THE UNIVERSITY OF BRITISH COLUMBIA
SCHOOL OF KINESIOLOGY
COURSE SYLLABUS

Program: Kinesiology	**Term/Year:** 2023WT2: January – April 2024
Course #: **KIN 419** (*Formerly KIN 357*), Section 001	**Course Title:** Laboratory Investigations in Neuromechanical Kinesiology
Day/Time: Tue: 9:30 – 10:50 am Wed: 10:00 am – 12:00 pm Wed: 12:00 pm – 2:00 pm Wed: 2:00 pm – 4:00 pm	**Location(s):** Tue: LSK (Leonard S. Klinck) 460 Wed: G1 Kinesiology Learning Ctr, Osborne Unit #2 (OSB2)
Instructor: Dr. Romeo Chua **Office:** 205 Osborne Centre Unit 2 **Lab:** Perceptual-Motor Dynamics Lab **Email:** romeo.chua@ubc.ca **Hours:** during labs or by appointment	**Teaching Assistants:** Gregg Eschelmuller **Email:** gregg.eschelmuller@ubc.ca Solenne Villemer **Email:** solennev@student.ubc.cca **Hours:** during labs or by appointment

COURSE DESCRIPTION

Integration and application of laboratory principles and techniques for experimental investigations of topics in Neuromechanical Kinesiology, including human sensorimotor control, neurophysiology, and biomechanics.

The objective of this laboratory course is to provide students with an opportunity to gain hands-on experience with tools and techniques related to Neuromechanical Kinesiology. Each lab activity is designed around a basic research question drawn from topics within the areas of Neuromechanical Kinesiology. KIN 419 draws upon the empirical frameworks offered by motor control, neurophysiology, and biomechanics, with particular emphasis on a neuromechanical analysis of movement.

PREREQUISITES AND/OR COURSE RESTRICTIONS

Enrolment is restricted to students with 3rd year standing or higher standing in Kinesiology.

COURSE FORMAT

The course will consist of one lecture and one 2-hour lab session per week.

Lectures/Discussions will be held in classroom LSK 460.

Labs will be held in the Kinesiology Learning Centre (OSB2 G1 – Neuro-Mechanical Kinesiology Section).

Students are expected to attend the lectures and complete all labs.

Course Canvas Site: http://canvas.ubc.ca

GENERAL LEARNING OBJECTIVES

As part of the general learning objectives of this course, students will:

1. Apply skills and techniques essential and applicable to neuromechanical kinesiology.
2. Demonstrate a conceptual understanding of the elements of the human cognitive, neural, and mechanical systems.
3. Apply knowledge of anatomy, physiology, and psychology to describe human movement and motor control in anatomical, mechanical, and neuro-behavioural terms.
4. Demonstrate knowledge of data collection and analysis techniques related to behavioural response measurements, electromyography, kinetic and kinematic analysis, and other methods typically employed in laboratory investigations related to Neuromechanical Kinesiology.
5. Demonstrate personal and social responsibility towards class and laboratory participation.
6. Facilitate active learning, critical thinking, and problem-solving skills in the analysis of human movement.

Additional, and more detailed, learning objectives will be presented during class.

LABORATORY LECTURE AND ACTIVITIES

The objective of the labs is to provide students with an opportunity to gain hands-on experience with tools and techniques related to Neuromechanical Kinesiology. Each lab activity is designed around a basic research question or technique drawn from topics within the areas of human sensorimotor control, neurophysiology, and biomechanics.

A lecture-discussion and lab handout/assignment are associated with each lab activity. The lecture-discussion is intended to provide some of the background and theory content for the laboratory investigation. The lab is used to carry out the laboratory activity (apparatus set-up, data collection, data analysis). The weekly discussion and lab handouts will provide a background and description of the lab activity, as well as an outline of the type of information (e.g., questions, data, presentation of results, discussion) that students are expected to obtain, complete, and submit in lab assignments.

Laboratory assignments, consisting of a brief description of the background and purpose of the lab, methods and procedures, presentation of data, and the results of each lab, as outlined in lab handouts **must be completed weekly and submitted individually for each lab** by the deadline designated for each lab. Lab assignments will be submitted through CANVAS.

All material covered in the weekly discussions, labs, as well as assigned Lab Readings, will be **evaluated in written exams**.

Students are expected to understand the concepts and research methodologies involved, the rationale underlying the methodologies, the research equipment, the data collection and analyses, the nature of the data, and the links between background concepts and experiment. **Students are responsible for all labs and assignments. There are no make-up labs**. If a student misses a lab for any reason, it is their responsibility to know what was done in the lab, obtain data from a classmate, and complete the assignment.

LEARNING MATERIALS

Class notes and lab handouts will be made available through the course website. Students are **required** to bring these notes and printed copies of lab handouts to class. Students are expected to review the lab handouts prior to the lab.

A research article will accompany each lab and is intended to provide an example of the application of the lab techniques to a research question in areas related to Neuromechanical Kinesiology. Content from these articles, with respect to the basic question, experimental methods and protocols, and basic results will be covered in the exams.

LEARNING ASSESSMENTS

Assessment 1	**Lab Participation, Assignments, Project**
Format	Attendance, participation, completion of lab activities and assignment.
Details	Students are expected to attend, participate, and complete each lab. For each lab, a lab assignment that consists of a brief description of the lab, background and methods, presentation of lab results and completion of lab questions must be submitted individually.
Due Date	Assignments are due by **5:00 pm on the Tuesday** following the lab, unless otherwise indicated. No exceptions.
Learning Outcomes	To demonstrate an understanding of fundamental laboratory concepts, techniques, and data collection and presentation.

Assessment 2	**Written Exams (2)**
Format	Short answer questions
Details	Students will be required to answer concept, application, methodology, and procedure questions based on the prescribed lectures, laboratory activities, and assigned research articles.
Learning Outcomes	To demonstrate an understanding of the fundamental theoretical principles, laboratory concepts and techniques in the neuromechanical study of human movement.

Evaluation

Lab Participation:	3%	
Lab Assignments:	35%	
Lab Project:	7%	April 17, 2024
Exam 1:	25%	February 27, 2024
Exam 2:	30%	Final Exam Period

Students must write all exams. Failure to write an exam will result in a mark of zero for that exam. Failure to submit a lab assignment will result in a mark of zero for that assignment.

The weightings from lab participation and exams will be used to convert raw marks to a final grade percentage at the completion of the course. There will be no reallocation of assessment weightings. Exams will not be rescheduled for any reason other than a medical issue or family emergency. Written documentation must be presented for the test to be rescheduled. If you do not contact your instructor, you will be given a score of zero on the assessment.

LABORATORY PLAN

Note: *The specific topic for each week may be subject to change.*

Date	***Activity***
January 10	Introduction to MATLAB **
January 17	Data Acquisition and Signal Processing
January 24	Basics of Electromyography
January 31	Human Stretch Reflexes
February 7	Long-Latency Stretch Reflex
February 14	Electromyographic Patterns of Movement
February 21	**Reading Week**
February 27	**In-class Midterm**
February 28	Anticipatory Postural Responses
March 6	Postural Sway and Centre of Pressure
March 13	Muscle Vibratory Illusion
March 20	Prism Adaptation
March 27	Stimulus-Response Compatibility
April 3	Lab Project
April 10	Lab Project / Open Lab
April 17	**Lab Project Due**

**** Students are expected to use MATLAB for this course. Data analyses and generation of data figures will be performed in MATLAB.**

**** Install the MATLAB Base, and the Signal Processing Toolbox.**

MATLAB is free for UBC students.
For information on how to install MATLAB, or use an online web-based version, see:
https://it.ubc.ca/news/matlab-free-ubc-students
https://ubc.service-now.com/kb_view_customer.do?sysparm_article=KB0015540
https://www.mathworks.com/products/matlab-online.html

Note that you will first have to register your eligibility at:
https://ubc.service-now.com/kb_view.do?sysparm_article=KB0016447

IMPORTANT – For MATLAB access, ensure your contact email is a **UBC domain email.** Students must have their @student.ubc.ca email address in their SSC contact email field (click here for instructions).

TOPICS and READINGS

Basics of Data Acquisition

Introduction to MATLAB

https://www.mathworks.com/learn/tutorials/matlab-onramp.html
https://www.youtube.com/watch?v=7f50sQYjNRA

Introduction to Basic Data Acquisition, LabChart Software

Basics of Data Acquisition ADInstruments
Introduction to LabChart 8 for Windows (reference)

Electrophysiological Measures of CNS Responses

Basics of Electromyography in Kinesiology (for reference only)

McManus L, et al (2020). Analysis and Biophysics of Surface EMG for Physiotherapists and Kinesiologists: Toward a Common Language with Rehabilitation Engineers. *Frontiers in Neurology*, *11*, 1-25.

Reflex Connections - The Human Stretch Reflex

Horslen BC, et al. (2013). Effects of postural threat on spinal stretch reflexes: evidence for increased muscle sensitivity. *Journal of Neurophysiology*, *110*, 899-906.

Reflex and Voluntary Response Interaction – The Long Latency Reflex

Kurtzer IL, et al. (2008). Long-latency reflexes of the human arm reflect an internal model of limb dynamics. *Current Biology, 18*, 449-453.

Motor Preparation of Goal-Directed Movements

Control of Rapid Voluntary Movements – Electromyographic Patterns of Movement

Cooke JD & Brown SH (1990). Movement-related phasic muscle activation II: Generation and functional role of the triphasic pattern. *Journal of Neurophysiology*, *63*, 465-472.

Anticipatory Postural Responses during Voluntary Movement

Dufosse M, et al. (1985). Postural forearm changes induced by predictable in time or voluntary triggered unloading in man. *Experimental Brain Research*, *60*, 330-334.

Kasai T & Kawai K (1994). Quantitative EMG analysis of APAs of voluntary contraction of leg muscles in standing man. *Electroencephalography and Clinical Neurophysiology*, *93*, 184-187.

Sensorimotor Integration

Control of Posture and Balance – Postural Sway and Centre of Pressure

Carpenter MG et al (2001). Sampling duration effects on centre of pressure summary measures. *Gait and Posture*, *13*, 35-40.

Muscles Spindles and Position Sense – The Muscle Vibratory Illusion

Eschelmuller et al. (2023). The effects of periodic and noisy tendon vibration on a kinesthetic targeting task. *Experimental Brain Research*. *Online Nov 2023.*

Sensorimotor Integration and Adaptation – Prism Adaptation

Champod AS et al (2014). Development of a new computerized prism adaptation procedure for visuo-spatial neglect. *Journal of Neuroscience Methods*, *235*, 65-75.

Cognition, Perception, and Perceptual-Motor Translation

Stimulus-Response Compatibility

Chen J, & Proctor RW (2012). Up or down: Directional S-R compatibility and natural scrolling. *Proceedings of the Human Factors and Ergonomics Society*, *56*, 1381-1385.

UNIVERSITY POLICIES

Regular attendance is expected of students in all their classes (including lectures, laboratories, tutorials, seminars, etc.). Students who neglect their academic work and assignments may be excluded from the final examinations. Students who are unavoidably absent because of illness or disability should report to their instructors on return to classes.

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all their actions.

Details of the policies and how to access support are available on the UBC Senate website (https://senate.ubc.ca/policies-resources-support-student-success).

IMPORTANT DATES

Last date for withdrawal without a W on your transcript: January 22, 2024.

Last date for withdrawal with a W instead of an F on your transcript: March 1, 2024

IN-TERM CONCESSION

If you need to apply for academic concession for in-term work, apply online through Kin Advising: Academic Concession: In-Term Work.

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