



Western University
 Faculty of Health Sciences
 School of Kinesiology



KIN 2230A/B – Introduction to Exercise Physiology

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NOTE: All course information including grades, assignment outlines, deadlines, etc. are available via OWL. Check the website regularly for course announcements.

Calendar Course Description (including prerequisites/anti-requisites):
 The physiological basis of muscular exercise and training. The course will examine metabolic, cardiorespiratory and muscular adaptations to acute and chronic exercise.

Prerequisite(s): Grade 12U Biology or equivalent, and [Physiology 1021](#) or equivalent with a minimum grade of 60%.

Extra Information: 3 lecture hours, 2 laboratory hours biweekly.

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

Statement on Prerequisite Checking

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.

1. Course Description

Dynamic exercise imposes a *demand* for energy that is proportional to both the force and rate at which the muscle contracts. To match energy *supply* to energy *demand*, the body relies on coordinated adjustments of the neural, respiratory, cardiovascular, hormonal, and muscle metabolic systems. Each of these systems is amenable to adaptation through chronic exercise (training) or disease (deconditioning) and it is the capacity and cooperation of these physiological systems that determine performance. This course will introduce this “energy demand versus energy supply” relationship with specific reference to how energy supply is maintained (or not) at various demands (intensities and durations).

2. Learning Outcomes

By the end of the course, students should be able to:

1. Explain how muscle contracts at the cellular and whole-body levels.
2. Demonstrate a working knowledge of: a) how energy is stored and utilized in muscle; and b) how the metabolic systems match energy supply to exercise energy demand.
3. Describe in detail the physiological systems connecting the atmosphere to the muscle mitochondria and their independent and integrative roles in oxygen supply and carbon dioxide removal during exercise.
4. Describe the basics of how breathing and blood flow are regulated with changes in exercise demand and how both may be challenged during near-maximal exercise.
5. Define exercise intensity based on “intensity domains” and describe/identify the unique physiological response profiles of and implications for exercise within each intensity domain.
6. List the common anatomical and functional adaptations to exercise training and explain specifically how they improve exercise performance or capacity.
7. Collect, analyze, and interpret exercise test data

3. Schedule

3.1 Lectures

Each week there will be ~2.5 hours of lecture. The first ~1.5 hours will be delivered **in-person**, (i.e., synchronous). The additional ~1 hour will be posted **online**, (i.e., asynchronous).

The following is a tentative schedule of content. Topics and the specific weeks on which they are delivered may change.

Lecture Week	Lecture Topic
1	Introduction to exercise physiology (posted to OWL)
2	Skeletal muscle and human movement I
2	Skeletal muscle and human movement II
3	Bioenergetics and muscle metabolism – in the cytosol
3	Bioenergetics and muscle metabolism – in the mitochondria
4	Bioenergetics of muscle metabolism – substrate utilization
4	Energy – expenditure and measurement
5	Maximal oxygen uptake
5	Exercise intensity
6	REVIEW FOR MIDTERM

6	Hormonal control during exercise
7	MIDTERM (October 17th)
7	Pulmonary ventilation and gas diffusion
8	Gas exchange and transport within blood
8	Control of breathing during exercise
9	READING WEEK
10	Exercise thresholds
10	The heart and circulation - systemic
11	The heart and circulation - peripheral
11	Muscle diffusion
12	Venous return and the pulmonary circulation
12	Cardiovascular control during exercise
13	What limits VO ₂ max?
13	Physiological adaptations to exercise training
14	REVIEW FOR FINAL EXAM

3.2. Lab

Each lab runs for 2 weeks. You attend one lab every two weeks. Lab section numbers correspond to whether it is scheduled in week one or two: Week 1 sections 2, 3, 4, 5, and 6; Week 2 sections 7, 8, 9, 10, and 11. All sections in Week 1 are classified as “Group 1” and all sections in week 2 are classified as “Group 2”.

Appropriate attire (gym wear) is required for all labs. Please come to each lab prepared to exercise. Data collected in your lab will be needed to complete each of the lab assignments.

Labs begin the week of September 18th.

Lab attendance will be taken. **If you do not attend a lab**, you will automatically receive a grade of “zero” on the lab quiz component for that lab.

Lab	Date	Lab Topic
1	Group 1: Sep 19 th and 21 st Group 2: Sep 26 th and 28 th	Muscle force-velocity relationship
2	Group 1: Oct 3 rd and 5 th Group 2: Oct 10 th and 12 th	Critical power
3	Group 1: Oct 17 th and 19 th Group 2: Oct 24 th and 26 th	Gas exchange and maximal oxygen uptake
4	Group 1: Nov 7 th and 9 th Group 2: Nov 14 th and 16 th	Muscle oxygen delivery and utilization

3.2.1 Lab Tutorial and Assignment Marks

Students wishing to discuss lab tutorial and assignment marks must first contact their graduate teaching assistant. If further discussion is required, students may attend the lab coordinator’s (Michael Herbert) office hours. Office hours will be posted in the OWL calendar and offered weekly throughout the term, both in person and via Zoom. *ALL electronic correspondence regarding lab evaluation marks, sent to the lab coordinator, will be deleted immediately.*

3.3. Other Notes

1. All lecture materials will be posted on OWL.
2. We will attempt to cover all material as indicated above but it is possible that we might not complete all listed material, that additional material may be added, or the order of lectures will be reorganized.
3. Attendance of lectures is highly recommended. For most lectures, slides will be the primary source of material, but additional material will be included.

4. Laboratory sections have been determined well in advance. Legitimate excuses for missing or re-scheduling labs include illness, compassionate circumstances, etc. Extended vacations, extra work, etc. do not qualify.
5. Exam periods have been selected to conflict as little as possible with other scheduled classes. Please report any potential conflicts **NOW**, do not wait until the week before the exam.

4. Required Course Material/Text:

All required readings will be posted on OWL.

5. Course Evaluation Plan:

Grades are a measure of the performance of a student in individual courses. Each student shall be judged on how well they have command of the course materials.

Component	Category	Value
I	Lab Tutorial Quizzes	4%
II	Lab Assignments	32%
III	Midterm Exam	30%
IV	Final Exam	34%

Evaluation Plan Breakdown:

Component I	Description	Value	Due Date
Lab 1 Tutorial Quiz	Short multiple-choice quiz on OWL	1%	Sep 18 th
Lab 2 Tutorial Quiz	Short multiple-choice quiz on OWL	1%	Oct 2 nd
Lab 3 Tutorial Quiz	Short multiple-choice quiz on OWL	1%	Oct 16 th
Lab 4 Tutorial Quiz	Short multiple-choice quiz on OWL	1%	Nov 6 th
Component II	Description	Value	Due Date
Lab Assignment #1	Analysis and interpretation of data collected in Lab 1	8%	Oct 6 th
Lab Assignment #2	Analysis and interpretation of data collected in Lab 2	8%	Oct 20 th
Lab Assignment #3	Analysis and interpretation of data collected in Lab 3	8%	Nov 10 th
Lab Assignment #4	Analysis and interpretation of data collected in Lab 4	8%	Nov 24 th
Component III	Description	Value	Due Date
Midterm Exam	Covers all lecture and lab material from 1 st day of class to midterm date ○ In-person ○ Multiple choice	30%	Oct 17 th
Component IV	Description	Value	Due Date
Final Exam	Non-cumulative, covers all lecture material from mid-to end-term and content from all 4 labs ○ In-person, time TBA ○ Multiple choice	34%	

All Lab Assignments will be released at noon after the last section of Group 2 has completed their lab (i.e., group 009). All tutorial quizzes and lab assignments will be completed and submitted through OWL. Assignments will not be accepted late, except under medical or other compassionate circumstances. Submitting a late assignment without appropriate documentation will result in a zero (0) grade. A missed mid-term or laboratory examination, without appropriate documentation will result in a zero (0) grade. Acceptable reasons might include hospital stays, serious illness, family emergencies (like serious accidents, illness, or death) or similar circumstances.

5.1 Missed Exams

In situations in which students miss an exam for legitimate reasons, there will be an opportunity to write the exam at a later date. Makeup tests and examinations may not be offered in the same format as the original exam. For example, the exam may shift from a multiple choice to an essay style examination.

Course/University Policies

The website for Registrar Services is <http://www.registrar.uwo.ca>.

1. Email

In accordance with policy, 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 his/her official university address is attended to in a timely manner.

2. 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, in the Academic Calendar (westerncalendar.uwo.ca).

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).

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.

3. 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 during ANY tests, quizzes, midterms, examinations, or other in-class evaluations.

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. **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.**

Personal Response Systems ("clickers") may be used in some classes. For those classes in which we use this technology, it is your responsibility to ensure that the device is activated and functional. You must speak with the course instructor immediately, if you have any concerns about whether or not your clicker is malfunctioning.

You must use only your own clicker. For all components of this course in which clicker records are used to compute a portion of the grade:

- The use of somebody else's clicker in class constitutes a scholastic offence;
- The possession of a clicker belonging to another student will be interpreted as an attempt to commit a scholastic offense

4. Academic Considerations and Absences from Lectures and Assessments

Religious Accommodation: When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request (in writing) any necessary academic considerations at least two weeks prior to the holiday to the academic counsellors in their Home Department. Additional information is provided in the [Western Multicultural Calendar](#).

Academic Accommodation: Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. Students with ongoing accommodation needs within this course are also encouraged to contact [Accessible Education](#), which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found [here](#).

Academic Consideration: The University recognizes that a student's ability to meet their academic responsibilities may, on occasion, be impaired by extenuating circumstances that are medical or compassionate in nature. These extenuating circumstances may be acute (short term), or it may be chronic (long term), or chronic with acute episodes. In all cases, students are advised to consult with the academic counsellors in their home units, at their earliest opportunity. Academic counsellors may refer students to [Accessible Education](#) for ongoing academic accommodations.

Most forms of academic consideration require documentation, and this documentation is to be submitted to academic counsellors within five (5) business days of their return to academic responsibilities. Any such documents will be retained in the student's file, and will be held in confidence in accordance with the University's [Official Student Record Information Privacy Policy](#). Once the petition and supporting documents have been received and assessed, appropriate academic considerations shall be determined by academic counseling, in consultation with the student's instructor(s). Academic considerations may include extension of deadlines, waiver of attendance requirements for classes/labs/tutorials, arranging Special Exams or Incompletes, re-weighting course requirements, or granting late withdrawals without academic penalty. Academic considerations shall be granted only where the documentation indicates that the onset, duration and severity of the illness are such that the student could not reasonably be expected to complete their academic responsibilities. (Note – it will not be sufficient to provide documentation indicating simply that the student “was seen for a medical reason” or “was ill.”).

Whenever possible, students who require academic considerations should provide notification and documentation in advance of due dates, examinations, etc. Under no circumstances are students expected to submit rationales for (or documentation of) any absences, to course instructors. Students are, however, required to follow-up with course instructors, in a timely fashion, to identify the ways in which the academic consideration will be implemented.

Examination Conflicts: A student completing tests or examinations with flexible submission times (e.g., where one or more evaluation is a take-home assessment) cannot request alternative arrangements unless a conflict cannot be avoided by rescheduling writing the exam to a different time within the window specified by the instructor. This applies to direct conflicts as well as “heavy load” conflicts (e.g., three exams within a 23-hour period). The student should discuss any concerns about a potential conflict and/or request academic considerations with their academic counselling unit prior to the deadline to drop a course without academic penalty

In the case of online tests and examinations, use of a “Conflict Room,” wherein student can write two proctored exams concurrently, will be interpreted as arrangements for continuous proctoring.

5. 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 OWL 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 behavior 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.

6. 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>.

7. Grades

Where possible assignment objectives and rubrics will be posted on OWL.

Generally, students can expect some form of feedback on their performance in a course before the drop date.

- November 13th, 2023 (for first term half-courses)
- November 30th, 2023 (for full-year courses)
- March 7th, 2024 (for second term half-or full year courses)

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

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".

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)

8. Support Services

Health and Wellness: Information regarding health and wellness-related services available to students may be found at <http://www.health.uwo.ca/>.

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

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

- *Student Development Centre* - <http://www.sdc.uwo.ca/ssd/>
- *Ombudsperson Office* - <http://www.uwo.ca/ombuds/>

9. 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>