

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

Course instructor: Dr. Matthew Heath
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Office Hours: TBA

Course Information:

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

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) neuro-pathology (e.g., Alzheimer's disease, ataxia, concussion, Down syndrome, Parkinson's disease, stroke) and their relationship to motor impairment.

Course 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.

i. Test #1 (TBA)	15%
ii. *Test #2 (TBA)	15%
iii. Final Exam (TBA)	25%
iv. Oral Presentation (TBA)	25%
v. Article summaries	20%

*Test #2 is a take-home exam. It will be TBA and is due at the beginning of class on TBA.

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.

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. Inform the course instructor in writing (mheath2@uwo.ca) on or before the assignment deadline or test date of your problem (see exception below). It is the student's responsibility to acquire appropriate documentation (doctor's note, death certificate, etc.). The documentation must be provided to your Academic Counsellor in the School of Kinesiology. Documentation must be provided within the first 48 hours after the test/exam/assignment date or a grade of zero will be recorded.
2. If medical, see a physician on or before the assignment deadline or test date to get the necessary documentation verifying your illness.
3. Medical exemptions are not automatic (e.g., having a headache on the day of an assignment may still result in a grade of zero if the assignment is not completed at the specified time).
4. Under no circumstances is a computer "problem" a valid reason for a missed assignment or presentation. If you have a computer "problem" your assignment and/or presentation will be subject to normal late assignment penalties (i.e., a grade of zero for that test/assignment/presentation).
5. If you plan to miss a test or an assignment for a sanctioned university

extracurricular club and/or team event you must inform the instructor (and provide official documentation) of your pending absence one week prior to the test/exam/assignment. Failure to document such an absence will result in a grade of zero for the missed assignment.

6. Make-up tests are not rescheduled. If a student provides an authorized reason for missing a test, the percentage of their remaining tests will be re-weighted. If a test is missed without a valid reason, then a grade of zero will be applied.
7. **Final Exam Accommodations:** An accommodation for a final exam must be cleared via an Academic Counselor in the School of Kinesiology.
8. If a valid reason is provided for missing the Oral Presentation deadline, then the student will be required to give their presentation on the last day of the assigned presentation period (see below for details).
9. Missing a test/assignment/presentation without a valid reason will result in a grade of zero.

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 the following Web site: <http://www.uwo.ca/univsec/handbook/appeals/scholoff.pdf>.

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 - GRADES 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). 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/PAGERS/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.**

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
 - *r*TMS
 - 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 motoneuron
 - 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 topic and specific readings will be assigned on a basis of overall class flow. **The specific due dates for each assignment will be specified in class.**

Oral Presentation

Oral presentations will begin approximately November 30th 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). Also, and in addition to my evaluation of the group presentation, students will provide a peer evaluation of their individual group members.**

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?**