Introductory Electromagnetism and Wave Motion

PHYS 1004A/B/C

Winter 2021
Course Outline

1. Course description and pre-requisites

This calculus-based course is designed to provide an introduction to potential energy, work, electricity, magnetism, circuits, electromagnetic induction, and electromagnetic waves from a physics perspective for students in engineering programs. The associated laboratory and tutorial sessions are during alternate weeks starting in the first week of the term (January 11-15, 2021). Student evaluations will be based on labs, tutorial tests given during each tutorial session, and a final exam.

Pre-requisites: MATH 1004, ECOR 1101 or ECOR 1053 (the ECOR courses may be taken concurrently) or PHYS 1001 or PHYS 1003 or PHYS 1007 (a grade of at least B- is required for PHYS 1007) or permission of the Physics Department.

2. Instructors contact information and office hours

Razvan Gornea	PHYS 1004A lecturer	razvan.gornea@carleton.ca	Tuesdays & Thursdays 11:35 – 12:55
Andrew Robinson	PHYS 1004B lecturer	andrew.robinson@carleton	TBD
Emily Heath	PHYS 1004C lecturer and course coordinator	emily.heath@carleton.ca.ca	Wednesdays & Fridays 11:35 – 12:55
Benjamin Freestone	Lab coordinator	benjamin.freestone@carleton.ca	TBD
Maria Paula Rozo	Lab supervisor	prmartin@physics.carleton.ca	TBD
Tamara Rozina	Lab supervisor	tamara.rozina@carleton.ca	TBD
Igor Ivanovic	Lab supervisor	igor@physics.carleton.ca	TBD
Jesse Lock	Lab supervisor	JesseLock@cmail.carleton.ca	TBD

In accordance with University policy, all communication with instructors and TAs must be 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.

To help resolve issues related to any missing term work, students must save all of their email correspondence with instructors and TAs until the course grades are finalized.

3. Course textbook

'Fundamentals of Physics', Volumes 1&2 (Chaps 1-44), 11th Edition, Halliday, Resnick & Walker, John Wiley & Sons Canada Ltd. A custom version of the textbook, comprising only the chapters we will cover in the course is available at the University Bookstore at the University Centre.
(https://www.bkstr.com/carletonstore)

An older edition of the textbook (eg. 10th edition) can be used but make sure that it covers both volumes 1 & 2.

4. Course website

The course outline and other course information will be posted on cuLearn. We reserve the right to amend the course outline on cuLearn and will inform you if that version changes. In the event of any discrepancy between this document, and the version currently posted on the website, then the website version on cuLearn will be taken as the definitive version.

If you are unable to access cuLearn or need help with your computing account, please contact the ITS Service Desk at 613-520-3700 or email its.service.desk@carleton.ca

5. Course modality

This course is an online course where there is a mixture of synchronous meetings (tutorials and labs) and asynchronous activities (pre-recorded lecture modules). Students need to be prepared to meet online via web conferencing tools at scheduled days and times. The specific dates and activities are described further on in this course outline. The asynchronous activities are intended to provide flexibility to students. Students are expected to remain up to date with the deadlines and due dates provided by the instructor. This cours requires a reliable high-speed Internet access and a computer.

Web conferencing sessions in this course may be recorded and made available only to those within the class. Sessions may be recorded to enable access to students with internet connectivity problems, who are based in different time zone, and/or who have conflicting commitments. If students wish not to be recorded, they need to leave your camera and microphone turned off.

You will be notified at the start of the session when the recording will start.

Please note that course materials and recordings are protected by copyright. These are for your own educational use, but you are not permitted to publish to third party sites, such as social media sites and course materials sites.

6. Labs and Tutorials

The first tutorial will take place the week of January 11th, 2021. Labs start the week of January 18th, 2021. Labs and tutorials run in alternating weeks.

Information about the labs and tutorials can be found on the LAB cuLearn page (Crosslist PHYS1004LXX [144XX] Electromagnetism & Wave Motion (LAB) Winter 2021).

All the sessions will be held via a BigBlueButton (BBB) session available on the lab CuLearn page. The lab/tutorial timetable is shown in the table below (all timeslots are in the Eastern Time zone). Information on using BBB can be found at: https://carleton.ca/culearnsupport/students/bigbluebutton/

	Monday	Tuesday	Wednesday	Thursday	Friday
AM (8:30 – 11:30)		L5 A – M. P. Rozo B – J. Lock	L6 A – B. Freestone B – I. Ivanovic	L3 A – B. Freestone B – J. Lock	L7 A – B. Freestone B – I. Ivanovic
Noon (11:30 – 2:30)	L4 A – B. Freestone B – J. Lock				
PM (2:30 – 5:30)	L8 A – J. Lock B – T. Rozina	L1 C – M. P. Rozo D – B. Freestone	L2 A – B. Freestone B – I. Ivanovic	L2 C – B. Freestone D – I. Ivanovic	L1 A – M. P. Rozo B – T. Rozina

(a) Labs

There are 5 laboratory experiments to complete throughout the semester. Each lab class will begin with an introduction from your supervisor. Following the introduction, breakout rooms occupied by a TA and your supervisor will be formed for the remainder of the class. All laboratory assignments are composed of a write-up worksheet (in-class) and a cuLearn quiz (pre-lab). **You must complete the quiz before the lab class!**

Details of the in-class worksheets will be given during the introduction tutorial orientation session. All 5 lab assignments will be considered towards your final grade.

The breakdown for each lab experiment is as follows: **75% Worksheet, 25% Quiz**.

(b) Tutorials

The structure of the tutorial is as follows:

A set of tutorial problems will be posted on CuLearn at least a week before the tutorial session. Students should attempt to solve these problems in order to prepare for the tutorial. At the start of the tutorial session the TAs will demonstrate solving example problems and answering questions about the tutorial problem set. The last hour of the tutorial will be an open-book tutorial test consisting of multiple-choice and one long-answer problem. **Open book means that you can use your notes, textbook, the formula sheet and a scientific calculator**. **No other aids are permitted.**

The 4 highest test grades will be used to determine the final Tutorial Test score.

Students must normally attend the lab/tutorial only in the lab section to which they belong. To be able to attend a different section, students must obtain permission from

the lab coordinator (benjamin.freestone@carleton.ca). Such permission will usually be granted only for emergencies or medical reasons. So, if you cannot attend your own lab section one week due to e.g. medical reasons, let us know AS SOON AS POSSIBLE so that you can be rescheduled to a different section.

Lab and Tutorial schedule

Week of	Lab/Tutorial
January 11, 2021	Tutorial 0: Introduction, review of vectors and calculus
January 18, 2021	Lab 1: Electrostatics
January 25, 2021	Tutorial test 1: covers Modules 1 and 2
February 1, 2021	Lab 2: DC Circuits
February 8, 2021	Tutorial test 2: covers Modules 3 and 4
February 15, 2021	**Winter Break**
February 22, 2021	Lab 3: Oscilloscope
March 1, 2021	Tutorial test 3: covers Modules 5 and 6
March 8, 2021	Lab 4: Magnetic balance
March 15, 2021	Tutorial test 4: covers Modules 7 and 8
March 22, 2021	Lab 5: RC & RLC Circuits
March 29, 2021	No labs or tutorials
April 5, 2021	Tutorial test 5: covers Modules 9 and 10

7. Lectures

The lectures will be recorded to video and will be available online. The course will be divided into 12 modules, which roughly cover a three-hour traditional lecture. The pre-recorded lecture modules have been divided into a number of individual units, so that individual units are typically 10-15 minutes long. In addition to the pre-recorded lecture, each instructor will have synchronous office hours (via BigBlueButton) every week according to the schedule in Section 2 of this course outline. Below is a list of the topics that will be covered in each lecture module and corresponding textbook sections.

Module	Subject Group	Textbook Sections
1	Electrostatics	Chap 3: Vectors Chap 21: Coulomb's Law
2	Electric Field due to discrete charges	Chap 22: Electric Fields
3	Electric field of continuous charge distributions	Chap 22: Electric Fields
4	Gauss' Law	Chap 23: Gauss' Law
5	Work and Energy	Chap 7: Kinetic Energy and Work Chap 8: Potential Energy and Conservation of Energy Chap 24: Electric Potential
6	Electric Potential	Chap 24: Electric Potential
7	Capacitance	Chap 25: Capacitance
8	Magnetic Fields	Chap 28: Magnetic Fields Chap 29: Magnetic Fields due to Currents
9	Induction	Chap 30: Induction and Inductance
10	AC circuits	Chap 31: EM Oscillations and Alternating Current
11	Maxwell's Equations	Chap 32: Maxwell's Equations; Magnetism of Matter
12	EM Waves and oscillations	Chap 33: Electromagnetic Waves

8. Final Exam

There is no mid-term examination. We regard the five tutorial tests as a way of providing feedback and guidance on your performance. If you do not perform to your own satisfaction on a tutorial test, it is imperative to discuss this with your lecturer during office hours or by email. Do not leave this consultation until the end of the course. Effective intervention and assistance is best applied at the beginning of term.

The final examination will be scheduled during the regular December examination period at the end of the term. It is the responsibility of the student to be present during this period; in particular, holiday travel arrangements must not be made before the examination schedule is known.

The final exam may include questions related to material contained within the lab portion of the course.

9. Marking Scheme

Tutorials (best 4 out of 5)	40%
Labs (5)	35%
Final Exam	25%
Total	100%

10. Passing Condition

Students must obtain a minimum of 50% for the lab grade in order to pass the course. Students are expected to attend all labs and tutorials and complete all lab reports and tests.

11. University Policies

Grade Definition:
In accordance with the Carleton University Undergraduate Calendar Regulations, the letter grades assigned in this course will have the following percentage equivalents:

A+ = 90-100	B+ = 77-79	C+ = 67-69	D+ = 57-59
A = 85-89	B = 73-76	C = 63-66	D = 53-56
A- = 80-84	B- = 70-72	C- = 60-62	D- = 50-52

F = <50
WDN = Withdrawn from the course
ABS = Student absent from final exam
DEF = Deferred (See above)

Academic Regulations, Accommodations, Plagiarism, Etc.:
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 Accommodations for Students with Disabilities:
The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation.

If you are already registered with the PMC, contact your PMC coordinator to send your *Letter of Accommodation* at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (*if applicable*).

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.

For Religious Obligations:
Students requesting academic accommodations on the basis of religious obligation should make a formal, written request to their instructors for alternate dates and/or means of satisfying academic requirements. Such requests should be made during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist, but no later than two weeks before the compulsory event. Accommodation is to be worked out directly and on an individual basis between the student and the instructor(s) involved. Instructors will make accommodations in a way that avoids academic disadvantage to the student.
Students or instructors who have questions or want to confirm accommodation eligibility of a religious event or practice may refer to the Equity Services website for a list of holy days and Carleton's Academic Accommodation policies, or may contact an Equity Services Advisor in the Equity Services Department for assistance.

carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

For Pregnancy:
Pregnant students requiring academic accommodations are encouraged to contact an Equity Advisor in Equity Services to complete a letter of accommodation. The student must then make an appointment to discuss her needs with the instructor at least two weeks prior to the first academic event in which it is anticipated the accommodation will be required.

carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

Plagiarism:
Plagiarism is the passing off of someone else's work as your own and is a serious academic offence. For the details of what constitutes plagiarism, the potential penalties and the procedures refer to the section on Instructional Offences in the Undergraduate Calendar.

What are the Penalties for Plagiarism?
A student found to have plagiarized an assignment may be subject to one of several penalties including: expulsion; suspension from all studies at Carleton; suspension from full-time studies; and/or a reprimand; a refusal of permission to continue or to register in a specific degree program; academic probation; award of an FNS, Fail, or an ABS.

What are the Procedures?
All allegations of plagiarism are reported to the Dean of Faculty of Science. Documentation is prepared by instructors and/or departmental chairs.

The Dean writes to the student and the University Ombudsperson about the alleged plagiarism.

The Dean reviews the allegation. If it is not resolved at this level then it is referred to a tribunal appointed by the Senate.

Students are expected to familiarize themselves with and follow the Carleton University Student Academic Integrity Policy (see https://carleton.ca/registrar/academic-integrity/). The Policy is strictly enforced and is binding on all students. Plagiarism and cheating – presenting another's ideas, arguments, words or images as your own, using unauthorized material, misrepresentation, fabricating or misrepresenting research data, unauthorized co-operation or collaboration or completing work for another student – weaken the quality of the graduate degree. Academic dishonesty in any form will not be tolerated. Students who infringe the Policy may be subject to one of several penalties including: expulsion; suspension from all studies at Carleton; suspension from full-time studies; a refusal of permission to continue or to register in a specific degree program; academic probation; or a grade of Failure in the course.

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).
- Students must always retain a hard copy of all work that is submitted.
- 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.

Important Dates for 2020/2021 academic year:
https://carleton.ca/registrar/registration/dates-and-deadlines/