



# HK\*3100 Neuromuscular Physiology

Winter 2023

Section(s): C01

Department of Human Health and Nutritional Sciences

Credit Weight: 0.50

Version 1.00 - January 09, 2023

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## 1 Course Details

### 1.1 Calendar Description

Normal muscle movement is controlled by the motor cortex or by reflexes within the context of the sensory environment. This course will introduce key concepts in motor control of mammalian, human movement, coordination of movement, motor program selection, motor program execution, motor unit recruitment, skeletal muscle excitation-contraction coupling. This course is required for students wishing to gain certification by the Ontario Kinesiology Association.

**Pre-Requisites:**

1 of BIOM\*3200, HK\*3810, ZOO\*3600

**Restrictions:**

Restricted to BSCH.HK and NEUR majors/minors.

### 1.2 Course Description

This course presents key concepts about the control and coordination of human movement through an examination of neurophysiological and functional neuroanatomical processes.

### 1.3 Timetable

Lecture: Monday, Wednesday, Friday 11:30-12:20 (in person)

This course has required in-person (face-to-face) components. Some lectures may also be delivered synchronously online. Lecture recordings will not be posted. Midterm and final examinations will be conducted in person. Students who have not submitted their vaccination status to the university portal or have not received an exemption (with regular testing) to be on campus are not eligible to register in any course with a required in-person component or assessment.

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format

of course offerings and academic schedules. Any such changes will be announced via CourseLink and/or class email. All University-wide decisions will be posted on the COVID-19 website (<https://news.uoguelph.ca/2019-novel-coronavirus-information/>) and circulated by email.

## 1.4 Final Exam

Exam time and location is subject to change. Please see WebAdvisor for the latest information.

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## 2 Instructional Support

### 2.1 Instructional Support Team

<b>Instructor:</b>	Leah Bent
<b>Email:</b>	lbent@uoguelph.ca
<b>Office:</b>	ANNU 373

### 2.2 Teaching Assistants

<b>Teaching Assistant (GTA):</b>	Michael Apollinaro
<b>Email:</b>	mapollin@uoguelph.ca
<b>Office Hours:</b>	By email appointment

<b>Teaching Assistant (GTA):</b>	Kristen De Melo
<b>Email:</b>	demelok@uoguelph.ca
<b>Office Hours:</b>	By email appointment

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## 3 Learning Resources

### 3.1 Recommended Resources

#### HK\*3100 Course Package (Other)

- Available in the Guelph Book Store by request
- This package is a collection of selected chapters from Kandel: Principles of Neural Science [4<sup>th</sup> edition] and Enoka: Neuromechanics of Human Movement [3<sup>rd</sup> edition].
- The readings complement the material presented in class, and should be the first place to go for clarification of course concepts.
- Please note that some lecture material will not be covered in the readings and the readings may go into the details not covered in lecture.
- Additional mandatory readings will be posted on CourseLink throughout the

semester.

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## 4 Learning Outcomes

Neuromuscular physiology is a broad scientific discipline, which includes many topics and sub-topics. It is impossible to cover them all in detail in a brief, twelve-week course. The goal of this course is to introduce foundational concepts in this field while providing an opportunity for deeper exploration/discussion on specific topics of interest.

### 4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. Develop an appreciation of the current scientific understanding in the field of neuromuscular physiology and some of the questions which remain unanswered
  2. Be able to integrate knowledge from different research areas to evaluate neuromuscular concepts
  3. Have increased scientific literacy; strengthened through critical evaluation of the strengths and weaknesses of primary research in the field of neuromuscular physiology
  4. Become a more proficient scientific writer (with a focus on using clear, concise, scientific language)
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## 5 Teaching and Learning Activities

This course employs a learner-centered approach to facilitate a deep understanding of the many aspects of human neuromuscular physiology. Independent learning along with group discussions are important features of this course. Course material is presented in lecture and complemented with assigned journal articles and supplementary course package readings. To encourage lecture attendance and peer-collaboration, incomplete lecture slides will be provided on CourseLink prior to each lecture. The discussion board will be a key source of peer, TA and instructor support. Independent learning will be assessed through a literature critique assignment, which provides an opportunity for you to critically assess primary literature in the neuromuscular field. The midterm and final exam will test your understanding of the lecture material and assigned readings through both topic specific and integrative questions.

### 5.1 Course Topics

- MUSCLE AND MOTOR UNITS  
Structure, function, recruitment, fatigue
- SOMATOSENSORY RECEPTORS

Muscle spindle, golgi tendon organ, skin (cutaneous) receptors, joint receptors  
Kinesthesia, proprioception

- SPINAL CORD NEUROPHYSIOLOGY
  - Spinal reflex loops
  - Stretch reflexes, long loop reflexes, influences within the spinal cord
  - Central pattern generators
- POSTURE, BALANCE AND LOCOMOTION
  - The vestibular system
  - Motor & postural control strategies
  - Where does sensory input fit in?
- HIGHER LEVEL CONTROL
  - Motor cortex and sensory cortex
  - The cerebellum
  - The basal ganglia
  - Cortical pathways

## 5.2 Courselink Discussion Board

- Topic Summary: At the end of each lecture topic (highlighted above) you will be encouraged in lecture to independently reflect upon: i) key concepts you learned ii) concepts that need more clarification and iii) areas that you want to learn more about and to post them on the discussion board. TAs and the instructor will monitor and respond to these points clarifying areas of confusion. Common areas will form the basis of future review lectures.
- Exam Question Brainstorm: A great way to learn is to think like a teacher! A discussion thread will be created for you to come up with, and provide answers to your own exam questions. You will have access to other students' questions/answers and are encouraged to provide your own thoughts. 5% of the midterm and final exam marks will be taken from questions presented on the discussion board (pending adequate participation).

## 6 Assessments

### 6.1 Assessment Details

#### Article Summary (5%)

**Due:** Fri, Jan 27, 11:59 PM

A written overview of the journal article that was chosen for the critique. The summary will be 350 words and should be different than the paper's abstract as your summary should

focus on methodology and why the findings are significant. This exercise is to ensure that each student is comfortable with the information in their chosen article before setting out to write the review. This assignment addresses learning objectives 1 - 4.

### **Prep Quiz #1 (10%)**

**Due:** Mon, Jan 30 - Fri, Feb 3, 11:59 PM, Complete on Courselink

- These quizzes are strategically placed to keep you engaged in the material as we move through topics.
- The quizzes will test your knowledge of material covered in class, in a quiz like format.
- These will be completed on courselink. The dates and times the quizzes are open and closed will be announced in class and posted on courselink. Make sure to check your courselink portal frequently.
- The quizzes will consist of multiple-choice questions randomly chosen from a list of questions.
- These Prep quizzes are OPTIONAL. If you do not write the Quiz, the grade will automatically be assigned to your Midterm grade for Quiz#1 and to the final grade for Quiz #2.
- Quizzes address learning objectives 1-3

### **Critique Outline (5%)**

**Due:** Mon, Feb 13, 11:59 PM

Using a template provided to you, you will outline a plan of **at least three key points** that will be discussed in your critique. This could include (and is not limited to) points that support or challenge the methods chosen, support or challenge of the results and the interpretation of the results. With each critique point, you will also provide a list of sources you plan to cite to support your points and justification. This assignment addresses learning objectives 1-4.

### **Midterm Exam (20%)**

**Date:** TBA (in person, outside of class time), TBA (in person)

- The midterm addresses learning objective 1-3
- The midterm is worth 20-30% depending on if you write Quiz #1. If you do not write Quiz #1, the midterm grade is worth 30%

### **Journal Article Review (20%)**

**Due:** Fri, Mar 17, 11:59 PM

- This deadline is the absolute latest this item will be accepted without penalty.
- If handed in late a 10% penalty applies per day.  
I encourage you to try and submit early.
- This assignment provides you an opportunity to 1) read and evaluate primary

literature in the neuroscience field as well as 2) gain experience in scientific writing. You will select from six journal articles provided during the first week of class. Three are designated topics from the first half of the course, as their topics will be discussed in lecture before the midterm, while the other three are designated for the latter half.

- There will be an equal number of students critiquing each article so you may not get your first choice. They are distributed as a first come-first serve basis. To choose an article you must sign onto CourseLink and select the article that you prefer. Once the max number of students has chosen a specific article, it will no longer be available for selection.
- The critique will be a maximum of five double spaced pages and must include a minimum of five additional primary references. **DO NOT LEAVE THIS ASSIGNMENT TO THE WEEK BEFORE IT IS DUE!!** It requires thorough planning and extensive research of the scientific field.
- This assignment is designed to be flexible, providing room for you, the author, to structure the critique as you see fit. However; within this flexibility there are formatting guidelines, which need to be followed. Within these guidelines you are encouraged to be creative in exploring the literature and have fun working on this assignment. There is a detailed description of the Journal Article Critique assignment including guidelines and a marking rubric provided on CourseLink.
- The written critique addresses learning objectives 1-4

### **Prep Quiz #2 (10%)**

**Due:** Mon, Mar 20 - Fri, Mar 24, 11:59 PM, Complete on Courselink

- These quizzes are strategically placed to keep you engaged in the material as we move through topics.
- The quizzes will test your knowledge of material covered in class, in a quiz like format.
- These will be completed on courselink. The dates and times the quizzes are open and closed will be announced in class and posted on courselink. Make sure to check your courselink portal frequently.
- The quizzes will consist of multiple-choice questions randomly chosen from a list of questions.
- These Prep quizzes are **OPTIONAL**. If you do not write the Quiz, the grade will automatically be assigned to your Midterm grade for Quiz#1 and to the final grade for Quiz #2.
- Quizzes address learning objectives 1-3

### **Final Exam (30%)**

**Date:** Wed, Apr 13, 8:30 AM - 10:30 AM, TBA

- The final exam addresses learning objective 1-3
  - The final exam is worth 30-40% depending on if you write Quiz #2. If you do not write Quiz #2, the final exam grade is worth 40% of your total grade.
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## 7 Course Statements

### 7.1 When you find yourself unable to meet an in-course requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor in writing/e-mail, with your name, student ID# and e-mail contact. Where possible, this should be done in advance of the missed work or event. See the undergraduate calendar for information on regulations and procedures for academic consideration.

### 7.2 Late Policy

The penalty for late submission of the Journal Article Critique is a reduction of 10% per day. The critique must be submitted on CourseLink by the start of class and a hard copy must also be handed in at the beginning of class on the date it is due. There will be no extension for the journal article quizzes as the answers to the questions will be discussed in lecture the following day.

### 7.3 Laptops

They are permitted but not recommended in lecture. Incomplete class slides will be provided on CourseLink prior to class and note taking will include both writing concepts as well as drawing diagrams and adding to figures. Many students find sitting behind laptops distracting so please be conscious of this if you choose to bring a laptop to lecture.

### 7.4 Communication

As per University regulations, all students are required to *routinely check their uoguelph.ca email*. This is the official route of communication between the University and its students. In addition, students are required to *check CourseLink* for further course specific communications.

### 7.5 Emailing

To encourage independent learning, emailing the lecturer or teaching assistants about concepts should be the last resort after reading lecture slides, primary literature and using the discussion board. If you do send an email, please DO NOT email the lecturer or teaching assistants the same questions individually, and allow at least 24 hours for a response.

### 7.6 Conduct in a Large Class

This is a large class but you are not a small part of it! It takes commitment from everyone to make our time together as valuable as possible. In order for you to get the most of the class

please consider the following:

- All testable exam material comes from lectures. Complete lecture slides will not be provided.
- It is expected that you come to lecture prepared to learn and participate. This involves arriving on time and staying to the end, bringing the incomplete class notes and having reviewed the readings each week. Coming to class prepared will allow you and your classmates to get the most out of in class discussions.
- The due dates for the journal article critique are fixed. It is critical that these deadlines are met as extensions will only be granted in the most extreme situations. If a deadline cannot be met, you must inform the instructor in person or by email *as soon as possible*.
- It is expected that you help maintain a safe and positive environment for yourself and your classmates to learn. In lecture this means limiting distractions to the students around you (cell phones, laptops, talking, packing up early etc) as well as treating your fellow classmates, the teaching assistants and instructor with respect at all times.
- If you have a problem with the course material or in the way it is being presented, it is expected that you respectfully bring up your concerns with the course instructor as soon as possible.
- Providing a challenging and supportive learning environment is a priority of this course and involves a team effort from all of us.

## 8 Department of Human Health and Nutritional Sciences Statements

### 8.1 Academic Advisors

If you are concerned about any aspect of your academic program:

- Make an appointment with a program counsellor in your degree program. [B.Sc. Academic Advising](#) or [Program Counsellors](#)

### 8.2 Academic Support

If you are struggling to succeed academically:

- Learning Commons: There are numerous academic resources offered by the Learning Commons including, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills. You can also set up individualized appointments with a learning specialist.  
<http://www.learningcommons.uoguelph.ca/>



- Science Commons: Located in the library, the Science Commons provides support for physics, mathematic/statistics, and chemistry. Details on their hours of operations can be found at: <http://www.lib.uoguelph.ca/get-assistance/studying/chemistry-physics-help> and <http://www.lib.uoguelph.ca/get-assistance/studying/math-stats-help>

### 8.3 Wellness

If you are struggling with personal or health issues:

- Counselling services offers individualized appointments to help students work through personal struggles that may be impacting their academic performance. <https://www.uoguelph.ca/counselling/>
- Student Health Services is located on campus and is available to provide medical attention. <https://www.uoguelph.ca/studenthealthservices/clinic>
- For support related to stress and anxiety, besides Health Services and Counselling Services, Kathy Somers runs training workshops and one-on-one sessions related to stress management and high performance situations. <http://www.selfregulationskills.ca/>

### 8.4 Personal information

Personal information is collected under the authority of the University of Guelph Act (1964), and in accordance with Ontario's Freedom of Information and Protection of Privacy Act (FIPPA) <http://www.e-laws.gov.on.ca/index.html>. This information is used by University officials in order to carry out their authorized academic and administrative responsibilities and also to establish a relationship for alumni and development purposes.

For more information regarding the Collection, Use and Disclosure of Personal Information policies please see the Undergraduate Calendar. (<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/intro/index.shtml>)

### 8.5 Course Offering Information Disclaimer

Please note that course delivery format (face-to-face vs online) is subject to change up to the first-class day depending on requirements placed on the University and its employees by public health bodies, and local, provincial and federal governments. Any changes to course format prior to the first class will be posted on WebAdvisor/Student Planning as they become available.

## 9 University Statements

### 9.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

## 9.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Graduate Calendar - Grounds for Academic Consideration

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions

<https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml>

## 9.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Graduate Calendar - Registration Changes

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml>

Associate Diploma Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml>

## 9.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

## 9.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is

required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to make a booking at least 14 days in advance, and no later than November 1 (fall), March 1 (winter) or July 1 (summer). Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time.

For Guelph students, information can be found on the SAS website  
<https://www.uoguelph.ca/sas>

For Ridgetown students, information can be found on the Ridgetown SAS website  
<https://www.ridgetownc.com/services/accessibilityservices.cfm>

## 9.6 Academic Integrity

The University of Guelph is committed to upholding the highest standards of academic integrity, and it is the responsibility of all members of the University community—faculty, staff, and students—to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff, and students have the responsibility of supporting an environment that encourages academic integrity. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

Undergraduate Calendar - Academic Misconduct  
<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Graduate Calendar - Academic Misconduct  
<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

## 9.7 Recording of Materials

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

## 9.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars  
<https://www.uoguelph.ca/academics/calendars>

## 9.9 Disclaimer

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings, changes in classroom protocols, and academic schedules. Any such changes will be announced via CourseLink and/or class email.

This includes on-campus scheduling during the semester, mid-terms and final examination schedules. All University-wide decisions will be posted on the COVID-19 website (<https://news.uoguelph.ca/2019-novel-coronavirus-information/>) and circulated by email.

## 9.10 Illness

Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g.. final exam or major assignment).

## 9.11 Covid-19 Safety Protocols

For information on current safety protocols, follow these links:

- <https://news.uoguelph.ca/return-to-campus/how-u-of-g-is-preparing-for-your-safe-return/>
- <https://news.uoguelph.ca/return-to-campus/spaces/#ClassroomSpaces>

Please note, these guidelines may be updated as required in response to evolving University, Public Health or government directives.

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