

THE UNIVERSITY OF BRITISH COLUMBIA
SCHOOL OF KINESIOLOGY
COURSE SYLLABUS

Program: Kinesiology Course #: KIN 311 (Formerly KIN 330), Section 001 Day/Time: Tue/Thu 8:00 am – 9:20 am Instructor: Dr. Romeo Chua, Professor Office: 205 Osborne Centre Unit 2 Hours: by appointment Phone: 604-822-1624 Email: romeo.chua@ubc.ca	Term/Year: September – December 2022 Course Title: Sensorimotor Control of Human Movement Location(s): Woodward IRC 5 Teaching Assistants: Heather Pudwell, BKin (heather.pudwell@ubc.ca) Annika Szarka, BKin (annika.szarka@ubc.ca) Hours: during tutorials / by appointment
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COURSE DESCRIPTION

Central to the relation between brain and behaviour is the problem of how movements are organized and controlled. The scientific field of study concerned with this problem is generally known as Motor Control. Students of motor control have available to them a variety of approaches with which to examine the nature of movement organization and control. These approaches to the study of motor control occur at different levels of resolution, requiring different perspectives, and utilizing different concepts and tools. At a biomechanical level, the student seeks to understand the physical basis for movement and the mechanical factors, or rules that govern human movement. At a neurophysiological level, the student seeks insights into the neuronal machinery and the functional neural interactions that underlie motor control. At a behavioural level, the student seeks to understand the processes underlying movement without reference to their physical instantiation.

KIN 311 draws upon the frameworks offered by neurophysiology, biomechanics, experimental psychology, and cognitive neuroscience, with particular emphasis on a behavioural analysis of movement. The focus of this course is upon the mechanisms and principles which govern sensorimotor control as well as the research methods commonly used in motor control research. Students of this course will gain an understanding of the current state of knowledge and its development, and an appreciation of several contemporary issues in motor control.

PREREQUISITES AND/OR COURSE RESTRICTIONS

Enrolment is restricted to students with 3rd year or higher standing in Kinesiology. KIN 311 builds directly on the foundations established in KIN 211 (formerly KIN 230) and assumes knowledge covered in KIN 211.

COURSE FORMAT

The course will consist of two lectures per week with supplementary tutorials.

Tutorials times will be posted on the Canvas course site. The instructor and TA will be available for assistance during tutorials. Tutorial hours will provide students the opportunity to seek assistance.

GENERAL LEARNING OBJECTIVES

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

1. Discuss major theoretical issues in the field of sensorimotor neuroscience.
2. Discuss fundamental principles and concepts in the study of human sensorimotor control.
3. Discuss how methods from psychology and neuroscience are used to study sensorimotor control.
4. Discuss factors that influence information processing and motor preparation.
5. Discuss the neurophysiological correlates of motor preparation.
6. Discuss feedback and feedforward processes in sensorimotor control and adaptation.
7. Discuss the dissociation between perception and action in visual-motor control.
8. Discuss dynamical systems principles in the study of sensorimotor coordination.
9. Discuss the rationale of research methods and the links between theory and experiment.
10. Facilitate active learning, critical thinking, and problem-solving skills in the study of human sensorimotor control.

Additional, more detailed, learning objectives will be presented during lectures.

LEARNING ASSESSMENTS

Mid-Term Exam 1 Lectures Sept 8 – Oct 4; Readings 1 – 3	October 6, 2022	20%
Mid-Term Exam 2 Lectures Oct 4 – Nov 3; Readings 4 – 7	November 15, 2022	30%
Final Examination All Lectures; Readings 8 – 11	December 11-22 Exam Period	50%

The Mid-term and Final Exams will consist of short answer and open-ended questions and will cover lecture material and assigned lecture readings. The Final Exam will be cumulative and inclusive of all lecture material covered in the course.

Students are required to write all exams. Mid-term exams will not be rescheduled for any reason. Failure to write an exam will normally result in a mark of zero for that exam.

Mid-term exam weightings can be re-weighted to the Final Exam only if a student applies and is approved for an [Academic Concession for In-Term Work](#) through the Kin Advising Office.

If a student does not contact the instructor and provide the approved concession for absence from a Mid-term, a score of zero will be given on the assessment.

Note that the University sets the date for the Final examination. This course will adhere to the date set by the University. As per University regulations, there will be no exceptions to the date of the Final.

The exam weightings will be used to convert raw marks to a final grade percentage at the completion of the course.

GENERAL COURSE TOPICS AND SEQUENCE**Lectures*****Introduction***

Motor Behaviour and Information Processing Framework – A Review

Sensorimotor Transformations in Response Selection and Preparation

[Readings: 1 – 3]

Principles of Stimulus-Response Compatibility and Cognitive Translation
Electrophysiological Indices of Response Selection and Preparation

Sensorimotor Transformations in Perceptual-Motor Integration

[Readings: 4 – 6]

Sensorimotor Integration and the Reafference Principle
Forward and Inverse Computational Models in Motor Control
Internal Models and Sensorimotor Adaptation

Sensorimotor Transformations in Visual-Motor Control

[Readings: 7 – 9]

Visual Systems for Perception and Action
Dissociations between Perception and Action
Intentional and Automatic Processes in Visual-Motor Control

Sensorimotor Constraints in Perceptual-Motor Coordination

[Readings: 10 – 11]

Degrees of Freedom Problem
Coordination Dynamics: A Dynamical Systems Approach
Dynamics of Inter-Limb Coordination

LEARNING MATERIALS

There is no required textbook for KIN 311. Required readings will be in the form of research articles that can be downloaded from the library or through Canvas. Students are responsible for assigned readings. The readings contain more material than can be covered directly in class. Students are responsible for this material, and it will be tested on exams.

Required Readings

1. Kunde W, et al. (2007). Spatial compatibility effects with tool use. *Human Factors*, 49, 661-670.
2. Falkenstein M, et al. (2006). Effects of stimulus-response compatibility in Parkinson's disease: a psychophysiological analysis. *Journal of Neural Transmission*, 113, 1449-1462.
3. Reuter EM, et al. (2015). Age-related differences in corticomotor facilitation indicate dedifferentiation in motor planning. *Experimental Gerontology*, 65, 79-84.
4. Diedrichsen J, et al. (2003). Anticipatory adjustments in the unloading task: Is an efference copy necessary for learning? *Experimental Brain Research*, 148, 272-276.
5. Blakemore SJ, et al. (2001). The cerebellum is involved in predicting the sensory consequences of action. *Neuroreport*, 12, 1879-1884.
6. Sarlegna FR et al. (2010). Force-field adaptation without proprioception: Can vision be used to model limb dynamics? *Neuropsychologia*, 48, 60-67.
7. Striemer CL, et al. (2009). "Real-time" obstacle avoidance in the absence of primary visual cortex. *Proceedings of the National Academy of Sciences*, 106, 15996-16001.
8. Day BL, & Brown P. (2001). Evidence for subcortical involvement in the visual control of human reaching. *Brain*, 124, 1832-1840.
9. Grea H, et al. (2002). A lesion of the posterior parietal cortex disrupts on-line adjustments during aiming movements. *Neuropsychologia*, 40, 2471-2480.
10. Ponsen MM, et al. (2006). Bimanual coordination dysfunction in early untreated Parkinson's disease. *Parkinsonism and Related Disorders*, 12, 246-252.
11. Salter JE, et al. (2004). Perceptual and motor contributions to bimanual coordination. *Neuroscience Letters*, 363, 102-107.

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

IMPORTANT DATES

Last date for withdrawal without a W on your transcript: September 19, 2022.

Last date for withdrawal with a W instead of an F on your transcript: October 28, 2022

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 ([Policies and Resources to Support Student Success](#)).

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COVID-19 INFORMATION

Provincial Health Orders and UBC policy recommends masks in all indoor spaces on campus.

You are encouraged to wear a non-medical mask during our class meetings, for your own protection and for the safety and comfort of everyone else in the class. For our in-person meetings in this class, it is important that all of us feel as comfortable as possible engaging in class activities while sharing an indoor space. Non-medical masks that cover our noses and mouths are a primary tool for combating the spread of Covid-19.

[Please maintain a respectful environment.](#)

If you are sick, it is important that you STAY HOME. Complete a self-assessment for Covid-19 symptoms here: [BC COVID-19 Self-Assessment Tool](#).

If you miss class because of illness:

- Make a connection early in the term to another student or a group of students in the class. You can help each other by sharing notes.
- Consult the class resources on Canvas and refer to Syllabus on exam policies.
- If you are concerned that you will miss a key activity due to illness, contact the instructor to discuss.

If you are feeling ill and cannot attend class for an in-class assessment, please email the instructor right away.

If you are feeling ill at the time of a Final Exam, DO NOT attend the exam. You must apply for deferred standing ([Academic Concession: Final Exam](#)) through Kin Academic Advising. Students who are granted deferred standing (SD) will write the Final Exam at a later date.

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](#).
