

**KIN 2230 – Introduction to Exercise Physiology  
Fall 2024**

<p><b>Instructor:</b> Dr. Kevin Boldt  <b>Office:</b> Thames Hall 4178  <b>Email:</b> <a href="mailto:kboldt@uwo.ca">kboldt@uwo.ca</a>  <b>Phone:</b> 519-661-2111 Ext.86957  <b>Office Hours:</b> TBA</p> <p><b>Lab Instructor:</b> Michael Herbert  <b>Office:</b> Thames Hall 4180  <b>Email:</b> <a href="mailto:mherber5@uwo.ca">mherber5@uwo.ca</a>  <b>Phone:</b> 519-661-2111 (ext. 88675)  <b>Office Hours:</b> TBA</p> <p><b>TAs:</b></p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr><td style="width: 50%; height: 20px;"></td><td style="width: 50%;"></td></tr> <tr><td style="height: 20px;"></td><td></td></tr> <tr><td style="height: 20px;"></td><td></td></tr> <tr><td style="height: 20px;"></td><td></td></tr> <tr><td style="height: 20px;"></td><td></td></tr> </table>											<p><b>Instruction Mode:</b> Blended:                  2h/week in-person lecture                  1h/week virtual asynchronous lecture                  2h/every second week in-person lab</p> <p><b>Lectures:</b> TBA</p> <p><b>Laboratories:</b> in-person: <span style="background-color: black; color: black;">XXXXXXXXXX</span></p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <thead> <tr> <th style="width: 33%;">Section</th> <th style="width: 33%;">Day</th> <th style="width: 33%;">Time</th> </tr> </thead> <tbody> <tr><td>002 &amp; 007</td><td></td><td></td></tr> <tr><td>003 &amp; 008</td><td></td><td></td></tr> <tr><td>004 &amp; 009</td><td></td><td></td></tr> <tr><td>005 &amp; 010</td><td></td><td></td></tr> <tr><td>006 &amp; 011</td><td></td><td></td></tr> </tbody> </table>	Section	Day	Time	002 & 007			003 & 008			004 & 009			005 & 010			006 & 011		
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**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.

<p><b>Calendar Course Description (including prerequisites/anti-requisites):</b>                  The physiological basis of muscular exercise and training. The course will examine metabolic, cardiorespiratory and muscular adaptations to acute and chronic exercise.</p> <p><b>Prerequisite(s):</b> Grade 12U Biology or equivalent, and Physiology 1021 or equivalent with a minimum grade of 60%.</p> <p><b>Extra Information:</b> 3 lecture hours, 2 laboratory hours biweekly.</p>
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*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.

**My Course Description**

Dynamic exercise (driven by muscle contraction) 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 enlists 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 deconditioning (through disease or inactivity) 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 (that’s when it gets most exciting)) at various exercise demands (intensities and durations).

### Learning Outcomes

Upon completion of this course, students will be able to:

1. Explain how muscle contracts at the cellular and whole-body levels.
2. Describe the impact of muscle contraction on energy demand and explain how energy is stored in muscle.
3. Describe in detail the contribution of energy systems in meeting energy supply.
4. 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.
5. 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.
6. Define exercise intensity based on “intensity domains” and describe/identify the unique physiological response profiles at each intensity.
7. Explain the short-term physiological consequences when energy supply is not sufficient for energy demand.
8. List the common anatomical and functional adaptations to exercise training and explain specifically how they improve exercise performance or capacity.
9. Describe key variables for exercise appraisal, and collect, analyze, and interpret exercise test data.

### Course Schedule:

#### Lectures:

Each week there will be ~2.5 hours of lecture. The first ~1.5 hours will be delivered in-person on Tuesdays (Location and time TBD) (i.e., synchronous). The additional ~1 hour will be posted online on Thursday mornings (i.e., asynchronous). The following is a tentative schedule of content. Specific topics and the specific weeks in which they are delivered may change.

Week	Lecture	Synchronous Lecture	Asynchronous Lecture	Dates
1	Lecture 1		Introduction to Exercise Physiology	September 5
2	Lecture 2+3	Skeletal muscle and human movement I	Skeletal muscle and human movement II	September 10, 12
3	Lecture 4+5	Bioenergetics and muscle metabolism – in the cytosol	Bioenergetics and muscle metabolism – in the mitochondria	September 17, 19
4	Lecture 6+7	Bioenergetics of muscle metabolism – substrate utilization	Energy – expenditure and measurement	September 24, 26
5	Lecture 8+9	Maximal oxygen uptake	Exercise intensity	October 1, 3
6	Lecture 10+11	Pulmonary ventilation and gas diffusion	Gas exchange and transport within blood	October 8, 10
<b>*Reading Week*</b>			<b>October 12-20</b>	
7	-	<b>Midterm</b>	<i>No virtual lecture</i>	October 22
8	Lecture 12+13	Control of breathing during exercise	Exercise thresholds	October 29, 31
9	Lecture 14+15	The heart and circulation - systemic	The heart and circulation - peripheral	November 5, 7
10	Lecture 16+17	Muscle diffusion	Venous return and the pulmonary circulation	November 12, 14

11	Lecture 18+19	Cardiovascular control during exercise	Hormonal control during exercise	November 19, 21
12	Lecture 20+21	What limits VO <sub>2</sub> max?	Physiological adaptations to exercise training	November 26, 28
13	Lecture 22	<b>Course Review</b>		December 3

### **Labs:**

Each lab runs for 2 weeks. **You attend one lab every two weeks.** Lab section numbers correspond to whether it is scheduled in Group one or two:

- Group 1 sections 002, 003, 004, 005, and 006;
- Group 2 sections 007, 008, 009, 010, and 011.

Appropriate attire (e.g., running shoes, shorts or gym pants/leggings, and t-shirts) 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.

The experiential learning associated with the practical laboratory experiences is an important part of the learning outcomes for this course. **Thus, lab attendance is mandatory and if you do not attend a lab, you will automatically receive a grade of “zero” on the lab assignment for that lab.**

Lab	Date	Lab Topic
1	Group 1: Sept 17 <sup>th</sup> and 19 <sup>th</sup> Group 2: Sept 24 <sup>th</sup> and 26 <sup>th</sup>	Muscle force-velocity relationship
2	Group 1: Oct 1 <sup>st</sup> and 3 <sup>rd</sup> Group 2: Oct 8 <sup>th</sup> and 10 <sup>th</sup>	Critical power
--	<b>October 22<sup>nd</sup> and 24<sup>th</sup></b>	<b>No labs - Midterm</b>
3	Group 1: Oct 29 <sup>th</sup> and 31 <sup>st</sup> Group 2: Nov 5 <sup>th</sup> and 7 <sup>th</sup>	Introduction to measuring gas exchange
4	Group 1: Nov 12 <sup>th</sup> and 14 <sup>th</sup> Group 2: Nov 19 <sup>th</sup> and 21 <sup>st</sup>	Muscle oxygen delivery and utilization

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.*

### **Required Course Material:**

There is no required textbook for this course.

### **Course Evaluation:**

Due dates are provided below and will be communicated on OWL Brightspace. Assigned work, including formal assignments are due as communicated below and in OWL Brightspace. Assignments are due before the date and time listed. Failure to submit assignments by due dates and times will result in a late penalty of 10% per day. Accommodations for assignments and examinations must be made through the Academic Support and Engagement office.

Assessment	Weight	Date
Pre-Lab Quizzes	4%	Ongoing (Tuesday the week of each lab)
Laboratory Assignments	32%	Oct 4, Oct 25, Nov, 15, Nov 29
Midterm Exam	29%	October 22
Final Exam	35%	Scheduled by Registrar
<b>Total</b>	<b>100%</b>	

**Pre-Laboratory Quizzes (1% each, total of 4%):** Students will be expected to prepare for their laboratory sessions by reading the assigned readings and protocols. Pre-laboratory quizzes will assess the students' basic understanding of the concepts as well as the protocols to be completed in-lab. Quizzes will be completed through OWL Brightspace and will be due the Tuesday on the week of their laboratory session:

Group 1: Sept 17, Oct 1, Oct 29, Nov 12

Group 2: Sept 24, Oct 8, Nov 5, Nov 19.

**Laboratory Assignments (8% each, total of 32%):** Students will complete assignments based on the analysis and interpretation of the data they collect in their laboratory sessions. The assignment outlines will be posted after the last section of Group 2 completes their laboratory. Assignments will include both consideration of student's own collected data and the theory behind what was expected to occur and the mechanisms for those physiological effects. Unexcused absences from laboratory sessions will result in a zero grade on the assignment for that lab.

Groups 1 *and* 2: Oct 4, Oct 25, Nov 15, Nov 29.

**Midterm Exam (29%):** The Midterm Exam will be comprised of multiple-choice questions and held during class time on October 22<sup>nd</sup>. Students will have the full class time (1 hour 50 minutes) to complete the exam. The focus of the midterm exam will be on energy demand, covering Lectures 1-11 inclusive. A missed examination without appropriate documentation will result in a zero (0) grade. Following formal documentation, a make-up mid-term will be available on October 28, 2024. Students unable to write the make-up midterm will have the weight of that test pushed to the final exam.

**Final Exam (35%):** The Final Exam will be comprised of multiple-choice questions and will be scheduled by the registrar during the examination period. The Final Exam will be cumulative, but will have emphasis on the material since the midterm: energy supply. A missed examination without appropriate documentation will result in a zero (0) grade. Per University policy, makeup examinations for the final exam (i.e., during the December exam periods) are held on the Thursday of the first week of classes in January (for first-term courses).

## Course/University Policies

The website for Registrarial 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](http://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](http://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 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.

### **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 12<sup>th</sup>, 2024 (for first term half-courses)
- December 2<sup>nd</sup>, 2024 (for full-year courses)
- March 7<sup>th</sup>, 2025 (for second term half-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 31<sup>st</sup> (for first-term half courses) or June 30<sup>th</sup> (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>