



## COURSE OUTLINE

### 1. **Course:** PHYS 341, Classical Mechanics I - Fall 2019

Lecture 01: MWF 10:00 - 10:50 in ST 131

Instructor	Email	Phone	Office	Hours
Dr. Jeroen Stil	jstil@ucalgary.ca	403 220-8015	SB 519	Thursdays, 10:00 am - 12:00 pm

#### **Course Site:**

D2L: PHYS 341 L01-(Fall 2019)-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):**

Physics 227 or 321 or a grade of "A-" or higher in either Physics 211 or 221; and Mathematics 211 or 213; and one of 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 1 (October 9, 2019 at 19:00)	15%
Midterm exam 2 (November 19, 2019 at 19:00)	20%
Labs (5)	15%
Assignments	20%
Final Exam (Registrar Scheduled)	30%
TopHat Bonus	2%

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
<b>Minimum % Required</b>	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.

Bear in mind that a grade of D+ or below will result if a student does not receive a passing grade for the final exam. If a passing grade for the final exam is not obtained, the maximum possible letter grade for the course is D+ irrespective of the weighted mean percentage grade for the course.

A 2% bonus grade can be earned for participating with TopHat Fact Check questions throughout the term as detailed in the supplementary material at the end of this course outline. For technical reasons, the TopHat Bonus grade will not be posted in D2L. It will be added to the average percentage grade of the course components before the letter grade for the course is determined.

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

In the event that a student misses the midterm or any course work due to illness, supporting documentation, such as a medical note or a statutory declaration will be required (see [Section M.1](#); for more information regarding the use of statutory declaration/medical notes, see [FAQ](#)). Absences must be reported within 48 hrs.

The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in [Section 3.6](#). It is the student's responsibility to familiarize themselves with these regulations. See also [Section E.3](#) of the University Calendar.

Missed components of term work receive a zero grade. This includes late assignments and assignments or lab reports deposited in the wrong dropbox. If a documented valid reason for missed work is provided a solution will be offered that may include transfer of weight or an opportunity to finish the work at a later date at the discretion of the instructor. Such accommodation will only be considered if the request is made at the earliest possible opportunity.

Students must complete all five labs. If you miss a lab for some reason, please contact Peter Gimby at 220-5403 or Wesley Ernst at 220-7401 to schedule a makeup lab.

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

The following out of class activities are scheduled for this course.

Activity	Location	Date and Time	Duration
Midterm 1	TBA	Wednesday, October 9, 2019 at 7:00 pm	1.5 Hours
Midterm 2	TBA	Tuesday, November 19, 2019 at 7:00 pm	1.5 Hours

**REGULARLY SCHEDULED CLASSES HAVE PRECEDENCE OVER ANY OUT-OF-CLASS-TIME-ACTIVITY.** If you have a conflict with the out-of-class-time-activity, please contact your course coordinator/instructor no later than **14 days prior** to the date of the out-of-class activity so that alternative arrangements may be made.

Midterms for PHYS 341 will be written out of scheduled lecture times, to reduce time pressure on the exam and to save lecture time for instruction.

Locations of the midterms will be communicated by email to the class when the room bookings are complete.

#### 6. Course Materials:

Required Textbook(s):

Fowles & Cassiday, *Analytical Mechanics, 7th edition*: Brooks/Cole, Cengage Learning.

Notes made by the instructor during lectures will be posted on D2L. These notes are intended as a supplement to the text book. The exams can include subjects covered in set sections from the text book, course notes posted on D2L, and related assignments.

## 7. Examination Policy:

Exams will be closed book. Use of a scientific calculator is allowed and highly recommended for exams. If your calculator has functionality exceeding that of a standard scientific calculator, it may not be allowed on the exam. Please check with the instructor well before the exam date. Calculator Apps on portable devices are not allowed on exams. Use of any device with wireless capability, including smart watches, is not allowed on the exams.

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.

**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 **10 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 immediately submit the Reappraisal of Graded Term work form to the department in which the course is offered. The department will arrange for a re-assessment of the work if, and only if, the student has sufficient academic grounds. 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:** The Students Union Wellness Centre provides health and wellness support for students including information and counselling on physical health, mental health and nutrition. For more information, see [www.ucalgary.ca/wellnesscentre](http://www.ucalgary.ca/wellnesscentre) or call [403-210-9355](tel:403-210-9355).

- c. **Sexual Violence:** The University of Calgary is committed to fostering a safe, productive learning environment. The Sexual Violence Policy (<https://www.ucalgary.ca/policies/files/policies/sexual-violence-policy.pdf>) is a fundamental element in creating and sustaining a safer campus environment for all community members. We understand that sexual violence can undermine students' academic success and we encourage students who have experienced some form of sexual misconduct to talk to someone about their experience, so they can get the support they need. 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](mailto:svsa@ucalgary.ca)) or phone at [403-220-2208](tel:403-220-2208).
- 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. **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on [assembly points](#).
- f. **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](mailto: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.
- g. **Safewalk:** Campus Security will escort individuals day or night (See the [Campus Safewalk](#) website). Call [403-220-5333](tel:403-220-5333) for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- h. **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.
- i. **Student Union Information:** [VP Academic](#), Phone: [403-220-3911](tel:403-220-3911) Email: [suvpaca@ucalgary.ca](mailto:suvpaca@ucalgary.ca). SU Faculty Rep., Phone: [403-220-3913](tel:403-220-3913) Email: [sciencerep@su.ucalgary.ca](mailto:sciencerep@su.ucalgary.ca). [Student Ombudsman](#), Email: [ombuds@ucalgary.ca](mailto:ombuds@ucalgary.ca).
- j. **Internet and Electronic Device Information:** Unless instructed otherwise, cell phones should be turned off during class. All communication with other individuals via laptop, tablet, smart phone or other device is prohibited during class unless specifically permitted by the instructor. Students that violate this policy may be asked to leave the classroom. Repeated violations may result in a charge of misconduct.
- k. **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.
- l. **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, come see the instructor 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. The instructor will make an effort to stay after lectures until all questions have been answered.

### **2. Labs.**

There will be five labs associated with PHYS 341. Students are required to complete all five labs. If you have a documented valid reason (as outlined in the University Calendar) for a missed lab, contact your lab TA to schedule a make-up lab for the next week with PHYS 341 labs.

**All students are required to fill out the sign-in sheet at each lab in person. Early departures shall be marked on the sign-in sheet by the TA. Before leaving the lab space, each lab group must email their data to their lab TA as instructed by the TA.**

Students are assigned to lab sections by the Department of Physics and Astronomy. Changing lab sections is not allowed, unless prior approval from the Department is obtained.

The labs for PHYS 341 are:

- Inclined Atwood Machine. ID#0081 Sep 16 to Sep 20 in ST 037
- Drag forces. ID#0083 Sep 30 to Oct 4 in **ST 034**
- Hanging Chain. ID#0080 Oct 14 to Oct 18 in ST 037
- Damped Mechanical Oscillations. ID#0086 Oct 28 to Nov 1 in ST 037
- Forced Damped Mechanical Oscillations. ID#0085 Nov 18 to Nov 22 in ST 037

Note: Labs are normally in ST 037. Only the drag forces lab is scheduled in ST 034 because of the nature of the experiment.

### **3. TopHat.**

We will use TopHat in this course for learning activities and for 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 PHYS341F2019. The join code is 955076.**

**You must have registered for the course in TopHat by Monday, September 16**

**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.**

**Most assignments for PHYS 341 will be administered through TopHat.** 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.

### Top Hat Fact Check questions:

You may be asked short-answer questions during lectures or outside lectures with a limited response time in the TopHat system. Answering Top Hat Fact Check questions earns you participation credit for a bonus mark that will be added to your percentage grade for the course before the letter grade is calculated. Some questions may only be open for a few minutes during lectures; most will be open longer so you can think about them at home.

### **TopHat Fact Check questions will be clearly marked as such. Do not confuse them with assignments!**

A bonus credit of 2% will be added to the course percentage grade for students who have a participation rate in Top Hat that is at least 60% (counting all Fact Check questions between September 15 and the last day of class). There is no bonus credit if your participation rate at the end of the term is less than 60%. The participation information provided by TopHat at the end of term will be the single determining factor whether this bonus credit is awarded.

## **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**

This course will focus on the mechanics of single particles under the presence of external forces, and in particular conservative forces. PHYS 343 will follow with an emphasis on multiple particle interactions and the motion of extended objects.

Topics to be covered in this course include:

### Chapter 1. Vectors

1. Review of vector notation and vector algebra.
2. Coordinates and coordinate transformations

### Chapter 2. Newtonian Mechanics: Rectilinear Motion of a Particle

1. Inertial reference frames
2. Uniform acceleration under a constant force
3. Forces that depend on position
4. Concepts of kinetic and potential energy
5. Velocity dependent forces, drag forces

### Chapter 3. Oscillations

1. Harmonic motion
2. Energy of harmonic oscillator
3. Damped harmonic oscillator
4. Forces harmonic oscillator and resonance
5. Non-linear oscillations and chaos (time permitting)

#### Chapter 4. General motion of a particle in 3 dimensions

1. Conservative forces and force fields
2. Potential energy in 3 dimensions; the Del/nabla/gradient Operator
3. Separable forces
4. Projectile motion
5. Harmonic oscillator in three dimensions

#### **We will cover Chapter 6 before Chapter 5.**

#### Chapter 6. Gravitation and Central Forces

1. Newton's law of gravitation
2. Gravitational force of a uniform sphere on a test particle
3. Kepler's laws of planetary motion
4. Potential energy in a gravitational field
5. Potential energy and kinetic energy in a general central field
6. Effective potential
7. Rutherford scattering

#### Chapter 5. Noninertial reference systems

1. Accelerated coordinate systems
2. Inertial forces
3. Rotating coordinate systems
4. Dynamics of a particle in a rotating coordinate system

#### **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

Department Approval:

Electronically Approved

Date: 2019-08-30 19:49

Associate Dean's Approval for out of  
regular class-time activity:

Electronically Approved

Date: 2019-09-03 13:44