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 488: Cortical Control of Movement

Faculty: Faculty of Health and Social Development
Department: Health and Exercise Sciences
Instructor: Dr. Brian Dalton
Instructor Email: brian.dalton@ubc.ca
Duration: Term 1 Winter 2026
Delivery Modality: In-Person
Course Location: ART 218
Course Days: Monday/Wednesday
Class Hours: 15:30 – 17:00
Office hours: By appointment

Course Description

Cortical events associated with sensation and motor planning associated with goal-directed movement. Particular focus on plasticity associated with disease and injury. Formerly offered as HMKN 413. Credit will be granted for only one of HES 488 or HMKN 413. [3-0-0]
Prerequisite: Either (a) HES 202 or (b) HMKN 202; and either (a) HES 240 or (b) HMKN 206; and either (a) HES 340 or (b) HMKN 205.

Course Structure

All course activities are designed for in-person delivery with some asynchronous activities (e.g., videos, readings, assignments). The course is structured with an emphasis on student engagement (e.g., discussion, presentations and interactive activities) in combination with traditional-based learning mediums (e.g., exams and written assignments). Course content will be available via readings and online videos. Application of the course concepts will occur during active discussion sessions during scheduled class times.

All course activities will be delivered in-person and resource materials will be delivered online, which will consist of a mix of asynchronous and synchronous components. On the Friday morning preceding each week, course content will be posted to Canvas via brief (10-15 min) lecture recordings and/or assigned readings. Weekly scheduled course meetings, will emphasize student engagement and participation via synchronous in-person discussions involving small and large groups that will be facilitated by the instructor.

Course Overview, Content and Objectives

The overall objective of this course is to provide a scientific foundation of the cortical and neural control of movement. The course will emphasize the study of movement disorders and intervention strategies through the integration and application of neurophysiological principles.

In this course, we will discuss the clinical manifestations and underlying physiological mechanisms of selected movement disorders as it relates to the cortex and central nervous system. There will be an emphasis on the role of scientific experiment in diagnostic and treatment techniques.

Canvas:
The majority of course information will be conveyed via the course Canvas site. Please review default Canvas notification settings. In addition to this syllabus, such things as important announcements, readings, handouts, and other course-related materials will be available via Canvas.

Learning Outcomes or Objectives (LOs)

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

1	Explain the anatomy and physiology within the sensorimotor system that is important for human movement
2	Identify the neuromuscular physiological origins of a number of different movement disorders
3	Distinguish and determine the link between the physiology of specific movement disorders and the motor symptoms experienced
4	Evaluate and discuss the efficacy of rehabilitation/intervention strategies to ameliorate or treat certain movement disorders, including the physiological mechanisms underlying the strategies
5	Evaluate primary literature related to the mechanisms and rehabilitation/intervention strategies of specific movement disorders and formulate a recommendation on the effectiveness of specific intervention strategies

Methods of Assessment

Description of Assessment	Learning outcome(s) being assessed
Participation and Professionalism (10%)	LO1-5
Reading and In-class Assignments (10%)	LO4-5
Mid-Term Exam 1 (15%)	LO1
Mid-Term Exam 2 (15%)	LO2-3
Written Project (25%)	LO1-5
Oral Presentation and Discussion (25%)	LO1-5

Late policy

Assignments are due at the specified due date and time indicated on the course outline or Canvas; after that, unless specified by your instructor, the assignment will be considered late. It is expected that you will budget your time accordingly to avoid work overload and manage personal issues to meet academic performance requirements. Be aware of when your work is due as it is common to have several exams and assignments due on the same day or within the same week. If an assignment is submitted greater than 24 hours late, 25% will be deducted from the grade and it will not be accepted after 7 days. *Throughout the semester students will be granted 3 "freebies" for all minor assessments* (e.g., reading assignments, peer evaluations, participation).

Learning Materials

All learning materials will be uploaded to Canvas and available via the course's Canvas website.

GenAI Usage

The expectations for GenAI use in this course are designed to support your learning. Some activities require you to develop skills through your own practice and process. For these activities, the use of GenAI tools to complete or substantially generate submitted work is not permitted because the learning comes from engaging directly in the process.

Other uses of technology or learning supports may be appropriate where identified. If you are unsure whether a particular use of GenAI is consistent with course expectations, please ask before submitting your work.

Missed exam policy

A make-up exam will be provided for any missed mid-term exam owing to a reasonable circumstance. The make-up exam will be written outside of class time at a specified date and time. A total of three "freebies" will be granted throughout the semester for any minor assessments (e.g., missed/late reading assignments or peer evaluations).

Course Schedule

Week/Date	**Topic**	**Readings**
Week 1 Sept 10	Week 1-1: Introduction	Week 1-1: Review HES 202 notes
Week 2 Sept 14	Week 2-1: Neuromuscular physiology overview	Week 2-1: Review HES 202 notes
Sept 16	Week 2-2: Critical evaluation of media and scientific reports	Week 2-2: Woloshin & Schwartz, 2006; Uman, 2011; Yu et al. 2026
Week 3		

Sept 21	Week 3-1: Brain areas involved in movement disorders - Basal Ganglia	Week 3-1: Chapter 43 of Kandel ER et al. Principles of Neural Science, 2013.
Sept 23	Week 3-2: Brain areas involved in movement disorders - Cerebellum	Week 3-2: Chapter 42 of Kandel ER et al. Principles of Neural Science, 2013.
<u>Week 4</u> Sept 28	Week 4-1: Brain areas involved in movement disorders - Vestibular system **Partner and presentation date selection**	Week 4-1: Wardman DL, Fitzpatrick RC. Sensorimotor Control of Movement and Posture, 2002. Lam CK et al. Brain and Behavior, 2017. Thompson TL, Amedee R. The Ochsner Journal, 2009.
Sept 30	Week 4-2: National Day for Truth and Reconciliation (No Class)	
<u>Week 5</u> Oct 5	Week 5-1: Brain areas involved in movement disorders - Vestibular system **Reading Assignment Due**	Week 5-1: Wardman DL, Fitzpatrick RC. Sensorimotor Control of Movement and Posture, 2002. Lam CK et al. Brain and Behavior, 2017. Thompson TL, Amedee R. The Ochsner Journal, 2009.
Oct 7	Week 5-2: Brain areas involved in movement disorders - Motor cortex	Week 5-2: Daniel Wolpert: The real reason we have brains
<u>Week 6</u> Oct 12	Week 6-1: Thanksgiving (No Class)	Week 6-1: TBD
Oct 14	Week 6-2: **Mid-term Exam 1**	Week 6-2: Review course material
<u>Week 7</u> Oct 19	Week 7-1: Cannabis and motor control	Week 7-1: TBD
Oct 21	Week 7-2: Excitotoxicity	Week 7-2: Velasco M et al. J Neurol Neurosci, 2017.
<u>Week 8</u> Oct 26	Week 8-1: Peripheral Neuropathy **Reading Assignment Due**	Week 8-1: Martyn CN, Hughes RAC. Neuroepidemiology, 1997. Sun Y et al. Acta Neurologica, 2005. Watanabe T. J Neurological Sci, 1994.

Oct 28	Week 8-2: Spasticity **Reading Assignment Due**	Week 8-2: Graham LA. Age and ageing, 2013.
<u>Week 9</u> Nov 2	Week 9-1: Project preparation - Neurophysiological description of disorder **In-class assignment due**	Week 9-1: Readings pertaining to your research topic
Nov 4	Week 9-2: Tremor **Reading Assignment Due**	Week 9-2: Jankovic J, Fahn S. Annals of internal medicine, 1980.
<u>Week 10</u> Nov 9	Week 10-1: Reading Week (No Class)	
Nov 11	Week 10-2: Remembrance Day (No Class)	
<u>Week 11</u> Nov 16	Week 11-1: **Mid-term Exam 2**	Week 11-1: Review Course Material
Nov 18	Week 11-2: Project preparation - Evaluation of intervention **In-class assignment due**	Week 11-2: Readings pertaining to your research topic
<u>Week 12</u> Nov 23	Week 12-1: Student-Led Topic 1 Student-Led Topic 2 **Reading Assignment Due** **Peer Evaluation Due**	Week 12-1: TBD – provided by students
Nov 25	Week 12-2: Student-Led Topic 3 Student-Led Topic 4 **Reading Assignment Due** **Peer Evaluation Due**	Week 12-2: TBD – provided by students
<u>Week 13</u> Nov 30	Week 13-1: Student-Led Topic 5 Student-Led Topic 6 **Reading Assignment Due** **Peer Evaluation Due**	Week 13-1: TBD – provided by students

Dec 2	Week 13-2: Student-Led Topic 7 Student-Led Topic 8 **Reading Assignment Due** **Peer Evaluation Due**	Week 13-2: TBD – provided by students
Week 14 Dec 7	Week 14-1: Student-Led Topic 9 Student-Led Topic 10 **Reading Assignment Due** **Peer Evaluation Due**	Week 14-1: TBD – provided by students
Dec 9	Week 14-2: Student-Led Topic 11 Student-Led Topic 12 **Reading Assignment Due** **Peer Evaluation Due**	Week 14-2: TBD – provided by students

UBC Policies & Resources

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. Visit UBC Okanagan's Academic Calendar for a list of campus-wide regulations and policies, as well as term dates and deadlines.

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 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 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.

Resources to Support Student Success:

UBC Okanagan Disability Resource Centre

The DRC facilitates disability-related accommodations and programming initiatives to remove barriers for students with disabilities and ongoing medical conditions. If you require academic accommodations to achieve the objectives of a course please contact the DRC at:
Email: drc.questions@ubc.ca
Web: www.students.ok.ubc.ca/drc

UBC Okanagan 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.
Email: equity.ubco@ubc.ca
Web: www.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.
Email: healthwellness.okanagan@ubc.ca
Web: www.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.
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 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.
Email: learning.hub@ubc.ca
Web: www.students.ok.ubc.ca/slh

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.
Email: ubco.global@ubc.ca
Web: www.students.ok.ubc.ca/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: www.security.ok.ubc.ca