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.

# HES 486: Muscle Fatigue

**Instructor:** Chris McNeil
**Instructor Email:** chris.mcneil@ubc.ca (please use this email address, not Canvas, to contact me)
**Duration:** Term 1 Winter 2026
**Delivery Modality:** In-Person
**Course Location:** ART 218
**Course Days:** Mon/Wed
**Class Hours:** 9:30-10:50 AM
**Office hours:** Appointments can be arranged by email (chris.mcneil@ubc.ca)

## Course Description

Physiological mechanisms within the central nervous system and muscle fibres which contribute to muscle fatigue. The influence of various factors (e.g., sex, age, disease) on muscle fatigue. Formerly offered as HMKN 415. It is recommended that students complete HES_O 340 prior to registering in this course. Credit will be granted for only one of HES 486 or HMKN 415 [3-0-0].
***Prerequisites***: Either (a) HES 240 or (b) HMKN 206; and either (a) HES 305 or (b) HMKN 310.

## Course Structure

This is a lecture-based course that has some lectures replaced by lab-based experiments to: i) gain firsthand experience with the concepts discussed during lectures; and ii) collect data for lab reports.

## Course Overview, Content, and Objectives

Muscle fatigue produced by physical activity is a common experience for healthy young people, and is magnified in many populations (e.g., patients with cancer, heart failure or chronic lung disease, stroke survivors, and the elderly) such that the performance of daily tasks can be limited. For this reason, there is considerable value in improving our understanding of its mechanisms. Hence, from a content perspective, the main objective of this course is to examine the elements of the neuromuscular system that contribute to fatigue-related impairments of motor function.

Beyond the scope of the specific content, the other primary objective of the course is to improve your ability to communicate concisely in written and oral formats. Regardless of your future career, you are likely to encounter situations when you have a limited number of words or amount of time to present information to peers, colleagues, or some other audience. As such, with detailed instruction and feedback, you will be given multiple opportunities to try the same task in order to build on your experiences and enhance critical communication skills.

## Learning Outcomes

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

1) Explain mechanisms at the level of the brain, spinal cord, and muscle fibres that contribute to the loss of force or power, and evaluate how the task performed influences the extent to which a mechanism contributes
2) Interpret neuromuscular data to determine the underlying physiological mechanisms
3) Differentiate between important and unimportant experimental details, and convey the relevant information clearly and concisely in a written format
4) Survey published literature, and, based on knowledge acquired during the course, develop a simple research proposal to study fatigue in a clinical population, the relevance of which can be clearly and concisely conveyed via a written document and during brief oral presentations
5) Communicate effectively in group discussions as well as collaborate both productively and respectfully with others to complete shared tasks

## Learning Materials

The course does not have a textbook; however, there will be readings posted to Canvas.

## Methods of Assessment

- Mid-term exam (LO1, LO2) – October 14 — 20%
- Lab report 1 (LO2, LO3) – October 19 (firm deadline) — 10%
- Lab report 2 (LO2, LO3) – November 25 (firm deadline) — 15%
- Research proposal (LO1, LO4, LO5) — 30%
    - 3-min presentation – October 28
    - 10-min presentation – December 2 or 7
    - Written proposal – December 9 (firm deadline)
- Final exam (LO1, LO2) – sometime between December 12-22 — 25%

## Late policy

For lab reports, a printed copy (brought to lecture) and an electronic copy (emailed to chris.mcneil@ubc.ca) are due at the start of class (i.e., 9:30am) on the date the report is assigned. As soon as you know an illness or other unexpected circumstance will prevent you from meeting a deadline, send me an email and complete the online HES self-declaration form. Without an approved form, assignments received after the appointed time will be considered late and assessed the following penalties:
<24 hours: 10% deducted from grade
24–48 hours: 50% deducted from grade
>48 hours: a grade of zero

## Use of artificial intelligence

The use of generative AI tools, including ChatGPT and other similar tools, to complete or support the completion of any form of assessment in this course (e.g., the written research proposal) is not allowed and would be considered academic misconduct.

## Missed exam policy

If you are ill or another extenuating circumstance arises that requires you to miss the midterm or final exam, contact me and complete the HES self-declaration form as soon as possible (i.e., before the start of the exam). With an approved form, we will work together to schedule a make-up exam. Without a valid reason, the exam will be given a grade of zero. Please note it is not possible to write a final exam early except under very exceptional circumstances and with approval of the HES undergraduate curriculum committee.

## Tentative Course Schedule and Learning Outcomes

| Date | Topic and/or Assessments | Learning Outcomes |
|---|---|---|
| Wed, Sept 9 | Course syllabus; introduction to fatigue | LO1 |
| Mon, Sept 14 | Central fatigue 1 | LO1, LO2, LO5 |
| Wed, Sept 16 | Central fatigue 2 | LO1, LO2, LO5 |
| Mon, Sept 21 | Central fatigue 3 | LO1, LO2, LO5 |
| Wed, Sept 23 | Central fatigue 4; prep for lab 1 | LO1, LO2, LO5 |
| Mon, Sept 28 | Lab 1 (group A) – **meet in ART 120 at designated time** | LO2, LO3, LO5 |
| Wed, Sept 30 | **National Day for Truth and Reconciliation – no class** | |
| Mon, Oct 5 | Lab 1 (group B) – **meet in ART 120 at designated time** | LO2, LO3, LO5 |
| Wed, Oct 7 | Lab results; discussion of lab report and research proposal; review for midterm exam | LO1, LO2, LO3, LO4, LO5 |
| Mon, Oct 12 | **Thanksgiving – no lecture** | |
| Wed, Oct 14 | **Midterm exam** | LO1, LO2 |
| Mon, Oct 19 | Peripheral fatigue 1; **lab report 1 due** | LO1, LO2, LO5 |
| Wed, Oct 21 | Peripheral fatigue 2 | LO1, LO2, LO5 |
| Mon, Oct 26 | Peripheral fatigue 3 | LO1, LO2, LO5 |
| Wed, Oct 28 | **Proposal presentations (3min)**; peripheral fatigue wrap-up; prep for lab 2 | LO1, LO2, LO4, LO5 |
| Mon, Nov 2 | Lab 2 (group B) – **meet in ART 120 at designated time** | LO2, LO3, LO5 |
| Wed, Nov 4 | Lab 2 (group A) – **meet in ART 120 at designated time** | LO2, LO3, LO5 |
| Mon, Nov 9 | **Reading Week – no class** | |
| Wed, Nov 11 | **Reading Week – no class** | |
| Mon, Nov 16 | COPD and fatigue; lab results | LO1, LO2, LO3, LO5 |
| Wed, Nov 18 | Sex-based differences and fatigue | LO1, LO2, LO5 |
| Mon, Nov 23 | Age-based differences and fatigue | LO1, LO2, LO5 |
| Wed, Nov 25 | Hypoxia and fatigue**; lab report 2 due** | LO1, LO2, LO5 |
| Mon, Nov 30 | In-class time to work on research proposal 10-min presentation and written document | LO4, LO5 |
| Wed, Dec 2 | **Final proposal presentations (10min)** | LO4, LO5 |
| Mon, Dec 7 | **Final proposal presentations (10min)** | LO4, LO5 |
| Wed, Dec 9 | Review for final exam; **written proposal due** | LO1, LO2, LO4, LO5 |

## *Other Course Policies:*

**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.

**UBC Values**

UBC creates an exceptional learning environment that fosters global citizenship, advances a civil and sustainable society, and supports outstanding research to serve the people of British Columbia, Canada, and the world. UBC's core values are excellence, integrity, respect, academic freedom, and accountability.

**About the Academic Integrity Matters (AIM) Program**

AIM is a program that provides help and supports with academic integrity (AI) issues for undergraduate and graduate students. Please contact aim.ok@ubc.ca for any questions or for a 1-on-1 appointment with an AIM consultant.

**Statement on Academic Misconduct**

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 may result in a mark of zero on the assignment or exam and more serious consequences may apply if the matter is referred to the President's Advisory Committee on Student Discipline. Careful records are kept in order to monitor and prevent recurrences.

A more detailed description of academic integrity, including the University's policies and procedures, may be found in the Academic Calendar.

**© Copyright Statement**

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.

## *Resources to Support Student Success:*

Visit the Student Support and Resources page to find one-on-one help or explore resources to support your experience at UBC Okanagan, as well as many other campus services available to all students.

**Disability Resource Centre**

The Disability Resource Centre (DRC) facilitates disability-related accommodations and programming initiatives to that remove 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**
Phone: 250.807.8053
Email: drc.questions@ubc.ca
Web: https://students.ok.ubc.ca/academic-success/disability-resources/

**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.

**ADM 100B & 100C**
Phone: 250.807.9291
Email: equity.ubco@ubc.ca
Web: https://equity.ok.ubc.ca/

**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**
Phone: 250.807.9270
Email: healthwellness.okanagan@ubc.ca
Web: https://students.ok.ubc.ca/health-wellness/

**Office of the Ombudperson**

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 217**
Phone: 250.807.9818
Email: ombuds.office.ok@ubc.ca
Web: https://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**
Phone: 250.807.8491
Email: learning.hub@ubc.ca
Web: https://students.ok.ubc.ca/academic-success/learning-hub/

**The Global Engagement Office**

The Global Engagement Office provides advising and resources to assist International students in navigating immigration, health insurance, and settlement matters, as well as opportunities for intercultural learning, and resources for Go Global experiences available to all UBC Okanagan students, and more.

**UNC 227**
Email: ubco.global@ubc.ca
Web: https://students.ok.ubc.ca/about-the-avp-students-portfolio/directory/global-engagement-office/

**Safewalk**

Don't want to walk alone? Not too sure how to get somewhere on campus? Call Safewalk at **250-807-8076**.
Web: https://operations.ok.ubc.ca/security-and-emergencies/safewalk/