

**PHYS 1002 Foundations of Physics II**

<b>Lectures:</b>	Wednesday 10:00 - 11:30 Friday 10:00 - 11:30	} Big Blue Button
<b>Laboratories:</b>	Monday 14:30 - 17:30 (section A1) Tuesday 14:30 - 17:30 (section A3) Friday 14:30 - 17:30 (section A2)	} Online
<b>Lecturer:</b>	Prof. Sangeeta Murugkar E-mail: sangeeta.murugkar@carleton.ca Office Hours: Posted on cuLearn, or by appointment	
<b>Teaching Assistant:</b>	Bindiya Chana Office Hours: Posted on cuLearn	
<b>Laboratory Supervisor:</b>	Dr. Igor Ivanovic E-mail: igor@physics.carleton.ca Office Hours: Posted on cuLearn, or by appointment	
<b>Teaching Assistants:</b>	Support, review material and assistance will be provided during the tutorial sessions and discussion forums on CuLearn and TA office hours.	
<b>Course Modality:</b>	Synchronous Course This course is a real-time, online course where the instructor and students meet via web conferencing tools, at scheduled days and times. Instructors and students share information, ideas and learning experiences in a virtual course environment. Participation in synchronous courses requires students to have reliable, high-speed internet access, a computer (ideally with a webcam), and a headset with a microphone.	
<b>Calendar Description:</b>	An introduction to electricity, magnetism, electromagnetic fields, and wave motion. This is a specialist course for students intending to take further courses in physics. Precludes additional credit for PHYS 1004 and PHYS 1008.	
<b>Prerequisites:</b>	You must have successfully completed: (i). MATH 1004 Calculus for Engineering or Physics or MATH 1002 Calculus & Introductory Analysis I (may be taken concurrently) <u>plus</u> (ii). PHYS 1001 Foundations of Physics I or PHYS 1003 Introductory Mechanics and Thermodynamics or PHYS 1007 Elementary University Physics I (with grade of at least B-).  If you do not have <i>both</i> of these requirements you <i>must</i> check with Prof. Murugkar and obtain permission of the Physics Department to take this course. This could be the case, for example, if you completed the equivalent of MATH 1004 or PHYS 1001 at another university.	
<b>Text:</b>	Physics for Scientists and Engineers with Modern Physics, 10th Edition Raymond A. Serway and John W. Jewett ISBN-10: 1-337-55329-8 or ISBN-13: 978-1-337-55329-2  If you bought the multi-volume text for PHYS 1001/1002 in the fall term then you already have the material for PHYS 1002 in the second volume (Part 4). The textbook contains all the volumes (Part 1, 2, 3, 4 & 5). The content that will be covered in PHYS 1002 is "Electricity and Magnetism". A small number of textbooks have been ordered by the Bookstore for students who do not have the multi-volume text already.	
<b>Lab documents:</b>	The laboratory manual and the documents for each experiment are on the Lab website on cuLearn.	
<b>Course Schedule:</b>		

		Lectures		Labs & Tutorials & HW	
		Wednesday	Friday	Mon (A3), Tues (A2), Fri (A1)	
January	13	Course intro Math and Physics toolbox Chapter 22.1-22.3: Electric Charge and Coulomb's Law	15	Chapter 22.3-22.4: Applications of Coulomb's law- Force due to discrete charges	Introductory Lab Post HW #1 (due Jan 22)
	20	Chapter 22.5-22.6: Electric field lines Motion of a particle in the E-field	22	Chapter 23.1: Electric Field due to a Continuous charge distribution	Tutorial # 1 Post HW #2 (due Jan 29)
	27	Chapter 23.2, 23.3: Electric Flux and Gauss's Law	29	Chapter 23.4: Application of Gauss's Law	Lab 1: Error Analysis Post HW #3 (due Feb 5)
February	3	Chapter 24.1-24.3: -Electric Potential -Potential difference -Electric Potential Energy	5	Chapter 24.4-24.6: -Field from the electric potential -Electric Potential due to Continuous charge distribution -Conductors-electrostatic equilibrium	Tutorial # 2 Post HW #4 (due Feb 12)
	10	Chapter 25: 25.1-25.2: Capacitance 25.3: Parallel, series capacitors 25.4: Energy stored 25.5: Dielectrics	12	Review Problems Midterm Preparation	Tutorial # 3 Post HW #5 (due Feb 26)
	<b>Week of February 15-19, 2021 - Winter Break: no lectures or laboratories.</b>				
	24	<i>Mid-term Test</i>	26	Chapter 26: Current and Resistance	Lab 2: Coulomb's Law
March	3	Chapter 27.1-27.3: Direct-Current Circuits. -Electromotive force -Resistors in series and parallel -Kirchhoff's Rules	5	Chapter 27.4: RC circuits	Lab 3: Ohm's Law Post HW #6 (due March 12)
	10	Chapter 28: Magnetic Fields 28.1-28.4: Magnetic forces on moving charges 28.5: Torque on a current loop in a magnetic field	12	28.6: Hall Effect Chapter 29.1: Biot-Savart Law 29.2: Mag Force between conductors 29.3: Ampere's Law	Tutorial # 4 Post HW #7 (due March 19)
	17	29.4: Mag field of a Solenoid 29.5: Gauss' Law in magnetism 29.6: Magnetism in Matter	19	Chapter 30.1: Faraday's Law 30.2-30.4: Motional emf, Lenz law 30.5 Applications	Lab 4: RC circuits and Rectifier Post HW #8 (due March 26)
	24	Chapter 31: Inductance 31.2: RL circuits	26	31.3, 31.4: Energy in magnetic field, mutual inductance 31.5, 31.6: LC oscillations RLC circuits	Tutorial # 5 Post HW #9 (due April 2)
	31	Chapter 32.1-32.4: Alternating Current Circuits (single element in AC circuit)	2	<b>Holiday (Good Friday)</b>	Lab 5: RLC circuits Post HW #10 (due April 9)
April	7	32.5-32.7: RLC series circuit, Power in AC circuits, Resonance in RLC circuit 32.8: Transformer	9	Chapter 33: Displacement current and Maxwell's Equations	Review Tutorial
	14	Final Review	16		
<b>Exam period: April 16-27, 2021</b>					

**Learning Outcomes:**

Upon completion of this course,

1. At an introductory level, students will be able to recall and utilize foundational knowledge in calculus-based electricity and magnetism, including electric field, electric potential, DC and RC circuits, motional EMF, inductance and circuit oscillation.
2. Students will have developed basic problem solving skills in calculus-based electricity and magnetism, and be able to use appropriately the tools of physics, calculus, and algebra. In the lab, students will be able to generate justifiable uncertainty estimates for experimental results.
3. Students will have developed basic written communication skills for reporting lab work and their analysis of solved problems.

**Grading Scheme:**

Lab Experiments	25 %	{	Homework assignments (10)	20 %
Theory	75 %		Tutorial evaluations (5)	10 %
	100 %		Mid-term test	15 %
			Final exam	30 %

The homework assignments are marked out of 50.  
 In the case of a delay to hand-in an assignment due to illness, a medical note is required.  
 Penalties for late homework assignments:

one day late	5 marks deducted (10% of 50)
two days late	10 marks deducted
three days late	15 marks deducted
over three days late	no marks given

**Laboratories:**

The labs are run independently of the lectures and are under the supervision of Dr. Ivanovic. There are four (4) hands-on experiments as shown in the schedule. In order to pass the lab, you must perform all experiments and submit all reports. In the case of a delay or a missed lab due to illness, a medical note is required.

Experiment report types and weights:	Error Analysis	20 %
	Coulomb's Law	20 %
	Ohm's Law	20 %
	RC circuits and Rectifier	20 %
	RLC circuits	20 %
		100 %

**Tutorials** - There are one introductory tutorial, five regular tutorials and one review tutorial at end of term. The first 30-40 minutes, a teaching assistant will solve key problems on the board – it will serve as a review of the material seen in class. The next 30-40 minutes will be for student to work on problems – students will have the opportunity to ask questions in an informal setting. Discussion in groups is encouraged. The tutorial concludes with a 60-minute quiz evaluation which you do on your own and upload. The evaluation will consist of a new problem. There is no evaluation in the introductory and review tutorials. Prepare for the tutorials in advance by reviewing your notes and attempting problems in the text. A list of suggested problems will be posted.

**TUTORIAL EVALUATION MAKEUPS:** if you miss a tutorial and its evaluation, immediately contact Dr. Ivanovic and explain why. If the reason is illness, a medical note is required. Students with valid reasons will be given written permission to write a makeup at the end of term.

**Homework Assignments** - There will be weekly assignments that are due on Friday by 10:00. In the case of a delay due to illness, a medical note is required. To submit your homework you will need to take pictures of your solutions and **send it as one PDF**. Make sure your document is legible before you send it; use of a scanning app is highly recommended. In the work you submit, your method of solution and clarity of explanation are as important as your final result. You are encouraged to discuss the problems with your classmates - but complete the analysis yourself, as the work you turn in must be your own.

**Mid-Term Test** - There will be an 80-minute mid-term test held during the lecture time on Wednesday, February 24, 2021. It will cover material discussed in the course up to the end of Tutorial # 2. You will need a calculator and a single-sided hand-written original (not word-processed, and not photocopied or scanned/printed) aid sheet, 8.5" x 11" for the test. The aid sheet will be submitted along with the midterm exam solutions as a single PDF file.

The **Final Examination**, in April, will cover the entire course. You will need a calculator and a two-sided hand-written original (not word-processed, and not photocopied or scanned/printed) aid sheet, 8.5" x 11" for the exam. The aid sheet will be submitted along with the Final exam solutions as a single PDF file.

If you miss the mid-term test or final exam, a valid reason is required with appropriate justification documentation.

**Deferred Final Exam** - This will replace only the Final Exam portion of the marks. Deferred Exams for the 2020 Winter term will be during the Summer term. Students with inadequate term work on the theory part of the course will not be permitted a Deferred Exam. Term work will be considered inadequate if less than 10 out of the possible 45 marks on Theory component of the course have been earned during the term.

### 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			
FND = Failed			

### 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).

## Useful information

**Website** cuLearn will be used as the course website.

**Academic Accommodation:** *In case of a need for academic accommodation for religious obligation, disability, or other circumstance please talk to Prof. Murugkar as soon as practical and contact the appropriate office as given at the end of this document.*

**Academic policy:** 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/>

### 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 policies on academic integrity <http://carleton.ca/senate/wp-content/uploads/Academic-Integrity-Policy1.pdf>

### 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's office. 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.

### Faculty of Science penalties for violation of the Carleton policies on academic integrity (1st year students)

- First offence: No credit for assessment(s) in question, or a final grade reduction of one full letter grade (e.g., A- becomes B-),

whichever is a greater reduction.

- Second offence: A grade of F in the course and a one-term suspension from studies.
- Third offence: Expulsion from the University

**Note: stronger penalties can be imposed at the discretion of the Associate Dean.**

**Academic Accommodations:** 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:

<https://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](mailto: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*).

See: <https://carleton.ca/pmc/>

**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.

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