UNIVERSITY OF CALGARY
FACULTY OF SCIENCE

Department of Physics & Astronomy
Science B 605
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COURSE OUTLINE

1. **Course:** PHYS 229, Modern Physics - Winter 2021

   Lecture 01: MWF 10:00 - 10:50 - Online

Instructor	Email	Phone	Office	Hours
Dr Timothy Friesen	timothy.friesen@ucalgary.ca	403 220-6123	SB 513	W 13:00 - 13:55

Online Delivery Details:

This course is being offered online in real-time via scheduled meeting times, you are required to be online at the same time.

To help ensure Zoom sessions are private, do not share the Zoom link or password with others, or on any social media platforms. Zoom links and passwords are only intended for students registered in the course. Zoom recordings and materials presented in Zoom, including any teaching materials, must not be shared, distributed or published without the instructor's permission.

This course has a registrar scheduled, synchronous final exam. The writing time is 2 hours + 50% buffer time.

PHYS 229 will be delivered as a synchronous (live) lecture course. During each scheduled lecture a zoom room will be set-up (accessible through D2L) for the lecture. The lecture will be recorded and uploaded to D2L following each class.

Office hours will also be conducted online via Zoom.

The online laboratory component will consist three online labs plus a final research lab report. The online labs will be conducted via Zoom synchronously during your scheduled lab sections. These online lab sections will also be used for a Modern Physics presentation session near the end of the semester.

In place of a midterm there will be three synchronous quizzes, each written during scheduled lecture time. There will be a synchronously written scheduled final (date and time TBA).

Course Site:

D2L: PHYS 229 L01-(Winter 2021)-Modern Physics

Please use Piazza (linked from D2L) for all questions about course content or logistics.

For personal issues, please contact your instructor via email. Students must use their U of C account for contacting their instructor.

Note: Students must use their U of C account for all course correspondence.

2. **Requisites:**

   See section 3.5.C in the Faculty of Science section of the online Calendar.

   Prerequisite(s):
   3 units from Physics 211, 221 or 227; and 3 units from Mathematics 249, 265 or 275. Also known as: (formerly Physics 325)

3. **Grading:**

   The University policy on grading and related matters is described in F.1 and F.2 of the online University Calendar.

   In determining the overall grade in the course the following weights will be used:

Component(s)	Weighting %
Assignments (Best 7 of 8)	20
Quizzes (3)	25
Online Labs	9#
Research Lab Report*	16#
Group Presentation	10
Final Examination	20

* This component replaces the originally planned in-person labs. See below for more details.

If a student's Online Lab mark is higher than their research lab report then 3% of the weight will be shifted from the report to the online labs (ie. Online labs will be weighted at 12% and the Research lab report will be weighted at 13%)

Assignments

There will be eight assignments throughout the term consisting of one or two problems for submission. These assigned questions will be part of a larger problem-solving set distributed a week before the deadline and worked on together in the Problem-solving Lectures. Your best 7 out of 8 assignments will form the Assignment component of your grade. All assignments must be submitted via D2L before 10 am on the dates below.

Due dates

Assignment 1: Jan. 18th

Assignment 2: Jan. 25th

Assignment 3: Feb. 8th

Assignment 4: Feb. 15th

Assignment 5: Mar. 8th

Assignment 6: Mar. 15th

Assignment 7: Mar. 29th

Assignment 8: Apr. 12th

Quizzes

There will be three synchronous quizzes that will be each held during scheduled lecture time. These will be individual open-book quizzes designed to take 33 minutes to complete. You will be given 50% more time to account for potential technical difficulties. The total time allotted for each quiz is therefore 50 minutes.

Quiz 1 - Friday Jan. 29th, 10:00 - 10:50

Quiz 2 - Friday Feb. 26th, 10:00 - 10:50

Quiz 3 - Friday Mar. 19th, 10:00 - 10:50

Laboratory

(Modified Feb. 2021)

Due to COVID19 we are unable to offer the regular in-person labs. The nominal lab portion of the course will be replaced with three online labs during the semester plus a final research lab report. Both of these components will be completed online.

A detailed description of the laboratory portions can be found below. The laboratory experiments are completed in groups and your final grade will include a peer evaluation component form your lab group. Your TA will check that all group members are present and active during the lab. Students who are not online or are not responsive to their group or the TA will be given zero for the lab.

The research lab report can be completed during the semester or following the semester with the absolute deadline being Friday May 28th at 11:59 pm.

Group presentation

You and your lab group will select either one laboratory experiment or a modern physics reading project to

present during an virtual **Symposium on Modern Physics** that will be held during the week of March 29th. The presentations will be held on Zoom during your regularly scheduled lab sections. The sessions will be open to the full Department of Physics and Astronomy. Laboratory TAs, the course instructor, and other volunteers will evaluate your presentation and your responses to questions. Strategies for effective scientific presentations as well as the criteria for grading will be discussed in the lectures. Your group presentation grade will include a peer evaluation component.

Final exam

This course will have a registrar scheduled synchronous final exam.

Each piece of work (reports, assignments, quizzes, midterm exam(s) or final examination) submitted by the student will be assigned a grade. The student's grade for each component listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade.

The conversion between a percentage grade and letter grade is as follows.

	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
Minimum % Required	95 %	90 %	85 %	80%	75%	70 %	65 %	60%	55%	50 %	45 %

This course will have a final exam that will be scheduled by the Registrar. The Final Examination Schedule will be published by the Registrar's Office approximately one month after the start of the term. The final exam for this course will be designed to be completed within 2 hours.

The final exam will be administered using an on-line platform. Per section G.5 of the online Academic Calendar, timed final exams administered using an on-line platform, such as D2L, will be available on the platform. Due to the scheduling of the final exams, the additional time will be added to **the end** of the registrar scheduled **synchronous** exam to support students. This way, your exam schedule accurately reflects the **start time** of the exam for any **synchronous** exams. E.g. If a **synchronous** exam is designed for 2 hours and the final exam is scheduled from 9-11am in your student centre, the additional time will be added to the **end** time of the **synchronous** exam. This means that if the exam has a 1 hour buffer time, a synchronous exam would start at 9 am and finish at 12pm. – **updated April 6, 2021**

4. **Missed Components Of Term Work:**

The university has suspended the requirement for students to provide evidence for absences. Please do not attend medical clinics for medical notes or Commissioners for Oaths for statutory declarations.

In the event that a student legitimately fails to submit any online assessment on time (e.g. due to illness etc...), please contact the course coordinator, or the course instructor if this course does not have a coordinator to arrange for a re-adjustment of a submission date. Absences not reported within 48 hours will not be accommodated. If an excused absence is approved, then the percentage weight of the legitimately missed assignment could also be pro-rated among the components of the course.

Missed Quiz

If you expect to be unable to or it will be problematic to write the quiz at the scheduled time (scheduled during regular lecture times) please email your instructor as soon as possible. Alternative arrangements will be made by the instructor on a case-by-case basis.

Students who miss a quiz for a valid reasons, will be granted an excused absence by the Instructor. Students must notify the Instructor by email within 48 hours after the midterm. The weight of the quiz will be distributed across the other quizzes and the final.

Missed Laboratory

If you expect you will miss a scheduled laboratory session please email your assigned TA and CC the course instructor as soon as possible. It is imperative to inform your group and your TA as soon as possible so that alternative arrangements can be made.

If you unexpectedly miss your scheduled laboratory session, please email your TA and CC the course instructor within 48 hours after the date of the missed lab. Students are NOT allowed to attend a lab section different than their own without prior approval.

5. **Scheduled Out-of-Class Activities:**

There are no scheduled out of class activities for this course.

6. **Course Materials:**

Required Textbook(s):

Kenneth Krane, *Modern Physics*: Wiley, 4th edition, 2020.

Online Course Components: Assignments, laboratory documents, and supporting lecture material will be posted on the course D2L website.

In order to successfully engage in their learning experiences at the University of Calgary, students taking online, remote and blended courses are required to have reliable access to the following technology:

- A computer with a supported operating system, as well as the latest security, and malware updates;
- A current and updated web browser;
- Webcam/Camera (built-in or external);
- Microphone and speaker (built-in or external), or headset with microphone;
- Current antivirus and/or firewall software enabled;
- Stable internet connection.

For more information please refer to the UofC ELearning online website.

7. **Examination Policy:**

The three quizzes and the final exam will be synchronous **individual open book exams**. Quizzes and the exam are not open-internet (i.e., search engines and websites other than D2L are prohibited) and no collaboration is allowed (neither with other students in the course nor any other persons). Accessing any site other than D2L (e.g., Chegg, Course Hero, Slack, Facebook, Discord, etc.) during a quiz or the exam is academic misconduct and, if discovered, will be treated as such. An extra 50% buffer time is included for each assessment to account for potential technical difficulties.

For any synchronous assessment, time will be adjusted for SAS students if needed and accommodations for students will be done on a case-by-case basis. Accommodated extra time will be applied to the base writing time and the technical time will remain as 1 hr. Example: A student writing the final with 50% additional time (accommodated time): Base time (2 hours) + accommodated time (1 hour) + technical time (1 hour) = Total Final Exam Time: 4 hours.

Students should also read the Calendar, Section G, on Examinations.

8. **Approved Mandatory And Optional Course Supplemental Fees:**

There are no mandatory or optional course supplemental fees for this course.

9. **Writing Across The Curriculum Statement:**

For all components of the course, in any written work, the quality of the student's writing (language, spelling, grammar, presentation etc.) can be a factor in the evaluation of the work. See also Section E.2 of the University Calendar.

10. **Human Studies Statement:**

Students will not participate as subjects or researchers in human studies.

See also Section E.5 of the University Calendar.

11. **Reappraisal Of Grades:**

A student wishing a reappraisal, should first attempt to review the graded work with the Course coordinator/instructor or department offering the course. Students with sufficient academic grounds may request a reappraisal. Non-academic grounds are not relevant for grade reappraisals. Students should be aware that the grade being reappraised may be raised, lowered or remain the same. See Section I.3 of the University Calendar.

a. **Term Work:** The student should present their rationale as effectively and as fully as possible to the Course coordinator/instructor within **ten business days** of either being notified about the mark, or of the item's return to the class. If the student is not satisfied with the outcome, the student shall submit the Reappraisal of Graded Term work form to the department in which the course is offered within 2 business days of receiving the decision from the instructor. The Department will arrange for a reappraisal of the work within the next ten business days. The reappraisal will only be considered if the student provides a detailed rationale that outlines where and for what reason an error is suspected. See sections I.1 and I.2 of the

University Calendar

b. **Final Exam:** The student shall submit the request to Enrolment Services. See Section I.3 of the University Calendar.

12. **Other Important Information For Students:**

a. **Mental Health** The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness and academic success, and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the mental health resources available throughout the university community, such as counselling, self-help resources, peer support or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre, Mental Health Services Website) and the Campus Mental Health Strategy website (Mental Health).

b. **SU Wellness Services:** For more information, see www.ucalgary.ca/wellnesscentre or call 403-210-9355.

c. **Sexual Violence:** The Sexual Violence Support Advocate, Carla Bertsch, can provide confidential support and information regarding sexual violence to all members of the university community. Carla can be reached by email (svsa@ucalgary.ca) or phone at 403-220-2208. The complete University of Calgary policy on sexual violence can be viewed at (https://www.ucalgary.ca/policies/files/policies/sexual-violence-policy.pdf)

d. **Misconduct:** Academic integrity is the foundation of the development and acquisition of knowledge and is based on values of honesty, trust, responsibility, and respect. We expect members of our community to act with integrity. Research integrity, ethics, and principles of conduct are key to academic integrity. Members of our campus community are required to abide by our institutional Code of Conduct and promote academic integrity in upholding the University of Calgary's reputation of excellence. Some examples of academic misconduct include but are not limited to: posting course material to online platforms or file sharing without the course instructor's consent; submitting or presenting work as if it were the student's own work; submitting or presenting work in one course which has also been submitted in another course without the instructor's permission; borrowing experimental values from others without the instructor's approval; falsification/fabrication of experimental values in a report. Please read the following to inform yourself more on academic integrity:

Student Handbook on Academic Integrity
Student Academic Misconduct Policy and Procedure
Research Integrity Policy

Additional information is available on the Student Success Centre Academic Integrity page

e. **Academic Accommodation Policy:** Students needing an accommodation because of a disability or medical condition should contact Student Accessibility Services in accordance with the procedure for accommodations for students with disabilities available at procedure-for-accommodations-for-students-with-disabilities.pdf.

Students needing an accommodation in relation to their coursework or to fulfill requirements for a graduate degree, based on a protected ground other than disability, should communicate this need, preferably in writing, to the Associate Head of the Department of Physics & Astronomy, Dr. David Feder by email phas.ahugrd@ucalgary.ca or phone 403-220-8127. Religious accommodation requests relating to class, test or exam scheduling or absences must be submitted no later than **14 days** prior to the date in question. See Section E.4 of the University Calendar.

f. **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). Students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information, see Legal Services website.

g. **Student Union Information:** VP Academic, Phone: 403-220-3911 Email: suvpaca@ucalgary.ca. SU Faculty Rep., Phone: 403-220-3913 Email: sciencerep@su.ucalgary.ca. Student Ombudsman, Email: ombuds@ucalgary.ca.

h. **Surveys:** At the University of Calgary, feedback through the Universal Student Ratings of Instruction (USRI) survey and the Faculty of Science Teaching Feedback form provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses. Your responses make a difference - please participate in these surveys.

i. **Copyright of Course Materials:** All course materials (including those posted on the course D2L site, a course website, or used in any teaching activity such as (but not limited to) examinations, quizzes, assignments, laboratory manuals, lecture slides or lecture materials and other course notes) are protected by law. These materials are for the sole use of students registered in this course and must not be redistributed. Sharing these materials with anyone else would be a breach of the terms and conditions governing student access to D2L, as well as a violation of the copyright in these materials, and may be pursued as a case of student academic or non-academic misconduct, in addition to any other remedies available at law.

Additional Information

Course Description

The goal of this course is to survey some of the significant challenges physics encountered in the 20th century and the solutions and their applications. An emphasis is placed on the experimental observations that led to the development of quantum mechanics and special relativity.

Topics include: Special Theory of Relativity, Electromagnetic waves, Blackbody radiation, Photoelectric Effect, X-rays, Compton Scattering, Atomic Structure, The Bohr Model, Atomic Spectra, The Schrödinger Wave Equation, Nuclear Structure, Radioactivity, and Elementary Particles.

Problem-solving Lectures

Throughout the term there will be eight special lectures which will have a mixed tutorial and lecture format. These will take place during the assigned lectures on Fridays (10:00 to 10:50). The objective of the problem-solving lectures is to give you an opportunity to work in a supported environment to solve problems related to the course material. A set of problems will be posted on Monday prior to the lecture. One or two of these problems will be submitted the following Monday and graded. These will count towards the Assignment component in the course.

Laboratory

(Modified Feb. 2021 -- The in-person lab component is replaced by a research lab report)

The laboratory component of PHYS229 is an essential opportunity for you to experience some of the exciting phenomena encountered in this course.

The PHYS229 laboratory consists of two components: (1) Three Online labs (2) A final research lab report. The online labs will occur during the W2021 semester with a focus on building important analysis and writing skills as well as testing modern physics phenomena.

The final research lab report will also be done online in your lab groups. You will be provided data for an experiment of your choice from a selection of labs. From this data your group will write a detailed lab report on the data with an extended research section. The research section should elaborate on the importance of the chosen experiment, recent versions of the experiment or implementations of the phenomena, etc...

Laboratory manuals will be available on D2L. Each laboratory exercise is accompanied by Pre-lab Questions. Each individual student must read over the laboratory exercise and complete these questions prior to the laboratory and working on the experiment. Your TA will check that these questions have been submitted before each lab session. Your laboratory grade for both online and research report will include a peer evaluation component.

Each lab section will be split into two groups, group A and group B such that only one group is doing a particular lab in a given week. This is done to maximize the TA to student ratio. You only need to attend your lab during week labeled with your group as below. Your group will be assigned during the first week of classes.

Online W2021 Laboratory Schedule:

Course Outcomes:

- Recognize the equivalence of matter and energy
- Justify the role of photons and failure of classical physics to explain blackbody radiation, the photoelectric effect and Compton scattering
- Recognize that simple microscopic systems must be described by probability densities using one dimensional, time independent Schrödinger wave equations
- Calculate physical observables for simple interactions and relate them to experimental outcomes
- Collaborate in a group to execute laboratory experiments
- Demonstrate proper laboratory techniques including data acquisition, analysis of data and uncertainty, and safe operation of equipment

- Clearly and accurately communicate concepts and arguments in writing and through scientific presentations

Electronically Approved - Apr 06 2021 16:55

Department Approval