carleton.ca/registrar/academic-integrity/

Such offences will normally result in a mark of zero on the cheated work. In addition, a report will be sent to the 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 is 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

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

Assistance for Students:
Academic and Career Development Services: https://carleton.ca/career/for-facultystaff/how-can-you-support-career-development/
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:

- 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.

Important Dates

Summer Sessions:

- **Early Summer:** May 6, 2024 to June 18, 2024
- **Late Summer**: July 2, 2024 to August 14, 2024
- **Full Summer:** May 6, 2024 to August 14, 2024

May 1	Last day for receipt of applications for undergraduate internal degree transfers to allow for registration for the summer term.
May 6	**Early** summer and **full** summer courses begin.
May 10	Last day for registration and course changes (including auditing) for **early** summer courses.
May 17	Last day for registration and course changes (including auditing) for **full** summer courses.
May 17 – 29	Fall/Winter and winter term deferred final examinations will be held.
May 20	Statutory holiday. University closed.
May 31	Last day to withdraw from full summer courses with a full fee adjustment.
June 1	Last day to request Formal Examination Accommodation for **early** summer examinations to the Paul Menton Centre for Students with Disabilities. Note that it may not be possible to fulfill accommodation requests received after the specified deadlines.
June 1	Last day for academic withdrawal from early summer courses.
June 11	Last day for summative tests or examinations, or formative tests or examinations totaling more than 15% of the final grade for **early** summer courses before the official examination period (see Examination Regulations in the Academic Regulations of the University section of the Undergraduate Calendar).
June 18	Last day of **early** summer classes (NOTE: Full summer classes resume July 2). Last day for academic withdrawal from **early** summer courses. Last day for handing in term assignments, subject to any earlier course deadline.
June 19 – 20	No classes or examinations take place.
June 21 – 27	**Early** summer final examinations and mid-term examinations in **full** summer courses may be held. Examinations are normally held all seven days of the week.
July 1	Statutory holiday. University closed.
July 2	**Late** summer courses begin. **Full** summer courses resume.

July 8	Last day for registration and course changes (including auditing) for **late** summer courses.
July 15	Last day to withdraw from late summer courses with a full fee adjustment.
July 19 – 21	**Early** summer term deferred final examinations to be held.
August 1	Last day to request Formal Examination Accommodation for August examinations to the Paul Mention Centre for Students with Disabilities. Note that it may not be possible to fulfill accommodation requests received after the specified deadlines.
August 1	Last day for academic withdrawal from full and late summer courses.
August 5	Civic holiday. University closed.
August 7	Last day for summative tests or examinations, or formative tests or examinations totaling more than 15% of the final grade for **late** summer and **full** summer courses before the official examination period (see Examination Regulations in the Academic Regulations of the University section of the Undergraduate Calendar).
August 14	Last day of **late** summer and **full** summer classes. Last day for handing in term assignments, subject to any earlier course deadline.
August 15 – 16	No classes or examinations take place.
August 17 – 23	Final examinations in **late** summer and **full** summer courses may be held. Examinations are normally held all seven days of the week.
August 23	All take-home examinations are due on this day, with the exception of those conforming to the Examinations regulations in the Academic Regulations of the University section of the Undergraduate Calendar/General Regulations of the Graduate Calendar.
September 20 – 22	**Late** summer and **full** summer term deferred final examinations will be held.