

Western University  
Faculty of Health Sciences  
**School of Kinesiology**

**KIN 2230A - Introductory Exercise Physiology  
Fall 2019**

<p><b>Instructor:</b> Dr. Glen Belfry <b>Office:</b> Arts &amp; Humanities Bldg Rm 3G24 <b>Email:</b> <a href="mailto:gbelfry@uwo.ca">gbelfry@uwo.ca</a> <b>Phone:</b> 519/661-2111 x88364 <b>Office Hours:</b> by appointment</p> <p><b><u>LABS</u></b> <b>Instructor:</b> Michael Herbert <b>Office:</b> Arts &amp; Humanities Bldg Rm 3G04 <b>Email:</b> <a href="mailto:mherber5@uwo.ca">mherber5@uwo.ca</a> <b>Phone:</b> 519/661-2111 x88675 <b>Office Hrs:</b> Office hours will be posted on OWL at the beginning of the semester</p> <p><b>TAs:</b> TBD</p>	<p><b>Lectures:</b> Mon-Wed-Fri 12:30pm - 1:30pm <b>Room:</b> Physics &amp; Astronomy Building Rm 148</p> <p><b>Lab</b> 002 We 1:30pm - 4:30pm ~AHB 1R43 003 We 1:30pm - 4:30pm ~ AHB 1R43 004 We 7:00pm - 10:00pm ~ AHB 1R43 005 We 7:00pm - 10:00pm ~ AHB 1R43</p> <p>* You attend 1 lab every 2 weeks (total of 4 labs throughout the semester)</p> <p>Labs 002 and 004 are held on the following dates;</p> <ul style="list-style-type: none"> <li>• September 11 and 25</li> <li>• October 9 and 23</li> </ul> <p>Labs 003 and 005 are held on the following dates;</p> <ul style="list-style-type: none"> <li>• September 18</li> <li>• October 2, 16 and 30</li> </ul>
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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, 3 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.*

*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 enrol 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.

**Learning Outcomes/Schedule:**  
**Lecture Outline:**

**Topic**

1. METABOLISM DURING EXERCISE

- a. What is energy?
- b. Energy value in food
- c. Factors affecting energy production
- d. Anaerobic energy sources
  - 1. ATP
  - 2. CP
  - 3. Glycolysis
- e. Aerobic energy sources
  - 1. Carbohydrate
  - 2. Lipid
- f. Significance of various energy sources and foods
- g. Oxygen uptake
  - 1. indirect calorimetry
- h. Lactic acid production
- i. EPOC
- j. Metabolic causes of fatigue

**Learning Objectives**  
To be able to:

- 1. Identify the amount of energy derived from food of different types.
- 2. To understand those factors which may influence energy release.
- 3. Explain the basic energy stores, their power and capacity.
- 4. Identify and explain the anaerobic energy stores.
- 5. Understand the basic aerobic pathways for both carbohydrate and lipid metabolism.
- 6. Identify the significance of the energy delivery systems to athletic events of various durations.
- 7. Understand some effects of exercise nutrition
- 8. Outline the kinetics of the oxygen uptake curve.
- 9. Differentiate between steady-state and maximum oxygen consumption.
- 10. Understand the importance of maximal oxygen consumption ( $VO_2\text{max}$ ) to endurance performance.
- 11. Understand and be able to calculate  $VO_2$  via indirect calorimetry.
- 12. Recognize the meaning and use of ATPS, STPD & BTPS.
- 13. Understand the concept of RER.
- 14. Understand the reasons for, and the relative production and importance of lactic acid production.
- 15. Outline the reasons for and functions of the EPOC.
- 16. Understand critical power.

2. VENTILATION DURING EXERCISE

- a. Lung structure and function
- b. Mechanics of ventilation
- c. Static lung volumes
- d. Gas pressures and exchange
- e. Gas transport in the blood
- f. Ventilatory control
- g. Ventilation during exercise
- h. Ventilation as a limiting factor to exercise

- Learning Objectives  
To be able to:
1. Outline lung structure and its relation to function.
  2. Outline how lung volume is altered and understand those factors which influence maximal capacity.
  3. Identify the static lung volumes and understand their relationship to dynamic ventilation.
  4. Explain how gas pressure acts as the driving force for gas exchange.
  5. Explain how gas (O<sub>2</sub> and CO<sub>2</sub>) is transported in the blood and the significance of the oxyhemoglobin curve.
  6. Outline the manner in which control may be exerted over the ventilatory system.
  7. Identify what happens to ventilation during exercise.
  8. Discuss why or why not, ventilation may be a limiting factor to exercise.
  9. Outline how acid-base status is maintained.
  10. Recognize the influence of physical training on respiratory adaptations.

### 3. CARDIOVASCULAR FUNCTION DURING EXERCISE

- a. Cardiac structure and function
- b. The circulatory system
- c. Cardiac output
- d. Relation between cardiac performance and oxygen uptake
- e. Blood pressure and exercise
- f. Distribution of blood flow
- g. Cardiac control

- Learning Objectives  
To be able to:
1. Discuss the relationship between cardiac structure and function.
  2. Outline the manner in which blood is circulated to our bodies as well as the function of various subsections of the circulatory system.
  3. Indicate the influence of exercise on blood pressure and the determination of mean arterial pressure.
  4. Discuss the intrinsic and extrinsic regulation of the cardiac cycle.
  5. Discuss those factors controlling blood flow distribution.
  6. Outline the factors affecting cardiac output and the influence of exercise on these factors.
  7. Indicate those factors responsible for increased cardiac performance during exercise.
  8. To understand the relation between cardiac output and oxygen uptake.
  9. To be aware of the influence of training on the heart and the cardiovascular system.

### 4. MUSCLE FUNCTION DURING EXERCISE

- a. Muscle structure and function
- b. The mechanism of muscular contractions. Some important contractile properties
- d. Neuromuscular control of movement
  1. Motor units
  2. Recruitment pattern
  3. Muscle fibre types
  4. Feedback loops
- e. Muscle soreness & recovery

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|---------------------|----|--|
| Learning Objectives | 1. | Outline muscle structure and function at the level of both whole muscle and individual sarcomere.  |
| To be able to:      | 2. | Outline the sequence of contractile events starting with initiation of a neural signal to relaxation of the muscle.  |
|                     | 3. | Explain the concept of motor units and their importance to a graded contraction.   |
|                     | 4. | Outline the various types of muscle fibers; <ul style="list-style-type: none"> <li>a. classification schemes</li> <li>b. metabolic potential</li> <li>c. association with <math>m\dot{V}O_2</math> and athletic success</li> </ul> |
|                     | 5. | Outline the manner in which muscles may grow or be altered by activity at the subcellular level.   |
|                     | 6. | Discuss the significance of various proprioceptors to muscle function  |
|                     | 7. | Understand the basic mechanisms of muscle injury and recovery  |

### TRAINING ADAPTATIONS TO EXERCISE

#### a. Physiological responses to training

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| Learning Objectives | 1. | Identify the major cardiovascular, respiratory and muscular adaptations that occur with different forms of training. |
| To be able to:      | 2. | Identify the cellular changes of anaerobic and aerobic systems that occur with different forms of training.          |
|                     | 3. | Discuss the influence of initial fitness, frequency, duration, intensity, and mode of training on adaptation.        |

- Note:**
1. All lectures will be posted on WebCT in Power Point format.
  2. During the course of the semester we will attempt to cover the material indicated. It is possible that we might not complete the suggested material, or that additional material may be added.
  3. Lectures will be developed with the text as primary source, but additional material will be commonly included, therefore attendance at lectures is recommended.
  4. The learning objectives associated with each section are designed to assist the student in focusing their reading and effort. The topics to be discussed cannot be considered exclusive however, and the student is responsible for all material covered.
  2. 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.
  6. Exam periods have been selected to conflict as little as possible with other scheduled classes.
    - \* **Makeup exams will be given only to those students with a direct class conflict with the scheduled midterm exams. All other absences from midterm exams will result in the weight of that midterm being added to the weight of the comprehensive final exam.**
 As a general policy, the instructor will not entertain any questions within a one day period before the day of a scheduled exam. Please note that computer software (ScanExam II) will be employed to check for unusual coincidences in answer patterns that may indicate cheating on multiple choice exams.

## LAB TOPICS

Lab 1: Enzyme kinetics

Lab 2: Static lung volumes and ventilatory response to incremental exercise.

Lab 3: Oxygen uptake and carbon dioxide response to incremental exercise.

Lab 4: Muscle contractile properties

### **Required Course Material/Text:**

All required readings will be posted on OWL.

### **Course Evaluation:**

Evaluation of the student's progress in this course will be assessed via 2 mid-term exams, a laboratory exam and a **COMPREHENSIVE** final exam. Lecture examinations will be of the multiple choice type, whereas the laboratory exam will consist of short answers and calculative questions requiring data manipulation and evaluation.

<b>Examination</b>	<b>Value%</b>	<b>Date</b>	
Lecture Mid-term #1	20	Thursday, October 10,	5:30-6:45 P.M. (rm TBA)
Lecture Mid-term #2	20	Thursday, November 14,	5:30-6:45 P.M. (rm TBA)
Laboratory Exam	15	Friday, November 22,	7:00-9:00 P.M. (rm TBA)
Laboratory Tutorials	5		
Laboratory Quizzes	5		
Final Comprehensive Exam	35	TBA	

Tutorials and quizzes are due as stated in the course syllabus/OWL and will not be accepted late, except under medical or other compassionate circumstances. Submitting a late tutorial or quiz without appropriate documentation will result in a zero (0) grade. A missed mid-term 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.

Lab attendance is MANDATORY. Missing a lab without appropriate documentation (through an academic counselor) will result in a mark of 0 on your quiz AND tutorial for the associated lab topic.

### **Course/University Policies**

#### **1. Statement on Use of Personal Response Systems (“Clickers”)**

If Personal Response Systems (“Clickers”) are used in the course, a reference to the Guidelines for their use (Guidelines are shown below). Instructors are to communicate clearly to students information on how clickers are used including: how the student’s privacy will be protected, how clickers may be used by the instructor for data gathering and for evaluating the students, and why they cannot be used by anyone but the student (since the students involved in misuse of a clicker may be charged with a scholastic offence).

**2. Academic offences:** They are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: [https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/scholastic\\_discipline\\_undergrad.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf)

A) Students must write their essays and assignments in their own words. Whenever students take an idea, or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence (see Scholastic Offence Policy in the Western Academic Calendar). All required 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 for such checking 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 <http://www.turnitin.com>

B) 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. Electronic Device Usage:

**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 of the following electronic devices during ANY of the tests, quizzes, midterms, examinations, or other in-class evaluations: cellphones, smart phones, smart watches, smart glasses, audio players or recorders of any sort, video cameras, video games, DVD players, televisions, laptop/notebook/netbook computers, flashlights or laser pointers.

**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. Please be respectful to your fellow students and turn the sound off. If the professor receives complaints from other students regarding noise or other disruptive behavior (e.g. watching videos on YouTube.com, updating your Facebook status, playing Solitaire), your classroom privileges will be revoked. 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.**

### 4. 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.

### 5. Support Services

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

1. *Student Development Centre* -- <http://www.sdc.uwo.ca/ssd/>
2. *Student Health & Wellness* -- <http://www.health.uwo.ca/>
3. *Registrar's Office* -- <http://www.registrar.uwo.ca/>
4. *Ombudsperson Office* -- <http://www.uwo.ca/ombuds/>

### 6. Documentation for Academic Accommodation (Illness, Medical/Non-Medical Absences):

[http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page\\_12](http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_12)

Students who experience an extenuating circumstance (illness, injury, or other extenuating circumstance) sufficiently significant to temporarily render them unable to meet academic requirements may submit a request for academic consideration through the following routes:

- (i) Submitting a Self-Reported Absence (see below for conditions)
- (ii) For medical absences exceeding 48 hours, submitting a Student Medical Certificate (SMC) signed by a licensed medical or mental health practitioner to their Academic Counselling in their Faculty of registration in order to be eligible for Academic Consideration; or
- (iii) For non-medical absences exceeding 48 hours, submitting appropriate documentation (e.g., obituary, police report, accident report, court order, etc.) to Academic Counselling in their Faculty of registration in order to be eligible for academic consideration. Students are encouraged to contact their Academic Counselling unit to clarify what documentation is appropriate.

Students seeking academic consideration **must communicate with their instructors no later than 24 hours** after the end of the period covered by either the self-reported absence or SMC, or immediately upon their return following a documented absence.

**The following conditions are in place for self-reporting of medical or extenuating circumstances:**

- a. a maximum of two self-reported absences between September and April and one self-reported absence between May and August;
  - b. any absences in excess of the number designated in clause a above will require students to present a Student Medical Certificate (SMC) or appropriate documentation supporting extenuating circumstances to the Academic Counselling unit in their Faculty of registration no later than two business days after the date specified for resuming responsibilities.
  - c. The duration of the excused absence will be for a maximum of 48 hours from the time the Self-Reported Absence form is completed through the online portal, or from 8:30 am the following morning if the form is submitted after 4:30 pm;
  - d. The duration of the excused absence will terminate prior to the end of the 48 hour period should the student undertake significant academic responsibilities (write a test, submit a paper) during that time;
  - e. The duration of an excused absence will terminate at 8:30 am on the day following the last day of classes each semester regardless of how many days of absence have elapsed;
  - f. Self-reported absences will not be allowed for scheduled final examinations; for midterm examinations scheduled during the December examination period; or for final lab examinations scheduled during the final week of term;
  - g. Self-reporting may not be used for assessments (e.g. midterm exams, tests, reports, presentations, or essays) worth more than 30% of any given course;
- For medical and non-medical absences that are not eligible for self-reporting Kinesiology students must submit an Academic Consideration Request form found online [https://www.uwo.ca/fhs/kin/undergrad/files/accommodation\\_request.pdf](https://www.uwo.ca/fhs/kin/undergrad/files/accommodation_request.pdf) in addition to an SMC or appropriate documentation in the event of a non-medical absence. These 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.

7. **Grades:** Where possible assignment objectives and rubrics will be posted on OWL. Should you have a concern regarding the grade you received for an assignment or feel that it is unfair in any way, you must wait 24 hours from the receipt of the assignment to approach the instructor or TA. In doing so, please make an appointment and prepare in writing, with evidence, why you feel your grade is inappropriate. Please be aware that in requesting a grade reassessment, your grade could go up/down/or stay the same. Note that calculations errors (which do occur!) should be brought to my attention immediately.

At least three days prior to the deadline for withdrawal from a 1000- or 2000-level course without academic penalty, students will receive assessment of work accounting for at least 15% of the final grade.

- November 9th, 2019 (for first term half-courses)
- November 27th, 2019 (for full-year courses)
- March 4th, 2020 (for second term half-or full year courses)

A+	90-100	<i>One could scarcely expect better from a student at this level</i>
A	80-89	<i>Superior work that is clearly above average</i>
B	70-79	<i>Good work, meeting all requirements and eminently</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% will occur in this course):

8. **Classroom Behaviour:** Class will begin promptly at the time specified at the top of page one of this syllabus. In the event that you must arrive late, please enter the classroom with a minimal disturbance to the class. Please keep all electronic devices on silent and avoid distracting classmates.

## **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>