THE UNIVERSITY OF BRITISH COLUMBIA

Land Acknowledgement

We respectfully acknowledge the Syilx Okanagan Nation and their peoples, in whose traditional, ancestral, unceded territory UBC Okanagan is situated.

PHYS 216: Mechanics I

Faculty: Irving K. Barber Faculty of Science

Department: Computer Science, Mathematics, Physics, and Statistics

Instructor(s): Dr. Reza Khanbabaie

Instructor(s) Email: reza.khan@ubc.ca

Duration: Term 2 Winter 2022

Delivery Modality: In-Person

Course Location: ART 104

Course Days: Tue/Thu

Class Hours: 8:00 AM - 9:30 AM

Other Instructional Staff

1	Dakota McKeown, Seminar Leader
2	Dakota McKeown, Marker and course support

Course Description

Review of kinematics, Newton laws, angular momentum, and fixed axis rotation. Rigid body motion, central forces, non-inertial frames of reference. [3-0-1]

Prerequisite: One of MATH 100, MATH 116, and one of PHYS 111, PHYS 112.

Course Format

In-person lectures, seminars, and exams.

Course Overview, Content and Objectives

This is an intermediate course in mechanics that starts with introductory mechanics and builds a base for advanced mechanics.
We review introductory mechanics briefly and will build a base for an accessible treatment of classical mechanics.
Expectations: Active learning engagement in class is expected. I will do my best to present materials in the best way possible and expect that you take responsibility for your learning. Pre-reading (a few minutes before the class) is very recommended. Your contribution to the discussion in class and your ideas will be very appreciated. I will stimulate your brain to think innovatively and expect that you start thinking out of the box and bring new ideas for discussion in class.
Hands-On Project (HOP) is an extra credit work in that you can build a demo or a device to demonstrate the concepts of this course better or a useful device for everyday life, medical, or industrial field.

Learning Outcomes

Upon successful completion of this course, students will be able to…

Understand introductory Mechanics in more depth
Understand Kinematics in more depth
Understand Introductory Dynamics in more depth
Understand Angular Momentum, and Conservation of Angular Momentum in more depth
Analyze Central Force Motion, Orbital motion, and planetary motion
Understand Non-inertial Reference Frames, and motion in an accelerated reference frame
Get familiar with Lagrangians and Hamiltonians* (if time permits)

Assessments of Learning

Assignments 30%
Midterm exam (week 8th) 30% (Chapters 1, 2, 3, and 7)
Final exam (April 17-28) 40% (Chapters 7, 10, and 15. Lagrangians and Hamiltonians will NOT be part of the Final Exam)
Hands-On Project (Optional) up to 5% bonus

Learning Activities

Class participation, engaging in class discussions
Seminar participation, solving problems, engaging in seminar discussions and problem-solving

Pre-class and post-class reading
Working on Assignments and submitting them on-time
Participating in Hands-on Projects activities (optional)

Course schedule

Week	Dates	Subject / Activity
1	Jan 9 - 13	Brief Review of Introductory Concepts, Kinematics in 1D and 2D
2	Jan 16 - 20	Rotation about a Fixed Axis, Kinematics in 3D, Coordinate Systems
3	Jan 23 - 27	Newton Laws, Determining the Motion, Forces
4	Jan 30 to Feb 3	Angular Momentum and Torque, Conservation of Angular Momentum, Angular Momentum of a system of particles
5	Feb 6 - 10	Angular Momentum relative to center of mass, Moment of Inertia (Cut off for Midterm exam)
6	Feb 13 - 17	Central Force Motion, Kepler Laws, Central Forces, The Equation of Motion, Effective Potential Energy
7	Feb 20 - 24	Midterm Break
8	Feb 27 - Mar 3	Midterm Exam (Tuesday, Feb 28) The Equation of the Orbit, Equation of an Ellipse
9	Mar 6 - 10	Kepler Laws Revisited, Orbital Mechanics
10	Mar 13 - 17	The Hohmann Transfer Orbit, A Perturbed Circular Orbit, Resonances
11	Mar 20 - 24	Non-interrail Reference frames, Linearly Accelerating, Reference Frame, A Rotating Coordinate Frame, Fictitious Forces
12	Mar 27 - 31	The Coriolis Force, The Foucault Pendulum
13	Apr 3 - 7	Lagrangians and Hamiltonians*

14	Apr 10 -13	Lagrangians and Hamiltonians*
15 and 16	April 17-28 TBA	Final Exam

Late policy

No late Assignment will be accepted except for very urgent matters. It must be in coordination with the instructor.
If for any reason you haven't submitted an Assignment and the solutions for that Assignment were posted, you will get a zero for that Assignment. No exception.

Missed exam policy

All students must write the Midterm and the Final Exam.
Since the Final Exam will NOT be cumulative, it is not possible to transfer the Midterm weight to the Final Exam.
If in a really urgent matter you will be missing the Midterm exam, please let the instructor know in advance.

Missed Activity Policy:

If you missed an Assignment or Midterm Exam without a reason accepted by the instructor, you will receive a Zero for it.

Passing/Grading Criteria

You must get a total of at least 50% to pass the course.

Learning Materials

Requires textbook: Intermediate Dynamics, 2nd Edition, Partick Hamill, Cambridge University Press, 2022
Available at the UBCO bookstore.

Other useful resources include:
Classical Dynamics of Particles and Systems, 5th Ed. by Thornton & Marion
Analytical Mechanics, 7th Ed. by Fowles & Cassiday
Any other classical mechanics textbook
Any calculus-based first-year physics textbook

Learning Resources

Lectures
Instructor office hours
Seminar classes

Other Course Policies

Academic Integrity

The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work. Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise and harsh sanctions are imposed. **For example, incidences of plagiarism or cheating usually result in a failing grade or mark of zero on the assignment or in the course.** Careful records are kept to monitor and prevent recidivism.

A more detailed description of academic integrity, including the University's policies and procedures, may be found in the Academic Calendar at:
http://www.calendar.ubc.ca/okanagan/index.cfm?tree=3,54,111,0

Final Examinations

You can find the Senate-approved term and examination dates here. Except in the case of examination clashes and hardships (three or more formal examinations scheduled within a 27-hour period) or unforeseen events, students will be permitted to apply for out-of-time final examinations only if they are representing the University, the province, or the country in a competition or performance; serving in the Canadian military; observing a religious rite; working to support themselves or their family; or caring for a family member. Unforeseen events include (but may not be limited to) the following: ill health or other personal challenges that arise during a term and changes in the requirements of an ongoing job.

Further information on Academic Concession can be found under Policies and Regulation in the Okanagan Academic Calendar http://www.calendar.ubc.ca/okanagan/index.cfm?tree=3,48,0,0

Grading Practices

Faculties, departments, and schools reserve the right to scale grades in order to maintain equity among sections and conformity to University, faculty, department, or school norms. Students should therefore note that an unofficial grade given by an instructor might be changed by the faculty, department, or school. Grades are not official until they appear on a student's academic record.

http://www.calendar.ubc.ca/okanagan/index.cfm?tree=3,41,90,1014

Student Services Resources

Disability Resource Centre

The DRC facilitates disability-related accommodations and programming initiatives to remove barriers for students with disabilities and ongoing medical conditions. The DRC determines a student's eligibility for accommodations in accordance with the university's Policy LR7: Accommodations for Students with Disabilities. Students must register with the DRC to receive accommodations and the process of registering may take 2-4 weeks as the process consists of providing medical documentation and meeting with an Accessibility Advisor.

UNC 215 250.807.8053
email: drc.questions@ubc.ca
Web: students.ok.ubc.ca/drc

Equity and Inclusion Office

Through leadership, vision, and collaborative action, the Equity & Inclusion Office (EIO) develops action strategies in support of efforts to embed equity and inclusion in the daily operations across the campus. The EIO provides education and training from cultivating respectful, inclusive spaces and communities to understanding unconscious/implicit bias and its operation within in campus environments. UBC Policy 3 prohibits discrimination and harassment on the basis of BC's Human Rights Code. If you require assistance related to an issue of equity, educational programs, discrimination or harassment please contact the EIO.

UNC 325H 250.807.9291
email: equity.ubco@ubc.ca
Web: equity.ok.ubc.ca

Office of the Ombudsperson for Students

The Office of the Ombudsperson for Students is an independent, confidential and impartial resource to ensure students are treated fairly. The Ombuds Office helps students navigate campus-related fairness concerns. They work with UBC community members individually and at the systemic level to ensure students are treated fairly and can learn, work and live in a fair, equitable and respectful environment. Ombuds helps students gain clarity on UBC policies and procedures, explore options, identify next steps, recommend resources, plan strategies and receive objective feedback to promote constructive problem solving. If you require assistance, please feel free to reach out for more information or to arrange an appointment.

UNC 328 250.807.9818
Email: ombuds.office.ok@ubc.ca

Web: ombudsoffice.ubc.ca

Student Learning Hub

The Student Learning Hub is your go-to resource for free math, science, writing, and language learning support. The Hub welcomes undergraduate students from all disciplines and year levels to access a range of supports that include **tutoring in math, sciences, languages, and writing, as well as help with academic integrity, study skills and learning strategies**. Students are encouraged to visit often and early to build the skills, strategies and behaviours that are essential to being a confident and independent learner. For more information, please visit the Hub's website.

LIB 237 250.807.8491

Email: learning.hub@ubc.ca

Web: students.ok.ubc.ca/slh

Student Wellness

At UBC Okanagan health services to students are provided by Student Wellness. Nurses, physicians and counsellors provide health care and counselling related to physical health, emotional/mental health and sexual/reproductive health concerns. As well, health promotion, education and research activities are provided to the campus community. If you require assistance with your health, please contact Student Wellness for more information or to book an appointment.

UNC 337 250.807.9270

email: healthwellness.okanagan@ubc.ca

web: students.ok.ubc.ca/health-wellness

SAFEWALK

Don't want to walk alone at night? Not too sure how to get somewhere on campus? Call Safewalk at ***250-807-8076.***

For more information, see: www.security.ok.ubc.ca

Other Important Information

Cooperation vs. Cheating

Working with others on assignments is a good way to learn the material and we encourage it. However, there are limits to the degree of cooperation that we will permit. Any level of cooperation beyond what is permitted is considered cheating.
When working on programming assignments, you must work only with others whose understanding of the material is approximately equal to yours. In this situation, working together to find a good approach for solving a programming problem is cooperation; listening while someone dictates a solution is cheating. You must limit collaboration to a high-level discussion of solution strategies, and stop short of actually writing down a group answer. Anything that you hand in, whether it is a written problem or a computer program, must be written by you, from scratch, in your own words. If you base your solution on any other written solution, you are cheating. If you provide your solution for others to use, you are also cheating.

Grievances and Complaints Procedures

A student who has a complaint related to this course should follow the procedures summarized below:

- • The student should attempt to resolve the matter with the instructor first. Students may talk first to someone other than the instructor if they do not feel, for whatever reason, that they can directly approach the instructor.

If the complaint is not resolved to the student's satisfaction, the student should e-mail the Associate Head for Physics, Dr. Jake Bobowski at jake.bobowski@ubc.ca or the Department Head, Dr. W. John Braun at cmps.depthead@ubc.ca .

Student Services Resources

Sexual Violence Prevention and Response Office (SVPRO)

A safe and confidential place for UBC students, staff and faculty who have experienced sexual violence regardless of when or where it took place. Just want to talk? We are here to listen and help you explore your options. We can help you find a safe place to stay, explain your reporting options (UBC or police), accompany you to the hospital, or support you with academic accommodations. You have the right to choose what happens next. We support your decision, whatever you decide.
Visit svpro.ok.ubc.ca or call us at 250-807-9640