COURSE OUTLINE

Physics 321A: Classical Mechanics I

Lectures: *Tuesdays*, *Wednesdays*, & *Fridays* at 10:30 – 11:20 am

We acknowledge and respect the Lək̓ʷəŋən (Songhees and Esquimalt) Peoples on whose territory the university stands, and the Lək̓ʷəŋən and W̱SÁNEĆ Peoples whose historical relationships with the land continue to this day.

COURSE DESCRIPTION

Course homepage: https://bright.uvic.ca/d2l/home/425071

In this course, we will cover the following broad topics:

- Motion in 1-D
  - General concepts
  - Oscillatory motion
- Motion in 3-D
  - General particle motion
  - Central forces (including gravitation and Kepler's Laws)
- Dynamics of systems of particles
- Dynamics of oscillatory systems

PREREQUISITES

Phys 110+111 *or* 120+130; Math 204; and any one of Phys 248, Math 248, CSC 226, *or* CSC 349A.

CONTACT INFORMATION

Instructor: Justin Albert
E-mail: jalbert@uvic.ca
Office: Elliott 213

Office Hours: Come by my office anytime! — or, chat with me anytime via the Zoom link above! I'll be sure to stay available for an hour after each class, but please just send e-mail or call if you want to be absolutely sure I will be in my office/available at any given time. If I'm in my office but busy I'll let you know a time to come back. Feel free to always try my office though, or phone, or e-mail. Cell phone is (250) 661-7066, feel free to call! (I tend to prefer e-mail to text messaging – and e-mail actually tends to reliably get to me faster than texting.) My lab space is in Elliott 022, so you can often find me there too.

COURSE MATERIALS

Text (required): ***Classical Mechanics*** by Tom Kibble & Frank H. Berkshire (5th edn). Like textbooks for most courses, you are likely to get a vastly better deal on the book if you purchase it online (at, e.g., abebooks.com or amazon.ca) than if you get it at the campus bookstore (especially if you get a used, rather than new, copy online). If you purchase online and it doesn't arrive until after the first few weeks of classes, don't worry at all!!! — please see the course Brightspace link for an online copy of the book. (It's good to have a physical copy of the textbook though, at least eventually.) Please kindly read the textbook sections near the beginning of the week that they are covered!

Some other textbooks that I occasionally consult:
Goldstein, *Classical Mechanics*
Landau & Lifschitz, *Mechanics*

LEARNING OUTCOMES

The intended learning outcomes for each one of the lectures in the course will be individually provided in the course Brightspace area.

EVALUATION

Weekly Assignments	**30%**
Labs	**20%**
Midterm Exam (Oct. 17)	**15%**
Final Exam	**35%**

Notes:

- Weekly assignments (there will be a total of 9 of them during the term) are due by the beginning of class on Tuesday (first one due on Tue., Sept. 16th). Answers will be posted the following Tuesday. Your lowest weekly assignment score (out of the 9) will be dropped. You are allowed *one* **late weekly assignment** without penalty, up to a week late (together with the one lowest assignment score that is dropped). **All** other late weekly assignments count 50% if completed before the answer key is handed out the following week. Afterwards, they count 10% (there is still a little bit of value in copying over the answers to better understand them). No exceptions (other than death in the immediate family, signed doctor's note). Note that the lowest assignment score is dropped, and another assignment can be a week late, so that covers cold/flu issues.

COURSE POLICIES

Collaboration on the homework is ***at your discretion****.* Each person is responsible for doing his/her share of the work, **writing up her/his own solutions and for listing his/her collaborators on each set**.

Exams are closed book, closed notebook. You will be allowed to bring an 8.5" x 11" formula sheet of your own making (double-sided) to each exam.

Calculator: The only acceptable calculator for student use on exams (as per the department policy) is the Sharp EL-510RB. It is available at the UVic Bookstore for approximately $8.95.

The midterm exam will be held in class. (**No makeups**; you need to show up & take it! It is like the final exam in that regard.)

Academic Integrity

UVic's Policy on Academic Integrity is found at uvic.ca/calendar/future/undergrad/index.php#/home. It is every student's responsibility to be aware of this policy, including policies on cheating, plagiarism, unauthorized use of an editor, multiple submission, and aiding others to cheat. If you have any questions or doubts, please talk to me. For more information, see uvic.ca/learningandteaching/cac.

Use of AI

Please be advised that in this course you are not authorized to use any form of generative AI. In order to successfully complete course activities, generative AI is not required nor welcomed. Students should not make any use of generative AI tools such as ChatGPT, Grammarly, among others that use AI for content generation and editing.

COURSE CALENDAR AND OUTLINE

UVic Important Dates:	uvic.ca/calendar/dates/
Last day to add courses:	Sept. 19
Last day to drop a course without penalty of failure:	Oct. 31
Final Exam Period:	Dec. 6 – 20

Week	Lecture Dates	Lecture Material (approximate)
1	Sept. 3	Lecture 1: Syllabus, introductions, dimensional analysis
	Sept. 5	Lecture 2: Newtonian mechanics in 1-D
2	Sept. 9	Lecture 3: Linear motion and conservation laws
	Sept. 10	Lecture 4: Dissipative forces
	Sept. 12	Lecture 5: Harmonic oscillator I
3	Sept. 16	Lecture 6: Harmonic oscillator II (Assignment 1 due before class)
	Sept. 17	Lecture 7: Damped oscillator
	Sept. 19	Lecture 8: Damping and phase space
4	Sept. 23	Lecture 9: Forced harmonic motion (Assignment 2 due before class)
	Sept. 24	Lecture 10: General periodic forces
	Sept. 26	Lecture 11: Nonlinear oscillators I
5	Oct. 1	Lecture 12: Nonlinear oscillators II (Assignment 3 due before class)
	Oct. 3	Lecture 13: Mechanics in 3-D
6	Oct. 7	Lecture 14: Polar coordinates, angular momentum (A4 due before class)
	Oct. 8	*Worksheet*: Conservation of angular momentum
	Oct. 10	Lecture 15: Isotropic, 3-D harmonic oscillator
7	Oct. 14	Lecture 16: Central conservative forces (Assignment 5 due before class)
	Oct. 15	Midterm review
	Oct. 17	**MIDTERM EXAM**
8	Oct. 21	*Worksheet*: Oscillations around minima
	Oct. 22	Lecture 17: Orbits I
	Oct. 24	Lecture 18: Orbits II
9	Oct. 28	Lecture 19: Orbits III (Assignment 6 due before class)
	Oct. 29	*Worksheet*: Effective potential energy and orbital properties
	Oct. 31	Lecture 20: Orbits and dark matter

10	Nov. 4 Nov. 5 Nov. 7	Lecture 21: Rotating reference frames (Assignment 7 due before class) *Worksheet*: Accelerating reference frames Lecture 22: Worked examples in rotating reference frames
11	Nov. 14 Nov. 18 Nov. 19	*Worksheet*: The Foucault pendulum Lecture 23: Intro to the two-body problem (Asst. 8 due before class) Lecture 24: Centre-of-mass reference frame
12	Nov. 21 Nov. 25 Nov. 26	Lecture 25: Elastic collisions I Lecture 26: Elastic collisions II (Assignment 9 due before class) Lecture 27: Dynamics of many particles
13	Nov. 28 Dec. 1 Dec. 2	Lecture 28: Rockets and tides Lecture 29: Restricted three-body problem Final exam review

CHANGES DUE TO UNFORESEEN CIRCUMSTANCES

The above schedule, policies, procedures, and assignments in this course are subject to change in the event of extenuating circumstances. In the event of significant changes, a revised outline will be posted/circulated.

UVIC GRADING SYSTEM – UNDERGRADUATE

As per the Academic Calendar:

Grade	Grade Point Value	Grade Scale	Description
A+ A A-	9 8 7	90 – 100% 85 – 89% 80 – 84%	**Exceptional, outstanding** and **excellent** performance. Normally achieved by a minority of students. These grades indicate a student who is self-initiating, exceeds expectation and has an insightful grasp of the subject matter.
B+ B B-	6 5 4	77 – 79% 73 – 76% 70 – 72%	**Very good, good** and **solid** performance. Normally achieved by the largest number of students. These grades indicate a good grasp of the subject matter or excellent grasp in one area balanced with satisfactory grasp in the other area.
C+ C	3 2	65 – 69% 60 – 64%	**Satisfactory**, or **minimally satisfactory**. These grades indicate a satisfactory performance and knowledge of the subject matter.
D	1	50 – 59%	**Marginal** Performance. A student receiving this grade demonstrated a superficial grasp of the subject matter.
F	0	0 – 49%	**Unsatisfactory** performance. Wrote final examination and completed course requirements; no supplemental.
N	0	0 – 49%	Did not write examination or complete course requirements by the end of term or session; no supplemental.

COURSE FEEDBACK

I greatly value your feedback on this course. Towards the end of term, as in all other courses at UVic, you will have the opportunity to complete an anonymous **Course Evaluation Survey (CES)** regarding your learning experience. The survey is important for providing feedback to me regarding the course and my teaching, as well as to help the department improve the overall program for students in the future. The survey is accessed online and can be done on your laptop, tablet, or mobile device. I'll remind you and provide you with more detailed information nearer the time, but please be thinking about this important activity during the course.

APPENDICES

DEPARTMENT OF PHYSICS AND ASTRONOMY INFORMATION

- **Department Website:** uvic.ca/science/physics/index.php
- **Department General Office:** physgen@uvic.ca
- **Department Undergraduate Advisor:** phast_advising@uvic.ca
- **Department Graduate Advisor:** pkovtun@uvic.ca
- **Department Graduate Program Assistant:** physgrad@uvic.ca

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UNIVERSITY STATEMENTS & POLICIES

- Academic Calendar: Information for All Students
- Creating a respectful, inclusive, and productive learning environment
- Accommodation of Religious Observance
- Accommodation and Access for Students with Disabilities
- Student Conduct
- Non-academic Student Misconduct
- Accessibility
- Diversity / EDI
- Equity Statement
- Sexualized Violence Prevention and Response
- Discrimination and Harassment Policy

STUDENT RESOURCES

POSITIVITY AND SAFETY

The University of Victoria is committed to promoting, providing, and protecting a positive and safe learning and working environment for all its members: Student Groups & Resources

ACADEMIC RESOURCES

UVic Library - *UVic Library offers many services and resources for undergraduate and graduate students*: uvic.ca/students/academics/library-services

Learning Resources - *UVic Learn Anywhere is the primary learning resource for students that offers many learning workshops and resources to help students with academics and learning strategies:* onlineacademiccommunity.uvic.ca/uviclearn/

Centre for Academic Communication - *Offers online and in-person one-on-one tutorials, workshops, and more:* uvic.ca/learningandteaching/cac

Math & Stats Assistance Centre - *Offers drop-in, face-to-face tutoring and a friendly, collaborative study space for 100- and 200-level math and stats courses:* uvic.ca/science/math-statistics/current-students/undergraduate/msac

MENTAL HEALTH & WELLNESS

A note to remind you to take care of yourself. Do your best to maintain a healthy lifestyle this semester by eating well, exercising, getting enough sleep, and taking some time to relax. This will help you achieve your goals and cope with stress. All of us benefit from support during times of struggle. You are not alone.

Student Wellness Centre - *Our team of practitioners offers a variety of services to support students' mental, physical, and spiritual health:* uvic.ca/student-wellness

Counselling Services - *Counselling Services can help you make the most of your university experience. They offer free professional, confidential, inclusive support to currently registered UVic students:* uvic.ca/student-wellness

Health Services - *University Health Services (UHS) provides a full-service primary health clinic for students and coordinates healthy student and campus initiatives:* uvic.ca/student-wellness

ACCESSIBILITY

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a documented disability or health consideration that may require accommodations, please feel free to approach me and/or the Centre for Accessible Learning (CAL) as soon as possible.

Centre for Accessible Learning - *The CAL staff are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations. The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.*

uvic.ca/accessible-learning

ADVISING

For academic advising-related questions, students in the Department of Physics and Astronomy are also encouraged to meet with one of the departmental Undergraduate Advisors (phast_advising@uvic.ca) as well as an academic advisor in the Academic Advising Centre early in their studies to help map out a plan to declare a major and complete university program requirements.

Academic Advising Centre - *Academic advice and support is currently available by phone, email and virtual or in-person appointments*. uvic.ca/services/advising

Ombudsperson - *The ombuds office is an independent, impartial, and confidential resource for undergraduate and graduate students and other members of the University of Victoria community. The ombudsperson helps resolve student problems or disputes fairly.* uvicombudsperson.ca

ACADEMIC CONCESSION

You can request an academic concession if your course requirements are affected by unexpected and unavoidable circumstances, or conflicting responsibilities. Concession requests can be for an in-course

extension, deferral, withdrawal under extenuating circumstances, or an aegrotat. Please speak to an advisor at the Academic Advising Centre if you have questions on how requesting a concession will affect your academic program.

Undergraduate Academic Concessions - uvic.ca/students/academics/academic-concessions-accommodations

EQUITY AND HUMAN RIGHTS AT UVIC

EQHR is a resource for students, staff, and faculty who have experienced sexualized violence, discrimination, and/or harassment and are looking for informal and/or formal resolution options as well as advice, coaching, and/or education. We are available for confidential consultations so that you can ask questions and learn your options.

EQHR – By email at eqhr01@uvic.ca or in-person (Sedgewick C115). uvic.ca/equity

Sexualized Violence Resource Office – *If you have been directly or indirectly impacted by sexualized violence, reach out to the SVRO for information, advice, and resolution options (restorative and disciplinary) as well as support options and referrals. The SVRO is both survivor-centred and trauma-informed in their approach. You can reach us by phone at 250-721-8021 or by email at eqhr01@uvic.ca to book either an in-person (Sedgewick C119) or online appointment.* uvic.ca/sexualizedviolence

RESOURCES FOR INTERNATIONAL STUDENTS

International Centre for Students - *The primary office supporting international students on campus at the university-wide level*. uvic.ca/international-experiences

UVic Global Community Initiative - *Provides various supportive programming, including a Mentorship Program and Conversation Partner Program*. uvic.ca/international-experiences/get-involved/uvic-global-community

RESOURCES FOR INDIGENOUS STUDENTS

Indigenous Student Support - *UVic offers holistic services to Indigenous students throughout their academic journey.* uvic.ca/students/info-for/indigenous-students

Elders in Residence - *The Office of Indigenous Academic and Community Engagement (IACE) has the privilege of assembling a group of Elders from local communities to guide students, staff, faculty, and administration in Indigenous ways of knowing and being.* uvic.ca/iace/