



Land Acknowledgement

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

HES 102: Biomechanics

Instructor: Chris McNeil

Instructor's Email: chris.mcneil@ubc.ca

Duration: Term 2 Winter 2023

Delivery Modality: In-Person

Course Location: FIP 204

Course Days: Wed/Fri

Class Hours: 08:00 - 09:30

Office hours: By appointment (please send an email to arrange a mutually acceptable time to meet)

Other Instructional Staff (Teaching Assistants)

- Vanessa Bulcock (vanessabulcock@gmail.com)
- Randall Chan (randall@student.ubc.ca)
- Paige Reekie (paige.reekie@ubc.ca)
- Claire Sweeney (claires8@mail.ubc.ca)

Course Description

Application of the elementary principles of physics and math to quantitative analysis of human movement. Analysis will also focus on the development of forces within muscles and their effect on initiating and controlling human movement (pertaining to exercise, physical activity, and rehabilitation). Formerly offered as HMKN 101. Credit will be granted for only one of HES 102 or HMKN 101. [3-0-0] Prerequisite: Registration limited to students in the B.H.E.S. program.

Course Overview, Content, and Objectives

The goal of this course is for students to gain an understanding of how the basic principles of physics may be combined with knowledge of the musculoskeletal system to form a basis for studying human movement. Examples of movement will include those pertaining to exercise and more general activities such as climbing stairs. The motion of objects in sports (e.g., a baseball) will also be investigated. The student should gain an understanding of the use of a quantitative analysis to explain how mechanical principles govern human motion.

Learning Outcomes

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

- 1) Understand how two-dimensional rigid-body dynamics can be used to quantify human motion
- 2) Grasp the cause-and-effect relationship between forces applied to an object and the resultant linear

or angular motion of the object

3) Perform mathematical analyses of complex human motion in two dimensions

Assessments of Learning

• Assignments (due January 24, February 7, March 1, March 15, and April 10)	30%
• Midterm 1 (February 9)	15%
• Midterm 2 (March 22)	20%
• Final Exam (sometime between April 15-26)	35%

Learning Activities

Lectures are structured to permit extensive practice solving the types of problems that will appear on assignments and exams. Students can work individually, but are encouraged to work together with those seated near to them to solve problems cooperatively. At times, questions will require that an answer be provided via the web-based version of iClicker.

Late policy

Assignments will be posted to Canvas, and **must be uploaded to Canvas prior to the start of the lecture one week later; i.e., before 08:05:00**. Any assignment received after the appointed time will be considered late and assessed the following penalties:

<24 hours: 20% deducted from grade

24–48 hours: 50% deducted from grade

>48 hours: a grade of zero

Missed exam policy

All exams will be a combination of multiple-choice, short answer and calculation questions. An equation sheet will be provided.

Midterm exams will be held during class time. When a midterm exam is missed, the student is required to contact the instructor as soon as possible. In the event of a medical reason, the School's Self Declaration Form must be completed, ideally prior to the exam. Without a valid reason for a missed exam, the student will receive a grade of zero. If there is a valid reason for the missed exam, the student may choose to: a) work with the instructor to schedule a make-up exam at the earliest opportunity; b) shift weighting of the midterm exam (15 or 20%) to the final exam; i.e., the final exam will be worth 50 or 55%. A known absence (e.g., a varsity sporting event) must be brought to the attention of the instructor as soon as the student is aware of the conflict.

The final exam is cumulative. It will take place during the exam period and, except for cases of an examination hardship / clash or academic concession, must be written at the scheduled time. Hence, students should not book travel until after the exam schedule has been published.

For all exams, students will be required to sign in and show their student card or a piece of government-issued photo ID.

Passing/Grading Criteria

- The teaching assistants do the marking for the course. If a student has a question/concern about the grade on an assignment or exam, the first step is to make an appointment with the teaching assistant who marked the work. If the matter cannot be resolved with the TA, email the instructor to make an appointment
- Unless there are exceptional circumstances, **students have 1 week from the date that assignments are returned (or exam grades are posted) to initiate the process of appealing a grade**
- The final grade of every student will reflect their actual performance during the term; i.e., there will be no rounding of grades (e.g., from 49% to 50% or 79% to 80%). To hand out extra marks here and there or offer additional assignments to select students would be unfair to the class as a whole and, in the grand scheme of things, would undermine the degree that each student is seeking

Learning Materials

Given the focus on practice problems, a scientific calculator is required for all lectures. Although entirely optional, students may find it helpful to bring a small ruler, a protractor, and graphing (a.k.a. grid or engineering) paper to assist in sketching problems accurately.

All electronic communication devices are strictly prohibited during exams, so a cell phone may not be used as a substitute for a calculator. If a programmable calculator (e.g., TI-84 Plus) is brought to an exam, the student will be required to reset the memory in the presence of the instructor or a teaching assistant. It is the responsibility of the student to know how to perform this task. If the student cannot reset the memory of a programmable calculator, the calculator will be confiscated for the duration of the exam.

Textbook:

McGinnis, Peter M., Biomechanics of Sport and Exercise. Human Kinetics Publishers

- 2nd (2004), 3rd (2013), or 4th (2021) edition will be fine.

Learning Resources

HES 102 is included in the Supplemental Learning (SL) program provided by the Student Learning Hub at UBCO. Details about your SL leader and the timing of sessions will be uploaded to Canvas as soon as the information is available.

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All materials of this course (course handouts, lecture slides, assessments, course readings, etc.) are the intellectual property of the Course Instructor or licensed to be used in this course by the copyright owner. Redistribution of these materials by any means without permission of the copyright holder(s) constitutes a breach of copyright and may lead to academic discipline.

Tentative Course Schedule and Required Readings

Date	Topic	Textbook
Wednesday, January 10	Course syllabus; math review	Introduction
Friday, January 12	Forces	Chapter 1
Wednesday, January 17	Forces; assignment 1 posted	Chapter 1
Friday, January 19	Forces & Linear kinematics	Chapters 1 & 2
Wednesday, January 24	Linear kinematics; assignment 1 due	Chapter 2
Friday, January 26	Linear kinematics & Linear kinetics	Chapters 2 & 3
Wednesday, January 31	Linear kinetics; assignment 2 posted	Chapter 3
Friday, February 2	Linear kinetics	Chapter 3
Wednesday, February 7	Review for midterm exam; assignment 2 due	
Friday, February 9	Midterm exam 1	
Wednesday, February 14	Work, power and energy	Chapter 4
Friday, February 16	Work, power and energy; assignment 3 posted	Chapter 4
Wednesday, February 21	Reading Week – no lecture	
Friday, February 23	Reading Week – no lecture	
Wednesday, February 28	Torques & moments of force	Chapter 5
Friday, March 1	Torques & moments of force; assignment 3 due	Chapter 5
Wednesday, March 6	Angular kinematics	Chapter 6
Friday, March 8	Angular kinematics; assignment 4 posted	Chapter 6
Wednesday, March 13	I am away for research – no lecture	
Friday, March 15	I am away at a conference – no lecture; assignment 4 due	
Wednesday, March 20	Review for midterm exam	
Friday, March 22	Midterm exam 2	
Wednesday, March 27	Angular kinetics	Chapter 7
Friday, March 29	Good Friday – no lecture	
Wednesday, April 3	Angular kinetics; assignment 5 posted	Chapter 7
Friday, April 5	Neuromuscular system	Chapters 11 & 12
Wednesday, April 10	Review for final exam; assignment 5 due	

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.

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](#).

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.

Further information on Grading Practices can be found in the [Okanagan Academic Calendar](#).

Student Service Resources:

Disability Resource Centre

The Disability Resource Centre (DRC) facilitates disability-related accommodations and programming initiatives to that ameliorate barriers for students with disabilities and/or ongoing medical conditions. If you require academic accommodations to achieve the objectives of a course please contact the DRC at:

UNC 215 250.807.8053

Email: drc.questions@ubc.ca

Web: www.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: www.equity.ok.ubc.ca

Office of the Ombudperson

The Office of the Ombudperson 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: www.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 behaviors 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: www.students.ok.ubc.ca/slh

Sexual Violence Prevention and Response Office (SVPRO)

The Sexual Violence Prevention and Response Office (SVPRO) is a confidential place for those who have been impacted by any form of sexual or gender-based violence, harassment, or harm, regardless of where or when it took place. SVPRO aims to be a safer space for all UBC students, faculty, and staff by respecting each person's unique and multiple identities and experiences. All genders and sexualities are welcome.

Nicola Townhome 120, 1270 International Mews 250.807.8053

Email: svpro@okanagan@ubc.ca

Web: www.svpro.ok.ubc.ca

Wellbeing and Accessibility Services (WAS)

Wellbeing and Accessibility Services (WAS) supports holistic student wellbeing in body, mind, and spirit. Students can access nurses, physicians and counsellors for health care and counselling related to physical health, emotional/mental health and sexual/reproductive health concerns. WAS is also home to the Disability Resource Centre, Spiritual and Multi-Faith Services, and Campus Health and Education. If you require assistance with your health, please contact Wellbeing and Accessibility Services for more information or to book an appointment.

UNC 337 250.807.9270

Email: healthwellness.okanagan@ubc.ca

Web: www.students.ok.ubc.ca/was

Walk-In Well-Being Clinic

The Walk-In Well-Being clinic offers no-fee, brief, single-session psychological services. Sessions are led by a doctoral student in clinical psychology and supervised by a registered psychologist (UBCO Faculty member). Clinicians can provide support with stress management, sleep, self-care, depression, anxiety, interpersonal issues, substance misuse, coping with academic demands/stressors, and provide options for connecting to additional resources. Virtual or in-person sessions are available at the UBCO Psychology Clinic, located in ASC 167 with or without an appointment, on Tuesdays and Thursdays between 10 am and 3 pm from September to June, excluding campus closures.

UNC 337 250.807.8421 (ext. 1)

Email: ipc.ok@ubc.ca

Web: <https://psych.ok.ubc.ca/psychology-clinic/walk-in-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**.

Web: www.security.ok.ubc.ca