



COURSE OUTLINE

1. **Course:** PHYS 341, Classical Mechanics I - Fall 2020

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

Instructor	Email	Phone	Office	Hours
Dr. Jeroen Stil	jstil@ucalgary.ca	403 220-8015	SB 519	Thursdays 2pm - 3pm

In order to be successful in this course, it is important to read the text book alongside the lectures. Lecture notes are intended to support studying from the text book.

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.

Although this course will be delivered in a "synchronous" manner with live lectures, the notes made during the lectures will be posted on D2L and links to video recordings will be posted on D2L as technology permits. Students are not required to be on-line during regular lectures to earn credit in this course, but see the section **Examination Policy** of this course outline for requirements related to exams.

Access the Zoom lectures through D2L. A password for the lectures will be sent by email.

This course includes 4 at-home laboratory experiments. Students will perform their own experiment as a contribution to a lab report from their lab group, one report per group. The group report will show the results obtained by the contributing authors. The group will provide common analysis and interpretation of the measurements. A tentative schedule for the at-home labs is given in Section 13 of this course outline. Students are not permitted to meet in person to do an experiment for this course, but they can have virtual meetings, e.g. via Zoom, to work on the collaborative part of the report. Labs are completely asynchronous, but lab reports are due on set dates (usually one week after the lab week, to be communicated by email).

Course Site:

D2L: PHYS 341 L01-(Fall 2020)-Classical Mechanics I

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 Mathematics 211 or 213; and Mathematics 267 or 277.

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 (%)
Midterm exam (October 14, 2019 class time)	10%
Labs (4 at home; dates in Section 13 of this course outline)	20%
Assignments	35%
Final Exam (Registrar Scheduled)	35%

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	93 %	85 %	80 %	75%	70%	65 %	60 %	55%	50%	45 %	40 %

Grading of individual course components depends in part on completeness, clarity and conciseness of the solution provided. Illegible responses or responses that are not offered in a logical, structured way will receive a lower or even a zero grade.

The percentage grades required to earn a particular letter grade for the course are strict minimum thresholds applied to the weighted mean percentage course grade. There is no rounding. For example, a mean percentage grade of 79.99% for the course translates into a letter grade B+.

Any missed component of course work receives a zero grade.

This course has a registrar scheduled final exam.

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 components of term work receive a zero grade. If you have a valid reason for missing course work, contact the course instructor or your TA. Accommodation will only be considered if the request is made at the earliest possible opportunity. Late requests for arrangements about missed course work will not be honoured.

If you miss a lab or a homework assignment, contact your TA as soon as possible to make arrangements. Credit for the labs will not be transferred to other course components.

5. Scheduled Out-of-Class Activities:

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

6. **Course Materials:**

Required Textbook(s):

John R. Taylor, *Classical Mechanics*: University Science Books.

Recommended Textbook(s):

John R. Taylor, *Classical Mechanics Student Solutions Manual*: University Science Books.

A digital version of the text book is also available.

Notes made by the instructor during lectures will be posted on D2L. These notes are intended as a supplement to the text book. As technology permits, lectures will be recorded and links will be posted on D2L.

Answers to odd-numbered problems are printed at the end of the text book. Complete solutions to these problems are available in the Student Solutions Manual, which is sold separately. Some students may find this book helpful.

For the labs, it is expected that students have access to a smart phone, tablet, or other device that allows them to record their experiment in a movie file for analysis with the on-line analysis tool provided by the department. Students who experience technical difficulties must contact their lab TA or the instructor immediately.

7. **Examination Policy:**

Exams will be written at home. Use of the text book is allowed. References to the text book will not be considered in the grading. The exams are graded for completeness and correctness of the methodology of answers to problems. Illegible answers will not receive marks.

The exams can include subjects covered in set sections from the text book, course notes posted on D2L, labs, and related assignments.

PHYS 341 teaches methods to solve a broad class of physics problems. Exams can contain applications that were not explicitly covered in lectures, assignments or the text book for the purpose of testing your ability to apply the problem solving methodology taught in this course.

Communication with anyone about an exam as the exam is in progress constitutes academic misconduct. Suspected cases of academic misconduct will be reported.

Students who experience a problem during an exam, or anticipate a situation that inhibits them from writing an exam at the set time must contact the instructor as soon as possible to make arrangements.

All exams are cumulative.

Students should also read the Calendar, [Section G](#), on Examinations.

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

There are no mandatory or optional 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.

In this course, the quality of the student's writing in laboratory reports will be a factor in the evaluation of those reports.

Grading of labs and exams depends in part on clarity and conciseness of the answers provided. This includes the structure and logic progression of solutions. No points are awarded for unclear or illegible answers. No points will be subtracted for minor grammatical, style, or spelling errors.

10. **Human Studies Statement:**

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

See also [Section E.5](#) of the University Calendar.

There are no human studies aspects associated with PHYS 341.

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 Center:** For more information, see www.ucalgary.ca/wellnesscentre or call [403-210-9355](tel: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](tel: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 misconduct (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under [Section K](#). Student Misconduct to inform yourself of definitions, processes and penalties. Examples of academic misconduct may include: submitting or presenting work as if it were the student's own work when it is not; submitting or presenting work in one course which has also been submitted in another course without the instructor's permission; collaborating in whole or in part without prior agreement of the instructor; borrowing experimental values from others without the instructor's approval; falsification/ fabrication of experimental values in a report. **These are only examples.**
- 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](tel: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](tel:403-220-3911) Email: suvpaca@ucalgary.ca. SU Faculty Rep., Phone: [403-220-3913](tel: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.

1. If you need assistance.

Part of the challenge of PHYS 341 is the amount of material that must be covered in a single term. Time to practice problems during lectures is extremely limited. If you need clarification on something, contact the instructor or your TA immediately. Do not wait until the last moment before an exam or an assignment due date.

Detailed course information will be posted on D2L. Check D2L for important dates like due dates for assignments, midterm information, etc.

Email to the instructor is strictly for issues related to the organization of the course, or to book an appointment. Questions about course material cannot be effectively answered by email. Do not send scanned notes by email.

Questions about course material can be asked immediately after class, during office hours, or by appointment. If students wish to make an appointment, a special Zoom meeting will be scheduled by the instructor.

The instructor will make an effort to stay after lectures until all questions have been answered. The intention is to turn off recording at the end of a lecture, before questions begin. Students should familiarize themselves with the red recording indicator in Zoom. At the end of the lecture, they may request recording to be turned off before asking a question, if that is not already done.

As this course is offered on-line, office hours are reduced to one hour per week by Zoom. These office hours are accessible to all. Flexible zoom meetings can be scheduled outside office hours to address questions or concerns that cannot be addressed through email or a public Zoom meeting. TAs will be available by email to provide guidance about the at-home lab experiments.

Students are advised to allow for some delay in response to email. Unpredictable delays in response time may be caused by meetings and other obligations of the instructor or the TAs. Especially outside office hours students should not expect an immediate response.

2. Labs.

There will be four **at-home labs** associated with PHYS 341. Students are required to complete all four labs. If you have a documented valid reason (as outlined in the University Calendar) for a missed lab, contact your lab TA as soon as possible to arrange a make-up lab.

Students are assigned to lab sections by the Department of Physics and Astronomy. Lab sections are necessary to divide TA support for the labs. Changing lab sections is not allowed, unless prior approval from the Department is obtained. TAs will provide guidance on on request in the week that the lab experiments are done, and in the week that the lab reports are being written.

Lab experiments (data collection) are done by individual students at home during the week assigned for the lab experiment. There will be one lab report per lab group of 4 students. Each student will provide their own data to be included in the lab report. Analysis and interpretation of the measurements will be done as a group in the week following the experiment. Lab reports must discuss the differences and similarities of the contributions in relation to the error estimates.

Labs are performed following instructions in a lab manual that will be posted on D2L in the labs folder. The lab report must show work on every task specified for the lab. The lab reports may strictly follow the points outlined in the lab report for full marks, but additional information on your experience on what worked and what did not, or other details pertinent to the experiment may help to raise your lab grade. Lab reports must include original images of the experiment. Selfies with your experiment are appreciated but not required.

Lab reports must be delivered electronically as a PDF file (details will be shared by email). The first page of the lab report must state the names and student IDs of the students who contributed to the report. One grade will be assigned to each report.

In order to comply with social distancing rules, it is not allowed to meet in person to perform a lab experiment. Members of a lab group are encouraged to coordinate their efforts on line.

The lab schedule below gives the weeks in which students are expected to work on their lab experiment. Due dates for lab reports are usually at the end of the following week. Specific due dates will be communicated by email to the class.

If you have difficulties performing your lab experiment or if you experience a delay, talk to your lab TA to find a solution.

The labs experiments for PHYS 341 are (tentative lab weeks subject to confirmation by the department):

- Hanging Chain. ID#0080 Sep 28 - Oct 4
- Tumbling Object Oct 12 - Oct 18
- Drag force with conic pendulum Oct 26 - Nov 1
- Damped Harmonic Oscillator Nov 16 - Nov 22

3. TopHat.

We will use TopHat in this course for learning activities and for some assignments. TopHat is available free of charge for registered students. The instructor will assume that you are familiar with TopHat. If you have any questions or problems, please ask the instructor.

The course ID for TopHat is PHYS341F2020. The join code is 056519.

You must have registered for the course in TopHat by Monday, September 14, 2020

Students are required to enter their name and student ID in the appropriate field in TopHat. Failure to do so will result in delayed posting of grades and possibly a zero grade if the information cannot be linked to D2L.

Some assignments for PHYS 341 will be administered through TopHat. For these assignments, only solutions entered in TopHat will be accepted. A PDF file with the assignment questions will be posted on D2L for your convenience. When you log in to TopHat, you will find each question on the assignment. For numeric answers, enter a number in the units specified in the question, but do not enter the units. Each question will give instructions on the units in which the answer must be specified. You may change your answer as often as you like before the due date. Only the final answer will be graded.

Assignments will be announced by email to the class, approximately a week before the due date.

It is highly recommended to speak to the instructor if anything is unclear about an assignment question. This is a good reason to start working on an assignment well before the due date.

Because of the option to follow the course asynchronously, there will be no in-class activities for credit with TopHat. We may do some spontaneous TopHat questions that will be open for some time outside lecture time, without credit.

4. Course Learning Incomes

Students taking PHYS 341 are expected to have prior knowledge in algebra, trigonometry, integration and differentiation, vector algebra and how it is used in physical systems, Newton's laws, solutions of accelerated motion of a particle in 1 and 2 dimensions.

Experience shows that many students starting PHYS 341 should review vector algebra. In particular the relation of the vector dot product to projection of a vector on another vector, and the vector cross product in terms of a vector that is perpendicular to each of the originating vectors. We will use these principles frequently in PHYS 341 in a various applications.

5. Syllabus

Topics to be covered in this course include:

Chapter 1. Newton's Laws of Motion

We will treat Chapter 1 mainly as a review of selected essential topics, with self-study expected to make up deficiencies:

Review of essential vector algebra

Derivatives of vectors and vector products

Newton's laws in three dimensions

Inertial frames

Multi-particle systems, interactions

Newton's laws in polar coordinates

Chapter 2. Projectiles and Charged Particles

2.1. Air resistance

2.2/2.3 Linear resistance

2.4 Quadratic resistance

2.5/2.7 Motion of a charge in a uniform magnetic field

2.6 Complex exponentials and hyperbolic functions

Chapter 3. Momentum and Angular Momentum

3.1 Conservation of momentum/collision of two particles

3.2 Rocket motion

3.3 Centre of mass

3.4 Angular momentum of a single particle

3.5 Angular momentum of a system of particles

Chapter 4. Energy

4.1 Kinetic energy and Work in Three Dimensions

4.2 Potential Energy and Conservative Forces

4.3 Force as a gradient of Potential Energy. The Del/Nabla/gradient Operator

4.4 Another Condition to Test for Conservative Force

4.6 Energy for linear One-dimensional Systems. Separable Forces

4.8 Central Forces

4.9 Energy of Interaction of Two Particles

4.10 Energy of a multi-particle system. Rigid bodies

Chapter 5. Oscillations

5.1 Hooke's Law

5.2 Simple Harmonic Motion. Exponential Solutions. Energy

5.4 Damped Oscillations. Decay Time. Phase Space

5.5 Driven Damped Oscillations

5.6 Resonance

Chapter 9. Non-inertial Frames (time permitting)

9.1 Acceleration without Rotation

9.3 Angular Velocity Vector

9.4 Time Derivatives in a Rotating Frame

9.5 Newton's Second Law in a Rotating Frame

9.6 Centrifugal Force

9.7 Coriolis Force

Course Outcomes:

- understand relations among coordinate systems
- present Newton's 2nd law as a first order ODE and solve
- understand the use and meaning of potential energy
- use the concept of velocity dependent dissipative forces
- recognize equations that govern oscillatory behaviour
- able to compute equilibrium states and their stability
- recognize central force laws and use effective potentials
- understand the behaviour and use of non-inertial systems
- develop familiarity with lab techniques

Electronically Approved - Aug 20 2020 12:33

Department Approval