Western HealthSciences

Kinesiology 4360B

Physiology of Exercise: An Integrative Systems Approach

Winter 2026

Campus Supports

Western University is committed to a **thriving campus**. For help with:

- Both physical and mental health, go to Wellness & Wellbeing
- Studying with disabilities, go to Accessible Education
- Writing skills, go to the Writing Support Centre
- Learning skills and strategies, go to Learning Development & Success
- Contacting the ombudsperson, go to the Office of the Ombudsperson

Your course coordinator can also **guide you** to available campus resources and/or services.

Technical Requirements

- Laptop computer

Contact Information

Table 1: Course coordinator information

Course Coordinator/instructor	Contact Information	Office Hours
J. Kevin Shoemaker	kshoemak@uwo.ca	Tuesdays 2-4pm (TBD)

Table 2: Teaching assistants' information

Teaching Assistant(s)	Contact Information	Office Hours
TBD	TBD	TBD

NOTE: All course information including grades, assignment outlines, deadlines, etc. are available via OWL Brightspace. Download the Brightspace Pulse App to stay up-to-date on course communication and enable your notification settings within "Communications" in the top toolbar. Check the website regularly for course announcements. If you need assistance, visit OWL Brightspace Help or contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Calendar Course Description (including prerequisites/anti-requisites):

This course will examine the interaction of muscle and the cardio-vascular and respiratory systems. Building upon content from Kinesiology 2230A/B and Kinesiology 3360A/B, this course will focus on cardiorespiratory control and coupling to muscle metabolism. Students will develop a deeper understanding of how these physiological systems integrate in response to exercise.

Detailed Course Description:

What limits your exercise capacity? The ability to elevate your levels of physical activity depends on a wonderful but complex integration of physiological systems. This course examines the acute adaptation and integration of cardio-vascular, respiratory, oxygen-carrying and neural systems to support the stress of muscular work. These systems will be studied in terms of their discreet physiology as well as how they are integrated across levels of physical stress. Additional topics may focus on factors that affect this integration such as sex hormones, aging, inactivity and exercise training. Students will develop a deeper understanding of how physiological systems integrate to form a response to stress, and how this integration varies depending on the context in which the exercise (or other physiological stressors) is being performed.

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.
NOTE: If you wish to enroll in this course without the stated pre-requisite(s), you must obtain written approval from the course instructor. The approval should then be forwarded to your academic counsellor.

Delivery Mode: [in-person]

Table 3: Date and times of course components

Component	Date(s)	Time
Lecture	M/T/W/Th/F	TBD
Review/Tutorial/Lecture	M/T/W/Th/F	TBD

Learning Outcomes

Upon successful completion of this course, you will be able to:

1. Describe in detail the physiological systems connecting the atmosphere to the muscle mitochondria and their independent and integrative roles in oxygen delivery
2. Draw relationships between key variables associated with respiratory, cardiac and vascular physiology change with increasing exercise intensity
3. Describe the role and control mechanisms affecting blood pressure changes with exercise.
4. Integrate the brain's role in cardiovascular adaptation to exercise through its integration of central, sensory and efferent autonomic neural patterns.
5. Describe the pathophysiology of exercise limitations caused by diseases of the cardiovascular, respiratory and musculoskeletal systems and distinguish these from normal physiological responses to exercise.

Course Content and Schedule

Each week, approximately two hours will be spent in lecture and one hour in review of that lecture with content that focuses on applied examples and/or on student submissions to the Instructor of lecture elements that were missed or poorly understood. These submissions can be made anonymously at the end of each lecture.

If no submissions are made, the Instructor will develop questions to be addressed for the class.

Table 4: Course content and schedule

Week	Dates	Topic	Study material	Things due
1	Jan 6-9	Lecture 1: Course Introduction and Basic Biophysics of Blood Flow	See readings aligned with Lecture 1	
2	Jan 12-16	Lecture 2: Pulmonary Function and Limitations to Exercise	Readings aligned with Lecture 2	
3	Jan 19-23	Lecture 3: Oxygen Delivery: Determinants of Cardiac Function/Cardiac Limitations to Exercise	Readings aligned with Lecture 3	
4	Jan 26-30	Lecture 3: Oxygen Delivery: Vasodilation, Muscle Blood Flow	Readings aligned with Lecture 3	Assignment 1
5	Feb 2-6	Lecture 3: Oxygen Delivery: Vasodilation, Muscle Blood Flow	Readings aligned with Lecture 3	
6	Feb 9-13			Midterm 1
7	Feb 15-20	Reading Week	N/A	
8	Feb 23-27	Lecture 4: Vasoconstriction and BP Control: Introduction	Readings aligned with Lecture 4	
9	Mar 2-6	Lecture 4: Vasoconstriction and BP Control: Baroreflex	Readings aligned with Lecture 4	
10	Mar 9-13	Lecture 4: Vasoconstriction and BP Control: Metaboreflex	Readings aligned with Lecture 4	
11	Mar 16-20	Lecture 5: Central Command (role of the brain)	Readings aligned with Lecture 5	
12	Mar 23-27	Lecture 6: Sympatholysis: The tension between blood pressure and blood flow during exercise	Readings aligned with Lecture 6	Assignment 2
13	Mar 30-Apr 3	Lecture 7: Exercise training bradycardia	Readings aligned with Lecture 7	
14	Apr 6-9	Cerebrovascular Control		
	If time allows	Detraining: Space Flight and Bed Rest Models		

***Note: This is a tentative list of topics. Timing, order and/or topics may change.**

Required Course Material/Text: There is no required textbook for this course. Any

required readings will be posted on OWL.

Course Materials You Must Acquire
Course materials, including course outline, readings and lecture notes, are available on the OWL course site. Past exams or exam questions are not available. The material in these readings will form the basis for, or supplement, the lecture presentations and their content will be considered in examinations.

Assessments and Evaluation

Below is the evaluation breakdown for the course. Any deviations will be communicated.

Table 5: Assessments' details

Assessment	Format	Weight	Due Date	Flexibility	Learning Objective
Midterm Test (designated assessment)	Mixed format; In person, on paper during class time. This is a designated assessment and must receive document for considerations	30	Feb 9-13	Not applicable	1,2, 3
Assignment	Written	15	Jan 30, 2026	72-hour no late penalty	1, 2, 4, 5
Assignment	Written	15	March 21, 2026	72-hour no late penalty	1, 2, 4, 5
Final Exam	Mixed format	40	TBD	Not applicable	1, 2, 3

Learning Objectives:
Upon completion of this course students will be able to:

1. Identify and delineate theoretical terms and concepts related to the cardiac, vascular and/or autonomic nervous system adjustments during exercise and how these (and other) systems work together in complex integrative physiology (Knowledge)

2. Compare and contrast theoretical and experimental approaches to study reflex cardiovascular control and how such variations affect interpretations. (Analysis)

3. Synthesize research and theoretical knowledge as it relates to the regulation of blood pressure and blood flow at rest and during exercise. (Comprehension)

4. Develop skills in critically evaluating scientific literature, and in considering various options the body can use to accomplish goals such as elevating blood pressure, or adjusting blood flow to skeletal muscle during exercise, and how such options vary from person to person. (Application)

5. Practice *critical reflection* upon research findings, and your own learning, and relate these to

the topics discussed in class. (Reflection)

Notes:

Assignments (Two assignments, each worth 15% of the total grade for a total of 30%): You may choose to work in teams of maximal three students, or as an individual. Students or teams will choose a topic related to a controversial topic in exercise physiology, cerebrovascular physiology or neural control of the circulation as it pertains to exercise. A minimum of 3 primary, peer-reviewed journal articles is required. The paper will be 3 typed pages (double-spaced), 12 point font, maximum of one inch border widths, excluding references.

Topics must be confirmed for use by the TA(s) before you begin the assignment.

Deadlines for each assignment are as follows:

Assignment 1: Topic and team members (with names and student identification numbers) submitted for approval via OWL by Monday, February 2, 2026 (23:59) with full assignment due on January 30th at 23:59 EST.

Assignment 2: Topic and team members (with names and student identification numbers) submitted for approval via OWL by Monday, March 2, 2026 (23:59) with full assignment due on March 21st at 23:59 EST.

A 1% per hour deduction from the final paper grade for failing to submit a topic on time.

General information about assessments

- ☑ All assignments are due at 23:59 EST unless otherwise specified
- ☑ Students are responsible for ensuring that the correct file version is uploaded; incorrect submissions including corrupt files could be subject to late penalties (see below) or a 0
- ☑ Written assignments will be submitted to Turnitin (statement in policies below)
- ☑ Students will have access to Turnitin reports before their submission is graded. Students may have 2 submissions to Turnitin.
- ☑ Group projects are expected to be a group effort. This means that all students in the group will receive the same grade. It also means that all students will receive the same penalty if any portion of the project is determined to be plagiarized.
- ☑ After an assessment is returned, students should wait 24 hours to digest feedback before contacting their evaluator; to ensure a timely response, reach out within 7 days
- ☑ Any grade appeals on term work must be initiated with the instructor within 3 weeks of the grade being posted. See the University Policy on Undergraduate Student Appeals for more information

The table below outlines University-wide grade descriptors.

Table 6: University-wide grade descriptors

Letter grade	Number grade	Description
A+	90-100	One could scarcely expect better from a student at this level
A	80-89	Superior work which is clearly above average
B	70-79	Good work, meeting all requirements, and eminently satisfactory
C	60-69	Competent work, meeting requirements
D	50-59	Fair work, minimally acceptable
F	below 50	Fail

Rounding of Grades (for example, bumping a 79 to 80%)
This is a practice some students request. The final grade documented is the grade that you have achieved. There is no rounding to the next grade level, or 'giving away' of marks. Please don't ask me to do this for you: the response will be "please review the course outline where this is presented".

Information about late or missed assessments:

☑ Students are expected to submit the two written assignments by the deadline listed. Should extenuating circumstances arise, students are permitted to submit their assignment up to 72 hours past the deadline without a late penalty. No Academic Consideration is required for this extension. Students submitting their assessment beyond the extended deadline will receive a penalty of 1% per hour that it is late. Academic Consideration requests may be granted only for extenuating circumstances that began before the deadline and lasted longer than the extension. Students must not provide medical or compassionate documentation to the instructor.

☑ Written Exams (70%): These include two exams each designed to be a maximum of 2 hours in duration. The exam format consists of multiple choice and short answer questions. Exams will be delivered in person. The Mid-Term exam will be delivered during class time. The makeup exam will be written 7-10 days following the stated exam date at a time that can be accommodated by the course Instructor or TAs. If the midterm is missed and appropriate documentation is provided, the grade will be redistributed to the final exam (i.e. the final exam will be worth 70%). The final exam will be scheduled for 2 hours (date and time to be set by the registrar's office).

Course-specific conditions:
INC (Incomplete Standing): If a student has been approved by the Academic Advising Office (in consultation with the instructor/department) to complete term work at a later date, an INC will be assigned. Students with INC will have their course load in subsequent terms reduced to allow them to complete outstanding course work. Students may request permission from Academic Advising to carry a full course load for the term the incomplete course work is scheduled.

SPC (Special examination): If a student has been approved by the Academic Advising Office to write a Special Examination and the final exam is the only outstanding course component, an SPC will be assigned. If the class has a makeup exam, the student is expected to write the makeup exam. If the class doesn't have a makeup exam or the student misses the makeup exam for reasons approved by the Academic Advising Office, the student will write the exam the next time the course is offered. Outstanding SPCs will reduce the course load for the term the exam is deferred as outlined in Types of Examinations policy

Academic Policies and Statements

Support Services

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

1. Academic Support and Engagement - http://academicsupport.uwo.ca
2. Wellness and Well-being - https://www.uwo.ca/health/
3. Registrar's Office -- http://www.registrar.uwo.ca/
4. Ombuds Office -- http://www.uwo.ca/ombuds/

The websites for Registrarial Services (http://www.registrar.uwo.ca), and the same for affiliated university colleges when appropriate, and any appropriate Student Support Services (including the services provided by the USC listed here: http://westernusc.ca/services/) and the Student Development Services, should be provided for easy access.

Students who are in emotional/mental distress should refer to Mental Health@Western (https://www.uwo.ca/health/) for a complete list of options about how to obtain help.

Statement on Gender-Based and Sexual Violence

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at:

https://www.uwo.ca/health/student_support/survivor_support/get-help.html.

Student Code of Conduct

The purpose of the Code of Student Conduct is to define the general standard of conduct expected of students registered at Western University, provide examples of behaviour that constitutes a breach of this standard of conduct, provide examples of sanctions that may be imposed and set out the disciplinary procedures that the University will follow. For more information, visit https://www.uwo.ca/univsec/pdf/board/code.pdf

Absence from Course Commitments

Students must familiarize themselves with the Policy on Academic Consideration – Undergraduate Students in First Entry Programs

Students missing course work for medical, compassionate, or extenuating circumstances can request academic consideration by completing a request at the central academic consideration portal (https://registrar.uwo.ca/academics/academic_considerations/index.html). Students are permitted one academic consideration request per course per term **without** supporting documentation. Note that supporting documentation is **always** required for academic consideration requests for examinations scheduled by the office of the registrar (e.g., December and April exams) and for practical laboratory and performance tests (typically scheduled during the last week of the term).

Students should also note that the instructor may **designate** one assessment per course per term that requires supporting documentation. This designated assessment is described elsewhere in this document. Academic consideration requests may be denied when flexibility in assessment has already been included. Examples of flexibility in assessment include when there are assessments not required for calculation of the final grade (e.g. 8 out of 10 quizzes), when there is flexibility in the submission timeframe (e.g. 72 hour no late penalty period), or when timed assessments (e.g., quizzes) are available over an extended period of time (e.g.,

when you are given a 72 hour time period to start – and finish – the assessment).

Please note that any academic considerations granted in this course will be determined by the instructor of this course, in consultation with the academic advisors in your Faculty of Registration, in accordance with information presented in this course syllabus. Supporting documentation for academic considerations for absences due to illness should use the Student Medical Certificate or, where that is not possible, equivalent documentation by a health care practitioner.

Accommodation for Religious Holidays
Students should review the policy for Accommodation for Religious Holidays. Where a student will be unable to write examinations and term tests due to a conflicting religious holiday, they should inform their instructors as soon as possible but not later than two weeks prior to writing the examination/term test. In the case of conflict with a midterm test, students should inform their instructor as soon as possible but not later than one week prior to the midterm.

Special Examinations
A Special Examination is any examination other than the regular examination, and it may be offered only with the permission of the Dean of the Faculty in which the student is registered, in consultation with the instructor and Department Chair. Permission to write a Special Examination may be given on the basis of compassionate or medical grounds with appropriate supporting documents. To provide an opportunity for students to recover from the circumstances resulting in a Special Examination, the University has implemented Special Examination dates. The Faculty of Health Sciences has set School-specific dates for these Special Examinations. Please speak with your instructor about the date on which the Special Examination for this course will be held.

Academic Offences
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 website: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf.

Plagiarism
Student work is expected to be original. Plagiarism is a serious academic offence and could lead to a zero on the assignment in question, a zero in this course, or your expulsion from the university. You are plagiarizing if you insert a phrase, sentence or paragraph taken directly from another author without acknowledging that the work belongs to him/her. Similarly, you are plagiarizing if you paraphrase or summarize another author's ideas without acknowledging that the ideas belong to someone else. All 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 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 Western University and Turnitin.com (www.turnitin.com).

Use of Artificial Intelligence for the Completion of Course Work
Within this course, you may only use artificial intelligence tools (e.g., "ChatGPT") in ways that are specifically authorized by the course instructor. All submitted work must reflect your own thoughts and independent written work.

Re-submission of Previously Graded Material
Without the explicit written permission of the instructor, you may not submit any academic work for which credit has been obtained previously, or for which credit is being sought, in another course or program of study in the University or elsewhere.

Use of Statistical Pattern Recognition on Multiple Choice 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.

Accessibility Statement
Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Accessible Education (AE) at 661-2111 x 82147 for any specific question regarding an accommodation or review The policy on Accommodation for Students with Disabilities

Correspondence Statement
The centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at their official university address is attended to in a timely manner. Students are further expected to attend to announcements presented through Brightspace, and to read emails generated in this way.

Use of Electronic Devices

During Exams
Unless you have medical accommodations that require you to do so, or explicit permission from the instructor of the course, you may not use any electronic devices (e.g., cell phones, tablets, cameras, smart glass, smart watches, or iPods) during ANY tests, quizzes, midterms, examinations, or other in-class evaluations. **These devices MUST either be left at home or with your belongings at the front of the room. They MUST NOT be at your test/exam desk or in your pocket. Any student found with a prohibited device will receive an automatic grade of zero on the test or exam.**

During Lectures and Tutorials
Although you are welcome to use a computer during lecture and tutorial periods, you are expected to use the computer for scholastic purposes only, and refrain from engaging in any activities that may distract other students from learning. From time to time, your professor may ask the class to turn off all computers, to facilitate learning or discussion of the material presented in a particular class.

Copyright and Audio/Video Recording Statement
Course material produced by faculty is copyrighted and to reproduce this material for any purposes other than your own educational use contravenes Canadian Copyright Laws. Unless explicitly noted otherwise, you may not make audio or video recordings of lectures – nor may you edit, re-use, distribute, or re-broadcast any of the material posted to the course website.

Contingency Plan for an In-Person Class Pivoting to 100% Online Learning
In the event of a situation that requires this course to pivot to online content delivery, all remaining course content will be delivered entirely online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on Brightspace for students to view at their convenience). The grading scheme will **not** change. Any remaining assessments will also be conducted online as determined by the course instructor

Note that disruptive behaviour of any type during online classes, including inappropriate use of the chat function, is unacceptable. Students found guilty of Zoom-bombing a class or of other serious online offenses may be subject to disciplinary measures under the Code of Student Conduct.

Online Proctoring
Tests and examinations in this course may be conducted using a remote proctoring service. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide **personal information** (including some biometric data) and the session will be **recorded**. Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at: https://remoteproctoring.uwo.ca.

Appealing a Grade Within this Course
You have the right to appeal any grade within this course. The grounds for a grade appeal may be one or more of: medical or compassionate circumstances, extenuating circumstances beyond the student's control, bias, inaccuracy, or unfairness. All grounds advanced in a request for relief must be supported by a clear and detailed explanation of the reasons for the request together with all supporting documentation.

Appeals generally proceed in this order:

1. Course instructor (informal consultation)
2. Department Chair (submission of written request)
3. The Dean of the Faculty (submission of written request)

In the case of perceived procedural unfairness, steps 2 and 3 are carried out within the Department and Faculty offering the course. In the case of extenuating medical or compassionate circumstances that impact on a grade, steps 2 and 3 are carried out within a student's Home Department and Faculty.

A request for relief against a mark or grade must be initiated with the instructor as soon as possible after the mark is issued. In the event that the instructor is not available to the student, or fails to act, or if the matter is not resolved satisfactorily with the instructor, a written request for relief must be submitted to the Chair of the Department within three weeks of the date that the mark was issued. In the case of a final grade in a course, the written request for relief must be submitted to the Chair of the department by January 31st (for first-term half courses) or June 30th (for second-term half courses or full-year courses