Department of Biology Course Outline

BIOL4510 Cellular and Molecular Basis of Muscle Physiology, Fall 2024, 3.00

Course Instructor: Robert Lakin Hear my name

How to address me: Professor Lakin

Personal Pronouns: (he/him/his)

Email: lakinrob@yorku.ca

Note: If you have or question or would like to talk with me, you can send an email, visit me during Zoom student hours (see below), or approach me before or after class.

Phone: N/A

Student Hours: Monday & Wednesday, 10am – 11am

What are 'Student Hours'?
Student hours are dedicated times through the week for the course instructor to meet with YOU. Pop in to the Zoom link to introduce yourself, ask questions about the course, or discuss content from the course.

Note: If these If these times don't work for you or you would prefer to meet in person, email me and we can arrange an alternate time to meet.

Course Format: In-Person (Students are expected to attend lectures at the indicated times)

*Students are allowed to record and share lectures

Prerequisites*: AS/HH/SC/KINE 3012 3.00 ***or*** SC/BIOL 3060 and SC/BIOL 3070 4.00

*Students without pre-requisites will be de-enrolled unless they have advanced standing or permission from the Course Director

Office Location: Farquharson 357

Click here for visual directions.

Class Times: Monday & Wednesday, 1:00 pm – 2:20 pm

Class Location: 115 Chemistry Building (CB115)

Click here for visual directions.

Study Spaces on Campus:
https://currentstudents.yorku.ca/study-spaces

Course Outline Table of Contents:

Land Acknowledgement

York University recognizes that many Indigenous Nations have longstanding relationships with the territories upon which York University campuses are located that precede the establishment of York University. York University acknowledges its presence on the traditional territory of many Indigenous Nations. The area known as Tkaronto has been care taken by the Anishinabek Nation, the Haudenosaunee Confederacy, and the Huron-Wendat. It is now home to many First Nation, Inuit, and Métis communities. We acknowledge the current treaty holders, the Mississaugas of the Credit First Nation. This territory is subject of the Dish with One Spoon Wampum Belt Covenant, an agreement to peaceably share and care for the Great Lakes region.

Welcome to this Course!

Welcome to BIOL4510: Cellular and Molecular Basis of Muscle Physiology. Have you ever wondered how your heart is able to continuously beat without taking a break? Why your heart is able to beat faster and work harder during exercise? Why some muscles are adapted for strength, but others are adapted for endurance? Why some muscles can regenerate themselves when damaged, while others cannot? Or in general, how your heart is formed during development?

If so, these are just a few of the questions that will be answered in the course as you will learn how your muscles work from a structural, functional, and electrical perspective. In addition to course content, you will have the ability to develop science literacy skills in this course that are transferable to any future career (not just in the sciences).

Course Calendar Description: Topics include muscle development, muscle-specific gene expression, molecular and electrophysiological basis of muscle contraction, biochemical plasticity of muscle, sarcolemmal and nuclear signal transduction in muscle, muscle regeneration and reprogramming, with a primary focus cardiac muscle and skeletal muscle.

Course level learning objectives: Upon successful completion of BIOL4510, students will be able to demonstrate an understanding of the structure and function of the heart, and the fundamental cellular mechanisms regulating excitation-contraction coupling, cell signaling and embryonic development of the heart. Students will have an understanding of the mechanisms of myocardial regeneration and aging, as well as the impact of exercise and disease on cardiac structure and function.

Upon successful completion of this course, students should be able to*:

1. Explain major concepts, methodologies, and issues in muscle physiology, demonstrating detailed knowledge on specific course topics (i.e., cardiac physiology, cell biology, ion channels)
2. Apply scientific knowledge and critical thinking to identify, define, and analyze issues in muscle physiology and design/suggest solutions
3. Given an experimental figure and associated experimental information, describe (in own words) what is represented and the significance of the experimental findings
4. Use technology (i.e., eClass forums, WhatsApp) to share information and collaborate with the course instructor and other students in the course
5. Communicate (in writing) concepts in muscle physiology to a scientific and/or lay audience
6. Read, interpret, critically evaluate, and synthesize information about muscle physiology in peer-reviewed articles

*additional learning outcomes will be posted with each lecture/assignment

**schedule

Week	Date	Lecture Topics
1	Wednesday, September 4	Course Introduction
2	Monday, September 9	Cardiac Physiology I
	Wednesday, September 11	Cardiac Physiology II / Cell Biology I
3	Monday, September 16	Cell Biology II / Contractile Proteins I
	Wednesday, September 18	Contractile Proteins II
4	Monday, September 23	Sarcoplasmic Reticulum
		Writing Assignment #1 – Due: September 23 @11:59pm
	Wednesday, September 25	Ion Channels I
5	**Monday, September 30**	**Midterm #1 – Cardiac Physiology to Sarcoplasmic Reticulum**
	Wednesday, October 2	Ion Channels II
6	Monday, October 7	Ion Channels III
	Wednesday, October 9	Pumps and Exchangers
7	October 12 – 18th	**Reading Week**
8	Monday, October 21	Channelopathies
	Wednesday, October 23	Excitation-Contraction Coupling I
		Writing Assignment #2 – Due: October 23 @11:59pm
9	Monday, October 28	Excitation-Contraction Coupling II
	Wednesday, October 30	Cell Signaling I
10	**Monday, November 4**	**Midterm #2 – Ion Channels to Excitation-Contraction Coupling**

	Wednesday, November 6	Cell Signaling II
	Friday, November 8	**Drop Date**
11	Monday, November 11	Cell Signaling III
	Wednesday, November 13	Embryonic Heart Development I
12	Monday, November 18	Embryonic Heart Development II
	Wednesday, November 20	Embryonic Heart Development III
13	Monday, November 25	Stem Cells and Regenerative Medicine I
	Wednesday, November 27	Stem Cells and Regenerative Medicine II
14	Monday, December 2	Final Exam Review

Writing Assignment #3 – Due: December 3 @11:59pm

Inclusive teaching statement:

The BIOL4510 learning environment is one that is committed to equity, diversity, and inclusion. You can expect the following:

- I am committed to fostering an environment for learning that is inclusive for everyone regardless of gender identity, gender expression, sex, sexual orientation, race, ethnicity, ability, age, class, and any other identity
- All students in the class, the instructor, and any guests should be treated with respect during all interactions.
- It is my hope that our class will support diversity of experience, thought, and perspective.
- Please feel free to contact me via email or in person to let me know about any experiences you have had related to this class that have made you feel uncomfortable.
- I will continually strive to create inclusive learning environments and would therefore appreciate your support and feedback.
- I welcome emails or in-person communications to let me know your preferred name or pronoun.

Community Guidelines

The following values are fundamental to academic integrity and are adapted from the International Center for Academic Integrity*. In our course, we will seek to behave with these values in mind.

	As students, we will…	As a teaching team, we will…
Honesty	• Honestly demonstrate our knowledge and abilities on assignments and exams • Communicate openly without using deception, including citing appropriate sources	• Provide honest feedback on your demonstration of knowledge and abilities on assignments and exams • Communicate openly and honestly about the expectations and standards of the course via the syllabus, and with respect

	As students, we will…	As a teaching team, we will…
		to assignments and exams
Responsibility	• Complete assignments on time and in full preparation for class • Show up to class on time, and be mentally/physically present • Participate fully and contribute to team learning and activities	• Provide timely feedback on your assignments and exams • Show up to class on time, and be mentally and physically present • Create relevant assessments and class activities
Respect	• Speak openly with one another, while respecting diverse viewpoints and perspectives • Provide sufficient space for others to voice their ideas	• Respect your perspectives even while we challenge you to think more deeply and critically • Help facilitate respectful exchange of ideas
Fairness	• Contribute fully and equally to collaborative work, so that we are not freeloading off others • Not seek unfair advantage over fellow students in the course	• Create fair assignments and exams, and grade them in a fair, and timely manner • Treat all students equitably
Trust	• Not engage in personal affairs while on class time • Be open and transparent about what we are doing in class • Not distribute course materials to others without authorization	• Be available to all students when we say we will be • Follow through on our promises • Not modify the expectations or standards without communicating with everyone in the course
Courage	• Say or do something when we see actions that undermine any of the above values • Accept a lower or failing grade or other consequences of upholding and protecting the above values	• Say or do something when we see actions that undermine any of the above values • Accept the consequences (e.g., lower teaching evaluations) of upholding and protecting the above values

[2] This class statement of values is adapted from Tricia Bertram Gallant, Ph.D.

Learning Materials

Textbook: None. All course materials (lecture notes/recordings, reading materials) will be posted on eClass. I will also post additional learning materials (i.e., Khan Academy, Science Ninja) that will serve as a refresher to supplement your learning (NOTE: additional videos are not testable)

Website (eClass): https://eclass.yorku.ca/course/view.php?id=65356

Technology Checklist:

 An internet-enabled computer to access eClass and materials	 Zoom software installed on computer	 Access to reliable internet	 Webcam	 Microphone (i.e., built into laptop)

Note: *Other than access to eClass, these technologies may only be required for communication outside of regular class time. If you don't have access to a computer, webcam, microphone, consider borrowing a laptop from York U, financial aid from York, and single workspaces available for student use on campus at the library. (https://www.library.yorku.ca/web/ask-services/printing-and-computing/computing/public-computers-labs/)*

Assessment in this Course

Research about learning strongly suggests that the most important factor in learning is doing the work of reading, writing, recalling, practicing, synthesizing, and analyzing. Learning happens best when people actively engage material on a consistent basis, and that is why we have high standards in this course. We are confident that, with appropriate effort, you **all** can meet those standards.

When possible, we also try to reduce unintentional bias in grading by, for example, grading assignments one question at a time (grading all of question 1 before grading any of question 2), grading anonymously, and using rubrics. These also help improve consistency in marking.

Grade Breakdown

COMPONENT	GRADE VALUE
QUIZZES	10%
WRITING ASSIGNMENTS (3 TOTAL)	10%
PROBLEM SET ASSIGNMENTS (2 TOTAL)	10%
MIDTERM 1	20%
MIDTERM 2	20%
FINAL EXAM	25%
REFLECTIONS / IN-CLASS ACTIVITIES	5%

Quizzes

There are **6 quizzes** total in the course (2% each). The quizzes will be multiple choice and completed on eClass. For each quiz you have 2 weeks to complete it. The **top 5 quizzes** will be used to tabulate your total quiz mark in the course. This means that if you miss a quiz, there is no need to worry, as only the top 5 quizzes will be used for your total quiz mark.

All quizzes will take place online (eClass) and will be held biweekly. They will be available to access for **72-96 hours** and posted on the dates below. Choose a time to complete the exam that works best for you, bearing in mind that if that time is the middle of the night eastern standard time, that you may have to wait for responses to questions or technical difficulties. Once you access the quiz you will have **45 mins** to complete it. The quizzes will consist of multiple choice, fill-in-the-blanks, diagrams, and/or short-answer (1-4 words) questions. The goal of the quizzes is to gauge and assess student learning throughout the course and to keep students on schedule in their learning.

QUIZ #	GRADE VALUE	TOPICS	OPENS	CLOSES
1	2%	Cardiac Physiology & Cell Biology	Sep 18	Sep 22
2	2%	Contractile Proteins & Sarcoplasmic Reticulum	Sep 23	Sept 27
3	2%	Ion Channels & Pumps and Exchangers	Oct 9	Oct 18
4	2%	Channelopathies & Excitation-Contraction Coupling	Oct 28	Nov 2
5	2%	Cell Signaling	Nov 11	Nov 15
6	2%	Heart Development	Nov 20	Nov 24

Writing Assignments (10%)

There are three (3) writing assignments in this course that are intended to develop scientific literacy skills in reading and writing that are transferable. Full assignment descriptions, word limits and marking rubrics are posted on eClass (https://eclass.yorku.ca/course/view.php?id=65356)

Students will be assigned research papers on topics that complement ongoing learning in the course. Students will be required to write written summaries of the papers that highlight the key background, methods/results, and conclusions of the work.

Late policy: Assignments have a **24-hour grace period** for assignments submitted beyond the due date (unless specified, see below). After that time, **5%** will be deducted per day.

NOTE: there will be flexibility in the submission dates at the discretion of the course instructor based on conflicts with major assignments/tests in other courses

ASSIGNMENT	GRADE VALUE	TOPIC	DUE
1	3%	SERCA Regulation	Monday, September 23
2	3%	Ion Channels	Wednesday, October 23
3	4%	Cardiac Regeneration	Tuesday, December 3

Problem Set Assignments (5% each)

There are **two** problem-set assignments in the course (each worth 5%). You will have one week to complete the assignment. The assignments will be given the week **prior** to midterms 1 and 2 and are designed to let you work through questions that will prepare you for the upcoming midterm (i.e., types of questions of varying difficulty you may see). While you can discuss with other students in the course prior to submission, I recommend working through the problems on your own first as they will be the best preparation for the midterms.

ASSIGNMENT	GRADE VALUE	TOPICS	DUE
1	5%	Cardiac Physiology to Sarcoplasmic Reticulum	Sept 27
2	5%	Ion Channels to Excitation-Contraction Coupling	Nov 1

Midterm Exams (20% each)

There are **two** midterms in the course. Both midterms will be in-person during assigned lecture time. They are **designed to take 60 minutes** each, but you will have the full 80-minute class period to complete them. The midterm will consist of short-answer and problem-solving questions. Example problems will be given ahead of time, and the Problem-Set Assignments are designed to prepare you for the types of questions you will get on your midterms. More details will be posted on eClass.

If you believe that a written answer on a test was marked incorrectly, you must submit your midterm for remarking within **one week** of the test being made available to you. Note that remarking can result in the mark being raised, confirmed, or lowered.

Missed midterm policy: If you miss a midterm due to an unpredicted reason, you do not need to bring physician's documentation. An option will be made available where you will have to write an alternative make-up within 48 hours of the original date. Otherwise, the midterm test and its weight will be transferred to the final exam (therefore, you will be required to write both a midterm and final exam at that time).

Please email me (lakinrob@yorku.ca) as soon as possible. In most cases, the weight of midterm will be assigned towards the final exam.

MIDTERM	GRADE VALUE	TOPIC	DATE

1	20%	**Module 1 – Cardiac Physiology to Sarcoplasmic Reticulum**	September 30
2	20%	**Module 2 – Ion Channels to Excitation-Contraction Coupling**	November 4

Final Exam (25%)

The final exam will take place during the Final Exam period and will be scheduled by the Registrar's Office. The final exam will be held in-person. The final exam is non-cumulative (i.e., will only cover Cell Signaling through Stem Cells and Regenerative Medicine).

NOTE: Students who do not write the final exam AND have missed at least one midterm or have not completed any of the assignments must submit a petition form to write a deferred exam. For more information, please go to: http://myacademicrecord.students.yorku.ca/academic-petitions

Reflections and In-Class Activities (5%)

Starting in Week 2 of the course, every Sunday you will be required to submit a brief reflection in which you identify "muddy", issued based on the previous week's lectures or in anticipation of the upcoming week's material. In addition, you will have the opportunity to submit any questions that you did not get answered in lectures. In addition to weekly reflections, during some weeks there may be in-class activities that will supplement the online reflections.

Regrading/Reappraisal Procedures

In order to be fair and consistent with regards to the entire class, individual grades are not negotiable (unless a clear error has occurred). Assignments can be submitted for re-grading (see below), and marks can go up, down, or stay the same. There will be no "extra credit" assignments. Marks for assignments and tests will not be "rounded".

For all re-grading requests, please submit your request via email within **5 days** of the work being returned (made available) to the student. In your email, please indicated a summary of the request (e.g., the total was miscounted, a written rationale providing valid reasons why you believe that you deserve credit) and a copy of the assessment. I will strive to review all re-grading requests within 1 week.

University Policies

Important Dates

Drop Deadline: Wednesday, November 8 (last day to drop without course on transcript)

Course Withdrawal Deadline: November 9 – December 5 (course still appears on transcript with 'W")

Grading Scheme

In accordance with the York University Undergraduate Calendar Regulations, the letter grades assigned in undergraduate courses at York conform to the descriptions and grade ranges shown here: https://calendars.students.yorku.ca/2022-2023/grades-and-grading-schemes

Academic Honesty and Integrity

Academic misconduct undermines the values of honesty, trust, respect, fairness, and responsibility that we expect in this class. York University provides supports such as academic integrity workshops to ensure that all students understand the norms and standards of academic integrity that we expect you to uphold.

York students are required to maintain the highest standards of academic honesty and they are subject to the Senate Policy on Academic Honesty (http://secretariat-policies.info.yorku.ca/policies/academic-honesty-senate-policy-on/). The Policy affirms the responsibility of faculty members to foster acceptable standards of academic conduct and of the student to abide by such standards. Please review and familiarize yourself with the policy.

There is also an academic integrity website with comprehensive information about academic honesty and how to find resources at York to help improve your research and writing skills, and cope with University life. Students are expected to review the materials on the Academic Integrity website:

Examples of actions that do not adhere to York's Academic Integrity Policy include:

- Plagiarism (passing off someone else's work as your own)
- Accessing unauthorized sites for assignments or tests
- Unauthorized collaboration on assignment and exams
- Uploading work to third party repository sites (e.g., Course Hero, One Class, etc.)
- Scanning, sharing, uploading, or publishing exams, tests, or scholarly work

For more information on what academic integrity is and why it is important see: https://spark.library.yorku.ca/academic-integrity-what-is-academic-integrity/. Information on the process of investigations into breaches of academic honesty: https://spark.library.yorku.ca/academic-integrity-breach-of-policy-on-academic-honesty/

Important Note from the FSc Committee on Examinations & Academic Standards (CEAS): Numerous students in Faculty of Science courses have been charged with academic misconduct when materials they uploaded to third party repository sites (e.g., Course Hero, One Class, etc.) were taken and used by unknown students in later offerings of the course. Whenever a student submits work obtained through an external site (e.g., Course Hero, Chegg), the **submitting student will be charged with plagiarism** and the **uploading student will be charged with aiding and abetting**. To avoid this risk, students are urged not to upload their work to these sites.

Assistance for Students (Academic and Well-Being)

Academic Advising*: https://www.yorku.ca/science/academic-advising/ * Departments also offer program-specific advising. Check with your Department's Undergraduate Office.

Centre for Human Rights, Equity, and Inclusion: https://rights.info.yorku.ca

Centre for Indigenous Students Services: https://aboriginal.info.yorku.ca/

Good2Talk 24-hour Ontario Student Helpline: 1-866-925-5454 /Text: GOOD2TALKON to 686868

Keep.meSAFE: https://myssp.app/keepmesafe/ca/home

Learning Commons (general academic learning supports including library research, time management, study skills, career planning, etc.): https://learningcommons.yorku.ca/

Peer Assisted Study Sessions (PASS): https://www.yorku.ca/colleges/bethune/get-help/pass/

Peer Tutoring: https://www.yorku.ca/colleges/bethune/get-help/peer-tutoring/

Sexual Violence Response and Support: https://thecentre.yorku.ca

Student Counselling, Health & Well-being: https://counselling.students.yorku.ca/

Support Services for International Students: https://yorkinternational.yorku.ca/international-student-support/

Writing Services: https://www.yorku.ca/colleges/bethune/get-help/writing/

York University Student Services: https://family.yorku.ca/student-services/#SCD

York University Student Well-being Resources: https://www.yorku.ca/well-being/resources/students/

Accessibility

York University is committed to principles of respect, inclusion, and equality of all persons with accessibility needs across campus. The University provides services for students with accessibility needs (including physical, medical, learning, and psychiatric needs) needing accommodation related to teaching and evaluation methods/materials. These services are made available to students in all Faculties and programs at York University.

Students in need of these services are asked to register with accessibility services as early as possible to ensure that appropriate academic accommodation can be provided with advance notice. You are encouraged to schedule a time early in the term to meet with each professor to discuss your accommodation needs. Please note that registering with accessibility services and discussing your needs with your professors is necessary to avoid any impediment to receiving the necessary academic accommodations to meet your needs.

Additional information is available at the following websites:

Student Accessibility Services: https://accessibility.students.yorku.ca

York Accessibility Hub: http://accessibilityhub.info.yorku.ca/

Religious Observance Accommodation

York University is committed to respecting the religious beliefs and practices of all members of the community and making accommodations for observances of special significance to adherents. Should any of the dates specified in this syllabus for an in-class test or examination pose such a conflict for you, contact the Course Director within the first three weeks of class. Similarly, should an assignment to be completed in a lab, practicum placement, workshop, etc., scheduled later in the term pose such a conflict, contact the Course Director immediately. To arrange an alternative date or time for an examination scheduled in the formal examination periods (December and April/May), students must complete and submit an accommodation request form at least 3 weeks before the exam period begins. https://secure.students.yorku.ca/pdf/religious-accommodation-agreement-final-examinations.pdf

Student and Instructor Conduct in Academic Situations

Students and instructors are expected to maintain a professional relationship characterized by courtesy and mutual respect. Moreover, it is the responsibility of the instructor to maintain an appropriate academic atmosphere in the classroom and other academic settings, and the responsibility of the student to cooperate in that endeavour. Further, the instructor is the best person to decide, in the first instance, whether such an atmosphere is present in the class. The policy and procedures governing disruptive and/or harassing behaviour by students in academic situations is available at http://secretariat-policies.info.yorku.ca/policies/disruptive-andor-harassing-behaviour-in-academic-situations-senate-policy/.

Academic accommodation refers to educational practices, systems and support mechanisms designed to accommodate diversity and difference. The purpose of accommodation is to enable students to perform the essential requirements of their academic programs. At no time does academic accommodation undermine or compromise the learning objectives that are established by the academic authorities of the University.

University rules regarding registration, withdrawal, appealing marks, and most anything else you might need to know can be found on the university's website, here:

https://calendars.students.yorku.ca/2021-2022/policies-and-regulations