Toronto Metropolitan University

Course Outline (W2023)

PCS125: Physics: Waves and Fields

Instructor(s)	Dr. Yuan Xu [Coordinator] Office: KHS331-D Phone: TBA Email: yxu@torontomu.ca Office Hours: See D2L Dr. Jian Yuan Office: See D2L Phone: See D2L Email: jyuan@torontomu.ca Office Hours: See D2L Dr. Carina Rebello Office: See D2L Phone: See D2L Email: rebellocm@torontomu.ca Office Hours: See D2L Dr. Sean P. Cornelius Office: See D2L Phone: See D2L Email: cornelius@torontomu.ca Office Hours: See D2L Dr. Razieh Enjilela Office: See D2L Phone: See D2L Email: razieh.enjilela@ryerson.ca Office Hours: See D2L
Calendar Description	Simple harmonic motion; motion of mechanical waves, wave speed; sound, Doppler effect, interference, standing waves, beats and resonance; gravitational fields and potential energy; electric fields and potential energy; electric potential; magnetic fields.
Prerequisites	None
Antirequisites	None
Corerequisites	None
Compulsory Text(s):	1. Physics for Scientists and Engineers with Modern Physics, Serway, R.A., Jewett, J.W., Jr., 10th edition, Thomson/Brooks/Cole, 2019.

Reference Text(s):	None
Learning Objectives (Indicators)	At the end of this course, the successful student will be able to: 1. A successful student will be able to understand the physical meaning of physics formulas and the physics concepts. He/she should be able to develop an intuitive understanding of the physical concepts. He/she should know the meaning of the formulas in the course and be able to relate language terminology to equations and vice versa. (**1c**) 2. A successful student will know which equations are fundamental and which ones have limited applicability. A successful student will be able to fill in missing or disguised information in a problem in order to solve it A successful student will have skill at algebra and be able to solve complex problems involving the mathematics of systems of equations, trigonometric functions, etc.. (**2b**) 3. A successful student will be able to identify the appropriate target variable and identify the correct physics needed to solve a problem. The student should be able to select the best equation to solve the problem. A successful student will perform checks at the end of their problem including checking units and whether their answer makes physical sense (**2a**) 4. A successful student will be able to correctly identify the objective(s) of a laboratory experiment. A successful student will be able to understand the difference between a theoretically calculated quantity and a measured one and be able to make quantitative comparisons between these in laboratory. A successful student will report data honestly and completely including estimates of measurement uncertainty (**3a**) 5. When performing a calculation on data which was directly taken, a successful student will be able to take the uncertainty in the measurements and calculate the uncertainty in the final result. A successful student will know how to determine desired parameters by plotting data in an efficient way, and fitting the data with a curve predicted by theory. A successful student will be able to determine when data is consistent with theory by comparing the two results with uncertainty. (**3b**) **NOTE:***Numbers in parentheses refer to the graduate attributes required by the Canadian Engineering Accreditation Board (CEAB).*
Course Organization	3.0 hours of lecture per week for 13 weeks 1.0 hours of lab per week for 12 weeks 1.0 hours of tutorial per week for 12 weeks
Teaching Assistants	TBA
Course Evaluation	

Theory	
WebAssign homework	5 %
Tutorial	8 %
Midterm Test (March 3, 6:30-8:30 pm)	25 %
Final Exam	38 %
Class Response	4 %
Laboratory	
Lab	20 %
TOTAL:	100 %

Examinations	Midterm exam (120 minutes) Final Exam (3 hours)

Other Evaluation Information	To pass the course, a minimum to be met: both 50% of theory (class reponse + web assign + tutorials+ midterm + exam) and 50% of labs.
Teaching Methods	All the course components will be offered in person.
Other Information	1. Students must attend only lectures of their assigned instructors. Registration for attending lectures may be required. 2. Students are required to obtain and maintain a Ryerson e-mail account for timely communications between the instructor and the students. Emails from students will be considered only if PCS125 appears in the subject line and the email is sent from the student's @ryerson.ca email account. 3. The following two models of calculators are approved during exams: Casio fx-991 and Sharp EL-546. If you have a different model, it must be a non-graphing, non-programmable calculator. If you are unsure, ask your instructor at least 2 weeks prior to the midterm and/or final exam. 4. All the required course-specific written reports will be assessed not only on their technical/academic merit, but also on the communication skills exhibited through these reports. 5. At the end of the semester, we will compare your final exam mark with your WebAssign mark. We will use the higher one to replace the WebAssign mark. Your WebAssign mark will automatically be your final exam mark if you choose not to purchase or do WebAssign. 6. Assignments and other deadline-bound course assessment components handed in past the due date will receive a mark of ZERO. Marking information will be made available when the course assessment components are announced. 7. The grade of the midterm exam will be returned to students before the deadline to drop an undergraduate course in good Academic Standing. 8. Medical or Compassionate documents for missing an exam or a lab must be submitted within 3 working days of the missed work. Relevant documentation should be submitted to your own program office (in most cases, this is the First Year Engineering Office). Even if documentation has been submitted, it is the student's responsibility to also notify the instructor via email about the missed work as soon as possible to request a make-up. 9. Lab instructions and guidelines will be provided via D2L. Check the Labs section there for more information. Students should pay particular attention to instructions regarding lab attendance, absences, and submission deadlines. A pre-lab quiz based on questions from each lab manual will be due at the midnight (12 AM) preceding your lab session. Policy on Missed Labs: You are required to complete all five experiments. If you are (or anticipate being) absent from your regularly scheduled lab session due to extenuating circumstances (See Academic Consideration – Policy 167), complete an Academic Consideration Request (ACR) within three business days of the missed session, and provide supporting documentation. Additionally, immediately contact your professor as well as the lab staff (physics-labstaff@ryerson.ca) to begin making arrangements for a makeup, please include your course and section number in the subject line of your emails. Lab reports for missed labs are only accepted if the professor has accepted the consideration request. Clearly indicate your Course and Section Number in all email communication. 10. MIDTERM: Should a student miss the midterm exam, with appropriate documentation, a make-up assessment can be scheduled. Alternatively, the weight of the missed work is placed on the final exam. This may not cause that exam or assessment to be worth more than 65% of the student's final grade. If a student misses a scheduled make-up test or exam, the grade may be distributed to the final exam, even if that makes the final exam worth more than 65% of the final grade in the course. Make-up assessments cover the same material as the original assessment but need not be of an identical format. 11. FINAL: Students who miss the final exam for a verifiable reason, and who cannot be given a make-up exam prior to the submission of final course grades, must contact the instructor and

	discuss the possibility of being given a grade of INC (as outlined in Senate Policy #46). If appropriate documentation is submitted, a make-up exam (normally within 2 weeks of the beginning of the next semester) that carries the same weight and measures the same knowledge, will be scheduled. 12. Class response. We will use a class response system (i.e. iClicker or PollEverywhere, your instructor will decide which one will be used in your class). At the end of the semester, we will compare your final exam mark with your Class response mark. We will use the higher one to replace the Class response mark. Your Class response mark will automatically be your final exam mark if you choose not to purchase or use a class response system.

Course Content

Week	Hours	Chapters / Section	Topic, description
1	3	1.1-1.6, 15.1-15.2	Course Introduction mathematical description of the simple harmonic oscillator.
2	3	15.3-15.7	Energy of the simple harmonic oscillator, circular motion, pendulum, damped oscillations and resonance.
3	3	16.1-16.4	Introduction to waves, traveling waves, waves on a string, energy in waves.
4	3	16.6-16.9	Sound waves, sound wave intensity and energy, Doppler Effect.
5	3	17.1-17.6, 17.7	Mathematics of wave addition, Standing waves on a string, more on wave interference, beats.
6	3	13.1-13.3, 13.5,13.6, 22.1	Newton's law of gravitation. Gravitational potential energy and orbits. Electric charge
7	0		Reading week.
8	3	22.1 - 22.2, 22.4 - 22.5 , 22.6, 22.3	Electric field. Review for midterm. Midterm exam on March 3, Friday evening.

9	3	23.2. 23.3, 23.4, 24.1-24.2	Gauss' Law, electric field inside of conductors. Electric potential, electric potential energy.
10	3	24.3, 24.4, 24.6	Potential energy for point charges. Relationship between potential/field, conductors in electrostatic equilibrium.
11	3	26.1, 26.2, 26.6, 28.1	Electric current, resistance, power. Magnetic filed and forces
12	3	28.2-28.4, 30.2	magnetic field motion of charged particle in magnetic field. Magnetic field force on a current carrying wire.
13	3	28.6, 29.1	Hall effect, Biot-Savart Law
14	3	29.2	Attraction / Repulsion of current carrying conductors. Catch-up and exam review

Laboratory(L)/Tutorials(T)/Activity(A) Schedule

Week	L/T/A	Description
2-3	1	Lab 1: Simple Harmonic Motion
4-5	2	Lab 2: Standing Waves on a String (subject to change)
7-8	3	Lab 3: Sound Waves and Beats (subject to change)
9-10	4	Lab 4: Electric Potential
11-12	5	Lab 5: Charge-to-Mass Ratio of the Electron

Policies & Important Information:

Students are reminded that they are required to adhere to all relevant university policies found in their online course shell in D2L and/or on the Senate website

1. In accordance with the Policy on TMU Student E-mail Accounts (Policy 157), Toronto Metropolitan University (TMU) **requires** that any electronic communication by students to TMU faculty or staff be sent from their official university email account;
2. Any changes in the course outline, test dates, marking or evaluation will be discussed in class prior to being implemented;
3. Assignments, projects, reports and other deadline-bound course assessment components handed in past the due date will receive a mark of ZERO, unless otherwise stated. Marking information will be made available at the time when such course assessment components are announced.
4. Familiarize yourself with the tools you will need to use for remote learning. The Continuity of Learning Guide for students includes guides to completing quizzes or exams in D2L or Respondus, using D2L Brightspace, joining online meetings or lectures, and collaborating with the Google Suite.
5. The University has issued a minimum technology requirement for remote learning. Details can be found at: https://torontomu.ca/covid-19/students/minimum-technology-requirements-remote-learning. Please ensure you meet the minimum technology requirements as specified in the above link.
6. Toronto Metropolitan University COVID-19 Information and Updates (available https://www.torontomu.ca/covid-19/students) for Students summarizes the variety of resources available to students during the pandemic.
7. Refer to our **Departmental FAQ** page for information on common questions and issues at the following link: https://www.ecb.torontomu.ca/guides/Student.Academic.FAQ.html.

Missed Classes and/or Evaluations

When possible, students are required to inform their instructors of any situation which arises during the semester which may have an adverse effect upon their academic performance, and must request any consideration and accommodation according to the relevant policies as far in advance as possible. Failure to do so may jeopardize any academic appeals.

1. **Academic Consideration Requests for missed work** (e.g. missing tests, labs, etc) - According to Senate Policy 134, Section 1.2.3, if you miss any exams, quizzes, tests, labs, and/or assignments for health or compassionate reasons you need to inform your instructor(s) (via email whenever possible) in advance when you will be missing an exam, test or assignment deadline. When circumstances do not permit this, you must inform the instructor(s) as soon as reasonably possible". *In the case of illness, a Toronto Metropolitan Student Health Certificate, or a letter on letterhead from an appropriate regulated health professional with the student declaration portion of the Student Health Certificate attached. For reasons other than illness, proper documentation is also required (e.g. death certificate, police report, TTC report).* ***ALL supporting documentation for illness or compassionate grounds MUST be submitted within three (3) working days of the missed work.***" **NOTE: You are required to submit all of your pertinent documentation through the University's online Academic Consideration Request system at the following link:** prod.apps.ccs.torontomu.ca/senateapps.
2. ***Religious, Aboriginal and Spiritual observance*** - If a student needs accommodation because of religious, Aboriginal or spiritual observance, they must submit a Request for Accommodation of Student Religious, Aboriginal and Spiritual Observance AND an Academic Consideration Request form within the first 2 weeks of the class or, for a final examination, within 2 weeks of the posting of the examination schedule. If the requested absence occurs within the first 2 weeks of classes, or the dates are not known well in advance as they are linked to other conditions, these forms should be submitted with as much lead time as possible in advance of the absence. Both documents are available at www.torontomu.ca/senate/forms/relobservforminstr.pdf. **If you are a full-time or part-time degree student, then you submit the forms to your own program department or school;**
3. ***Academic Accommodation Support*** - Before the first graded work is due, students registered with the Academic Accommodation Support office (AAS - prod.apps.ccs.torontomu.ca/senateapps) should provide their instructors with an Academic Accommodation letter that describes their academic accommodation plan.

Virtual Proctoring Information (if used in this course)

Online exam(s) within this course may use a virtual proctoring system. Please note that your completion of any such virtually proctored exam may be recorded via the virtual platform and subsequently reviewed by your instructor. The virtual proctoring system provides recording of flags where possible indications of suspicious behaviour are identified only. Recordings will be held for a limited period of time in order to ensure academic integrity is maintained and then will be deleted.

Access to a computer that can support remote recording is your responsibility as a student. The computer should have the latest operating system, at a minimum Windows (10, 8, 7) or Mac (OS X 10.10 or higher) and web browser Google Chrome or Mozilla Firefox. You will need to ensure that you can complete the exam using a reliable computer with a webcam and microphone available, as well as a typical high-speed internet connection. Please note that you will be required to show your Toronto Metropolitan University OneCard prior to beginning to write the exam. In cases where you do not have a Toronto Metropolitan University OneCard, government issued ID is permitted.

Information will be provided prior to the exam date by your instructor who may provide an opportunity to test your set-up or provide additional information about online proctoring. Since videos of you and your environment will be recorded while writing the exam, please consider preparing the background (room / walls) so that personal details are not visible, or move to a room that you are comfortable showing on camera.

Academic Integrity

Toronto Metropolitan University's Policy 60 (the Academic Integrity policy) applies to all students at the University. Forms of academic misconduct include plagiarism, cheating, supplying false information to the University, and other acts. The most common form of academic misconduct is plagiarism - a serious academic offence, with potentially severe penalties and other consequences. It is expected, therefore, that all examinations and work submitted for evaluation and course credit will be the product of each student's individual effort (or an authorized group of students). Submitting the same work for credit to more than one course, without instructor approval, can also be considered a form of plagiarism.

Suspicions of academic misconduct may be referred to the Academic Integrity Office (AIO). Students who are found to have committed academic misconduct will have a Disciplinary Notation (DN) placed on their academic record (not on their transcript) and will normally be assigned one or more of the following penalties:

1. A grade reduction for the work, ranging up to an including a zero on the work (minimum penalty for graduate work is a zero on the work);
2. A grade reduction in the course greater than a zero on the work. (Note that this penalty can only be applied to course components worth 10% or less, and any additional penalty cannot exceed 10% of the final course grade. Students must be given prior notice that such a penalty will be assigned (e.g. in the course outline or on the assignment handout);
3. An F in the course;
4. More serious penalties up to and including expulsion from the University.

The unauthorized use of intellectual property of others, including your professor, for distribution, sale, or profit is expressly prohibited, in accordance with Policy 60 (Sections 2.8 and 2.10). Intellectual property includes, but is not limited to:

1. Slides
2. Lecture notes
3. Presentation materials used in and outside of class
4. Lab manuals
5. Course packs
6. Exams

For more detailed information on these issues, please refer to the Academic Integrity policy(https://www.torontomu.ca/senate/policies/pol60.pdf) and to the Academic Integrity Office website (https://www.torontomu.ca/academicintegrity).

Academic Accommodation Support

Toronto Metropolitan University acknowledges that students have diverse learning styles and a variety of academic needs. If you have a diagnosed disability that impacts your academic experience, connect with Academic Accommodation Support (AAS). Visit the AAS website or contact aasadmin@torontomu.ca for more information.

Note: All communication with AAS is voluntary and confidential, and will not appear on your transcript.

Important Resources Available at Toronto Metropolitan University

1. The Library provides research workshops and individual assistance. If the University is open, there is a Research Help desk on the second floor of the library, or students can use the Library's virtual research help service at https://library.torontomu.ca/ask to speak with a librarian.

2. Student Life and Learning Support offers group-based and individual help with writing, math, study skills, and transition support, as well as resources and checklists to support students as online learners.

3. You can submit an Academic Consideration Request when an extenuating circumstance has occurred that has significantly impacted your ability to fulfill an academic requirement. You may always visit the Senate website and select the blue radial button on the top right hand side entitled: Academic Consideration Request (ACR) to submit this request).

   Please note that the Provost/Vice President Academic and Deans approved a COVID-19 statement for Fall 2022 related to academic consideration. This statement will be built into the Online Academic Consideration System and will also be on the Senate website (www.torontomu.ca/senate) in time for the Fall term:

   Policy 167: Academic Consideration for Fall 2022 due to COVID-19: Students who miss an assessment due to cold or flu-like symptoms, or due to self-isolation, are required to provide a health certificate. All absences must follow Senate Policy 167: Academic Consideration.

   Also NOTE: Policy 167: Academic Consideration does allow for a once per term academic consideration request without supporting documentation if the absence is less than 3 days in duration and is **not for a final exam/final assessment**. If the absence is more than 3 days in duration and/or is for a final exam/final assessment, documentation is required. For more information please see Senate Policy 167: Academic Consideration.

4. TMU COVID-19 Information and Updates for Students summarizes the variety of resources available to students during the pandemic.

5. TMU COVID-19 Vaccination Policy.

6. If taking a remote course, familiarize yourself with the tools you will need to use for remote learning. The Remote Learning guide for students includes guides to completing quizzes or exams in D2L Brightspace, with or without Respondus LockDown Browser and Monitor, using D2L Brightspace, joining online meetings or lectures, and collaborating with the Google Suite.

7. Information on Copyright for students.

8. At Toronto Metropolitan University (TMU), we recognize that things can come up throughout the term that may interfere with a student's ability to succeed in their coursework. These circumstances are outside of one's control and can have a serious impact on physical and mental well-being. Seeking help can be a challenge, especially in those times of crisis.

   If you are experiencing a mental health crisis, please call 911 and go to the nearest hospital emergency room. You can also access these outside resources at anytime:
   - **Distress Line:** 24/7 line for if you are in crisis, feeling suicidal or in need of emotional support (phone: 416-408-4357)
   - **Good2Talk:** 24/7 hour line for postsecondary students (phone: 1-866-925-5454)
   - **Keep.meSAFE:** 24/7 access to confidential support through counsellors via My SSP app or 1-844-451-9700

   If non-crisis support is needed, you can access these campus resources:

   - Centre for Student Development and Counselling: 416-979-5195 or email csdc@torontomu.ca
   - Consent Comes First - Office of Sexual Violence Support and Education: 416-919-5000 ext: 553596 or email osvse@torontomu.ca

   We encourage all Toronto Metropolitan University community members to access available resources to ensure support is reachable. You can find more resources available through the Toronto Metropolitan University Mental Health and Wellbeing website.