UNIVERSITY OF CALGARY
FACULTY OF SCIENCE

Department of Physics & Astronomy
Science B 605
403 220-5385
phasoffice@phas.ucalgary.ca

COURSE OUTLINE

1. **Course:** PHYS 343, Classical Mechanics II - Winter 2024

Lecture 01 : TR 12:30 - 13:45 in SA 106

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

To account for any necessary transition to remote learning for the current semester, courses with in-person lectures, labs, or tutorials may be shifted to remote delivery for a certain period of time. In addition, adjustments may be made to the modality and format of assessments and deadlines, as well as to other course components and/or requirements, so that all coursework tasks are in line with the necessary and evolving health precautions for all involved (students and staff).

In Person Delivery Details:

This is an in-person course. Exams are in-person. There are no for-credit activities that require students to be present during regular lectures.

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.

Course Site:

D2L: PHYS 343 L01-(Winter 2021)-Classical Mechanics II

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

Equity Diversity & Inclusion:

The University of Calgary is committed to creating an equitable, diverse and inclusive campus, and condemns harm and discrimination of any form. We value all persons regardless of their race, gender, ethnicity, age, LGBTQIA2S+ identity and expression, disability, religion, spirituality, and socioeconomic status. The Faculty of Science strives to extend these values in every aspect of our courses, research, and teachings to better promote academic excellence and foster belonging for all.

The Physics and Astronomy EDI Committee acknowledges there are persistent barriers that prevent such accessibility and hinder our progress towards EDI. Our representatives (faculty, postdocs, graduate and undergraduate students) are committed to addressing any concerns and work towards proactive solutions that enact necessary change within the department. To submit anonymous questions, comments or concerns regarding EDI related issues, please reach out to our Associate Head EDI, Claudia Gomes da Rocha (claudia.gomesdarocha@ucalgary.ca)

2. **Requisites:**

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

Prerequisite(s):
Physics 341.

Antirequisite(s):
Credit for Physics 343 and Physics Engineering 383 will not be allowed.

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:

Course Component	Weight	Due Date (duration for exams)	Modality for exams	Location for exams
Assignments (4)[1]	30%	Ongoing		
Midterm 1	20%	Feb 15 2024 at 12:30 pm (70 Minutes)	in-person	In Class
Midterm 2	20%	Mar 21 2024 at 12:30 pm (70 Minutes)	in-person	In Class
Registrar Scheduled Final Exam[2]	30%	Will be available when the final exam schedule is released by the Registrar	in person	Will be available when the final exam schedule is released by the Registrar

[1] Tentatively due January 28, February 25, March 10 and March 31 at 23:59 Calgary time. Due dates subject to change to fit the needs of the course and to improve flexibility in students' schedule. Assignment 2 is a written assignment about Lagrangian/Hamiltonian mechanics with work to be scanned and submitted in a D2L dropbox. Assignments 1, 3 and 4 are scheduled as TopHat assignments.
[2] All exams are cumulative and closed-book.

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+.

This course will have a Registrar Scheduled Final exam that will be delivered in-person and on campus. 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 3 hours.

If the **weighted average** percentage grade of midterm 1 (weight 20/70), midterm 2 (weight 20/70) and the final exam (weight 30/70) is less than 40%, the maximum attainable letter grade for the course is a D+, irrespective of the average percentage grade for the course.

The University of Calgary offers a flexible grade option, Credit Granted (CG) to support student's breadth of learning and student wellness. Faculty units may have additional requirements or restrictions for the use of the CG grade at the faculty, degree or program level. To see the full list of Faculty of Science courses where CG is not eligible, please visit the following website: https://science.ucalgary.ca/current-students/undergraduate/program-advising/flexible-grading-option-cg-grade

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

In the event that a student legitimately fails to submit any online or in-person assessment on time (e.g. due to illness, domestic affliction, 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, or possible exemption and reweighing of components. Absences not reported within 48 hours will not be accommodated. Students may be asked to provide supporting documentation (Section M.1) for an excused absence, See FAQ.

If an excused absence is approved, options for how the missed assessment is dealt with is at the discretion of the coordinator or course instructor. Some options such as an exemption and pro-rating among the components of the course may not be a viable option based on the design of this course.

If you miss any component of the course, send an email to the instructor at the earliest possible opportunity in order to work out a suitable accommodation. Missed components of course work receive a zero grade by default. Unduly late requests for accommodation will be denied. Students should refer to section I.2 of the Calendar and Section 11 of this course outline for details.

Students are responsible for accurate and complete personal information in TopHat. This includes first name, last name, and UCID. Missing information can result in a missing (zero) grade for assignments.

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 (www.uscibooks.com).

The text book for PHYS 343 is the same as for PHYS 341. Scanned lecture notes will be posted on D2L after the lectures.

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:**

Exams may draw from all components of the course, including assignments, course notes, and set sections of the text book.

PHYS 343 teaches methods to solve a broad class of physics problems. Exams can contain applications that were not explicitly covered 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 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.

Grading 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.

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 a s 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 their website 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 here.

d. **Student Ombuds Office:** A safe place for all students of the University of Calgary to discuss student related issues, interpersonal conflict, academic and non-academic concerns, and many other problems.

e. **Student Union Information:** SU contact, Email your SU Science Reps: science1@su.ucalgary.ca, science2@su.ucalgary.ca, science3@su.ucalgary.ca,

f. **Academic Accommodation Policy:**

It is the student's responsibility to request academic accommodations according to the University policies and procedures listed below. The student accommodation policy can be found at: https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Student-Accommodation-Policy.pdf

Students needing an accommodation because of a disability or medical condition should communicate this need to Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities: https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Accommodation-for-Students-with-Disabilities-Procedure.pdf.

Students needing an accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, by filling out the Request for Academic Accommodation Form and sending it to Dr. David Feder by email phas.ahugrd@ucalgary.ca preferably 10 business days before the due date of an assessment or scheduled absence.

g. **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
Faculty of Science Academic Misconduct Process
Research Integrity Policy

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

h. **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.

i. **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.

j. **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.

1. If you need help.

Part of the challenge of PHYS 343 is 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 or ask the TA. Do not wait until the last moment.

Detailed course information will be posted on D2L. Current information on assignments and exams will be sent by email. Assignments will also be announced by email once they are posted on D2L.

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. TopHat.

We will use TopHat in this course 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 PHYS343W2024. The join code is 518907 .

You must have registered for the course in TopHat by Monday, January 15, 2024.

3. Syllabus

Topics to be covered in this course include:

Chapter 9. Noninertial reference systems

1. Accelerated coordinate systems
2. Angular velocity vector
3. Time derivatives in a rotating frame
4. Newton's second law in a rotating frame
5. Centrifugal force
6. Coriolis force

Chapter 6. Calculus of variations (overview)

1. Euler-Lagrange equation
2. Generalized coordinates
3. Lagrangian defined in generalized coordinates

Chapter 7. Lagrange's equations

1. Lagrange's Equations for unconstrained motion
2. Constrained systems
3. Degrees of freedom
4. Lagrange's equations with constraints
5. Examples of Lagrange's equations

Chapter 13. Hamilton's Equations

1. Hamiltonian function
2. Hamilton's equations

3. Ignorable Coordinates

Chapter 8. Two-body Central-Force problems

1. Centre of mass and relative coordinates
2. Reduced mass
3. Equations of motion for two-body central force problem
4. Orbital motion
5. Kepler orbits, Kepler's laws
6. Unbound Kepler orbits
7. Changes of orbit

Chapter 10. Rotational Motion of Rigid Bodies (time permitting)

1. Total angular momentum
2. Rotation about a fixed axis
3. Products of inertia
4. The inertia tensor
5. Principal axes of inertia
6. Euler's equations

Course Outcomes:

- know how to compute mechanical properties of multi-particle systems
- able to analyze collisions in lab and centre-of mass frames
- recognize the concept of a rigid body and its properties
- able to calculate moments of inertia
- apply Newton's 2nd law for rotating systems
- understand general methods in calculus of variations
- understand and use Lagrangian methods to derive equations of motion
- understand and use Hamiltonian methods to derive equations of motion

Electronically Approved - Jan 05 2024 12:40

Department Approval