

School of Kinesiology
Faculty of Health Sciences
University of Western Ontario
KIN 3480A - Movement Neuroscience
Fall 2018

Course instructor: Dr. Matthew Heath
School of Kinesiology
University of Western Ontario
2369 Somerville House
Email: mheath2@uwo.ca

Office Hours: TBD.

Course Information:

Course Number/Name: KIN 3480A, Movement Neuroscience
Course Meeting Information: 12:30 – 1:20 pm: M, W, and F
Location: TBD
Course Website: <https://owl.uwo.ca/portal>

Calendar Course Description:

This course is designed to provide students with an intermediary level and multi-disciplinary understanding of movement neuroscience. Topics include nervous system structures involved in planning, control and learning of movement, as well as the neurocognitive principles of movement. Students will also be introduced to neuro-pathology (e.g. Parkinson's disease) and the relationship to motor impairment.

Instructor's Course Description:

This course is designed to provide students a multidisciplinary understanding of movement neuroscience. Topics covered include: (1) the nervous system structures involved in the planning, control and learning of movement, (2) the neuro-cognitive principles of movement, and (3) neuropathology (e.g., Alzheimer's disease, ataxia, concussion, Down syndrome, Parkinson's disease, stroke) and motor impairment.

Anti-requisite(s)!Pre-requisite(s)!Co-requisite(s)

You are responsible for ensuring that you have successfully completed all course pre-requisites, and that you have not taken an anti-requisite course.

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

Learning Objectives:

- i. To understand the structure and function of the nervous system. Emphasis will be devoted to central and peripheral nervous systems mechanisms involved in the production and regulation of voluntary and involuntary human movement.
- ii. To understand the behavioural, physiological and clinical tools used to study movement neuroscience.
- iii. To understand how the dynamic interplay between the nervous system and the physical environment influences movement.
- iv. To understand the principal components associated with the regulation of movement (e.g., visual, proprioceptive, and vestibular control).
- v. To understand the cognitive mechanisms influencing movement.

Course Materials:

Course materials (e.g., Course Outline, Lecture Overheads) are available via OWL – you are responsible for downloading and printing these materials. Overheads should not be considered a replacement for class lectures. Supplementary reading materials will be assigned during regular class hours and it is your responsibility to retrieve these materials at the library or via electronic medium when available. No course text is assigned in this class.

Course Methods of Evaluation and Assignments:

Course evaluation involves tests, article summaries and an oral presentation (see description below). Grades will be rounded according to the scientific method. Grades for this class will be posted exclusively via the OWL grade book; i.e., I will not release grades via other medium.

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|--|-----|
| i. Test #1 (Friday, October 12) | 15% |
| ii. *Test #2 (Friday, November 9) | 15% |
| iii. Final Exam (TBA) | 25% |
| iv. Oral Presentation (Wednesday, November 21) | 25% |
| v. *Article summaries | 20% |

*Test #2 is a take-home test. It will be assigned Friday, November 9 and is due at the beginning of class on Monday, November 12. **Note: up until the end of the second week of class the instructor reserves the right to change test dates, the number of article summaries and the distribution of grades across all assignments.**

University Grading Policy

A+	90-100	<i>One could scarcely expect better from a student at this</i>
A	80-89	<i>Superior work that is clearly above average</i>
B	70-79	<i>Good work, meeting all requirements and eminently</i>
C	60-69	<i>Competent work, meeting requirements</i>
D	50-59	<i>Fair work, minimally acceptable.</i>
F	below 50	<i>Fail</i>

Assistance with Class Material:

1. The preferred means for students to get assistance with course material is to ask questions during lectures. Remember, it is unlikely that you are the only one with the question/problem.
2. A second option is to ask me during office hours. It is also possible to contact me via email; however, bear in mind that I am not always able to respond promptly to email queries.
3. It is the student's responsibility to obtain ancillary lecture notes/materials when they have missed a class (i.e., students must get this information from a colleague in the class).

Missing Tests/Exams or Assignment Deadlines

Students do miss exams and/or assignment deadlines due to illness or other uncontrollable emergencies. If this happens, the following steps should be taken:

1. **Lateness/Absences.** Assignments are due on the assigned due date and will not be accepted late without penalty, except under medical or other compassionate circumstances. Submitting a late assignment without appropriate documentation will result in the grade deductions as specified in the Lab Assignments section (see below). Appropriate documentation for assignments worth 10% or less should be submitted to the Undergraduate office. A missed test or examination without appropriate documentation will result in a grade of zero (0). The course policy **is not to allow make-ups for scheduled tests**, nor to assign a grade of Incomplete without acceptable and verifiable medical (or equivalent compassionate) reasons. Acceptable reasons might include hospital stays, serious illness, family emergencies (like serious accidents or illness, death) or similar circumstances.
2. **Written documentation.** Whenever possible, students who require academic accommodation should provide notification and documentation in advance of due dates, examinations, etc. stating specific reasons and dates. Students must follow up with their professor and their Academic Counselling office in a timely manner. Documentation for medical requests (which should be obtained at the time of the initial consultation with the physician or walk-in clinic) for accommodation, must be submitted directly within two business days after the end date on the documentation, to the appropriate Academic Counselling office of the student's Faculty/School of registration (e.g., KIN students will submit documentation to the KIN Undergraduate Office), not to the instructor. An "Accommodation Consideration Request Form" found online or in the Kinesiology Undergraduate Office" for ALL accommodation requests must be submitted into the appropriate Academic Counselling office of the student's Faculty/School of registration. These documents will be retained in the student's file, and will be held in confidence in accordance with the University's Official Student Record Information Privacy Policy. https://www.uwo.ca/fhs/kin/undergrad/files/accommodation_request.pdf
3. **Grades.** Where possible assignment objectives and rubrics will be posted on OWL. Should you have a concern regarding the grade you received for an assignment or feel that it is unfair in any way, you must wait 24 hours from the receipt of the assignment to approach the instructor or TA. In doing so, please make an appointment and prepare in writing, with evidence, why you feel your grade is inappropriate. Please be aware that in requesting a grade reassessment, your grade could go up/down/or stay the same. Note that calculations errors (which do occur!) should be brought to my attention immediately. 15% of course grades will be posted by the last day to drop a course.

4. If you are to miss a test/exam due to a sanctioned university varsity or club team event then you must notify the instructor at least 48 hours in advance of the test and provide official documentation for your team/club event. **Failure to provide at least 48 hours advance notification (via email) combined with failure to write the test/exam will result in a grade of zero. In addition, the student (and not the coach) must contact the course instructor.**
5. **Make-up tests are not rescheduled.** If a student provides an authorized reason for missing a test, then their grade will be determined based on the cumulative grade associated with completed labs and tests. If a test is missed without a valid reason, then a grade of zero will be applied.
6. All laboratory assignments are to be uploaded to OWL on the date specified. **There are no exceptions to this policy.** Computer problems or other “situations” apart from medical and/or compassionate reasons do not represent justification for a late lab. Hardcopy submitted labs will receive a grade of zero.
7. A student must complete at least one of the mid-term tests. Failure to complete at least one of the mid-term tests will be considered as not meeting the course requirements and will result in a grade of Incomplete.

NOTE: in the above “test” and “exam” are used interchangeably.

Academic Dishonesty:

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf.

You must read the document identified in the aforementioned web link. Ignorance of what constitutes plagiarism or other offenses of academic dishonesty may not be used as an excuse in this class.

In particular students are required to fully understand the term plagiarism and why protecting against this act represents an important academic process. **In this class, any exam/test/assignment with an identified breach of academic misconduct (plagiarism, cheating etc.) will receive a grade of zero. Moreover, the case will be reported to the appropriate Dean or Director’s Office and handled via the university-wide resolution policy (see website above for details).**

Regarding assigned written work: *All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).* NOTE: THIS INSTRUCTOR – AND NOT TEACHING ASSISTANTS – WILL GRADE ALL ASSIGNMENTS. HENCE, BE ABSOLUTELY CERTAIN TO PRESENT WORK WRITTEN IN YOUR OWN WORDS.

Regarding computer-marked multiple choice tests and exams: *Computer-marked multiple-choice tests and/or exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.*

Regarding oral presentations: It is your duty to ensure that assigned oral presentations represent your own original work and compilation of research ideas. That means all slides and visual information presented during your presentation should be solely created and constructed by you (see the instructor for possible exceptions). Any presentation found to contain information that is not original will receive a grade of zero and the case will be reported to the appropriate Dean or Director's Office and handled via the university-wide resolution policy.

Posting class materials (i.e., lecture notes) to an online cite are subject to copyright laws as indicated by the recent Supreme Court of Canada ruling of Bill C-11 (the following is a somewhat layperson description of this ruling:

<http://www.michaelgeist.ca/content/view/6616/125/>).

Disruptive Behavior:

To protect the rights of all students to learn in an uninterrupted setting, students are expected to conform to the instructor's standard of appropriate classroom decorum. Students who disrupt the academic process will be asked to leave class, and may be involuntarily withdrawn from the course for repeated or serious offenses (see Handbook of Scholastic Discipline for Undergraduate Students:

<http://www.uwo.ca/univsec/pdf/board/code.pdf>).

In this class examples of disruptive behavior include:

1. Eating in class.
2. Entering class late or leaving early. If you ABSOLUTELY have to enter late or leave early make sure you do so via the doors at the back of the room.
3. Talking to your neighbor during class. I strongly urge you to refrain from this activity. **Note: in the past students have been involuntarily withdrawn from the course due to frequent in-class talking. I will provide individual students with one warning involving in-class talking. A second offense will be reported to the Dean/Director's Office for academic sanction, or sanctions. My typical recommendation in such a case is that the student be involuntarily withdrawn from the course.**
4. The usage of electronic equipment other than that specifically enhancing the learning environment is not permitted. Thus, if you are taking class notes with your computer that is fine; however, if you are observed using your computer for other purposes (e.g., internet browsing, playing computer games etc.) you may be asked to leave the class and your actions will be reported to the Dean/Director's office for academic sanction, or sanctions.
5. **THE USE OF CELL PHONES/IPODS/MP3 PLAYERS ETC. IS NOT PERMITTED. PLEASE BE CERTAIN YOUR CELL PHONE HAS BEEN TURNED OFF PRIOR TO ENTERING CLASS.**

- 6. ELECTRONIC EQUIPMENT - OF ANY KIND - IS NOT PERMITTED DURING EXAMS.**
- 7. AUDIO AND/OR VIDEO RECORDING OF CLASS CONTENT IS NOT PERMITTED UNLESS YOU HAVE SOUGHT, AND BEEN PROVIDED, WRITTEN PERMISSION FROM THE INSTRUCTOR.**

English Proficiency for the Assignment of Grades:

Visit the website <http://www.uwo.ca/univsec/handbook/exam/english.pdf>

Support Services:

There are various support services around campus and these include, but are not limited to:

1. Student Development Centre -- <http://www.sdc.uwo.ca/ssd/>
2. Student Health -- <http://www.shs.uwo.ca/student/studenthealthservices.html>
3. Registrar's Office -- <http://www.registrar.uwo.ca/>
4. Ombuds Office -- <http://www.uwo.ca/ombuds/>

Students who are in emotional/mental distress should refer to Mental Health@Western <http://www.uwo.ca/uwocom/mentalhealth/> for a complete list of options about how to obtain help.”

Course Content:

I frequently supplement course lectures with required readings. Readings may be posted to OWL and will be assigned on a class-by-class basis. Also, I will frequently present materials (i.e., research articles) that are not included in lecture overheads, thus attending class is your best bet for academic success.

A. Introduction to Movement Neuroscience

1. Neuroscience techniques.
 - Behavioural
 - EMG
 - neuroimaging
 - rTMS
 - single cell recording

B. The Nervous System

1. Structure and Function of the Central Nervous System
 - Cortex
 - Basal ganglia, brain stem and cerebellum
 - Spinal cord
2. Structure and Function of Peripheral Nervous & Neuromuscular Systems
 - The motorneuron
 - The motor unit
 - Muscle spindles

<http://www.med.harvard.edu/AANLIB/home.html>

<http://www.waiting.com/brainanatomy.html>

<http://www.pbs.org/wnet/brain/3d/index.html>

- C. Cognitive-Motor and Neurobehavioral Factors in Human Movement Control
 - 1. Attention
 - 2. Memory

- D. Fundamentals of Motor Control
 - 1. Sensory Contributions to Motor Control
 - 2. Central Contributions to Motor Control
 - 3. Principles of Simple Movements

- E. Neuro-motor impariments:
 - 1. Apraxias
 - 2. Ataxia (cortical and cerebellar)
 - 3. Parkinson's
 - 4. Alzheimer's
 - 5. Hemiballismus
 - 6. Huntington's Disease
 - 7. Neglect and alien hand disorder

Bi-weekly Article Assignments (20% of Final Grade)

Every other Friday of the semester the class I will assign an original research article to review (the completed summary is due one week from the date of assignment). The article will outline a major research theme for the upcoming lecture week and will serve to facilitate class discussion. As part of this reading, you will be responsible for completing a two-page written summary of the article (Note: your write-up will not exceed a two-page specification). The format of the write-up will entail double-spacing with margins set at one-inch and will include Times New Roman 12 point font and will be double-sided (i.e., you can hand in a SINGLE sheet of paper). Your written summary will discuss not only major findings from the assigned work (i.e., methodology/technique/theoretical implications) but also address other work that has direct bearing on the assigned topic area (i.e., you will have to complete additional readings to supplement your knowledge). Moreover, your written summary will be succinct and clear and demonstrate an advanced understanding of the extant topic area. As such, summaries will be graded for the effectiveness and efficiency of writing (50% of grade) and for demonstrating competence in the topic area (50% of grade). Please be aware that any summary in which only a cursory attempt is provided at writing and/or understanding the content area will be given a grade of zero. In a nutshell, significant effort is expected in the completion of this section of the course. **The tentative dates that articles will be assigned are September 14, September 28, and November 16.**

Oral Presentation

Oral presentations will begin approximately November 23rd and will be 15 minutes in duration. As such, there will be approximately 15 groups and there will be three group presentations per class. The presentation will cover a pertinent or emerging area specific to the neuroscience of human movement. For example you can select a specific theoretical area of movement neuroscience (e.g., reaching and grasping) and provide a presentation of relevant and recent research in that area. Alternatively, you may select a movement disorder (e.g., apraxia, dystonia) and discuss the neuro-motor consequences associated with that disorder. The format of the presentation will entail PowerPoint/Keynote slides or other similar media.

Information for your presentation should be compiled via a combination of scientific text and original research articles. I recommend the use of PubMed to research your topic area (see web link below). I strongly discourage the use of web-based mediums such as Wikipedia or google; these websites are not fully vetted for factual correctness.

Pub Med: <http://www.ncbi.nlm.nih.gov/sites/entrez?db=pubmed>

The grading rubric for evaluation of oral presentations is presented on the following page. You will also receive written feedback from your peer group. **Note: due to class size it is necessary that presentations will be completed in groups (4 persons per group).**

GENERAL TOPIC

SPECIFIC SAMPLE TOPICS

Reaching and grasping	Separate cortical visual pathways for perception and action
Posture	The impact of H-reflex training in the elderly and postural regulation
Timing	The role of the cerebellum in the timing of movement
Force control	The neural regulation of force output for volitional tasks
Learning	How the central nervous system “learns” new movement
Storage	The ability of the central nervous system to retain movement-related information
Eye-movement	Neural underpinnings of smooth and saccadic eye movement
Dystonia	The pathology and behavioural outcome
Apraxia	The pathology and behavioural outcome.
Ataxia	The pathology and behavioural outcome.
Parkinson’s	The pathology and behavioural outcome.

Presentation Evaluation: KIN 3480A

Presenter: _____ Topic: _____

Scale: 1- missing 2 – needs work 3-satisfactory 4-good 5-excellent

Organization

- | | | |
|--------------------------------------|--|-----|
| 1. Introduction | Presenter explains topic and subject of thesis clearly. | [] |
| 2. Body | Body points are simple, clear, and logically support the focus of the presentation. | [] |
| 3. Transitions and sequencers | Transitions and sequencers are used to bridge major points (i.e., from one topic to another) and minor points in the presentation. | [] |
| 4. Visual Aids | Visual aids clearly relate to and support the major points of the presentation. | [] |
| 5. Conclusions | Presenter provides a concise summary of the major components/ramifications associated with their presentation. | [] |

Delivery

- | | | |
|--------------------------|--|-----|
| 1. Speaking level | Speaking level is loud and confident enough for the audience. | [] |
| 2. Pacing | Speaking style is natural, calm, and clear. Presenter ensures the audience that they understand each point. | [] |
| 3. Eye Contact | Presenter maintains continuous eye contact with the audience. | [] |
| 4. Gestures | Presenter uses gestures to highlight major points. | [] |

Content

- | | | |
|---------------------------|---|-----|
| 1. Well researched | Presenter provides clear evidence of evaluation of extant research. | [] |
| 2. Expertise | Presenter demonstrates developing expertise in topic area. | [] |
| 3. Questions | Presenter readily able to address audience-based questions. | [] |

General Comments

- 1. Overall strength(s) of this presentation.**
- 2. Overall weakness/weaknesses of this presentation.**
- 3. What could be done to significantly improve this presentation?**