Western University
Faculty of Health Sciences
School of Kinesiology

KIN 2230A - Introductory Exercise Physiology
Fall 2020

Instructor: Dr. Glen Belfry **Office:** Arts & Humanities Bldg Rm 3G24 **Email:** gbelfry@uwo.ca **Phone:** 519/661-2111 x88364 **Office/Zoom Hours:** by appointment **LABS** **Instructor:** Michael Herbert **Office:** Arts & Humanities Bldg Rm 3G04 **Email:** mherber5@uwo.ca **Phone:** 519/661-2111 x88675 **Office Hrs:** Office hours will be posted on OWL at the beginning of the semester **TAs:** TBD	**Lectures:** Mon-Wed-Fri 12:30pm - 1:30pm **Room**: Online Live and Recorded **Lab:** Online Live and Recorded

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_2max) 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. <u>VENTILATION DURING EXERCISE</u>

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_2 and CO_2) 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

Learning Objectives
To be able to:

1. Outline muscle structure and function at the level of both whole muscle and individual sarcomere.
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;
    a. classification schemes
    b. metabolic potential
    c. association with mVO_2 and athletic success
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

Learning Objectives
To be able to:

1. Identify the major cardiovascular, respiratory and muscular adaptations that occur with different forms of training.
2. Identify the cellular changes of anaerobic and anaerobic 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.

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

LAB TOPICS

Lab 1: Static lung volumes and ventilatory response to incremental exercise.
Lab 2: Oxygen uptake and carbon dioxide response to incremental exercise.
Lab 3: Muscle contractile properties
Lab 4: Energy System Contributions to Sprint Exercise.

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 multiple choice, short answers and calculative questions requiring data manipulation and evaluation.

Examination	**Value%**	**Date**
Lecture Mid-term #1	20	Thursday, October 8 (5:30-6:10pm)
Lecture Mid-term #2	20	Thursday, November 12 (5:30-6:10pm)
Laboratory Exam	15	Friday, November 20 (TBA)
Laboratory Tutorials	5	
Laboratory Quizzes	5	
Final Comprehensive Exam	35	TBA

Tutorials and quizzes are due as stated on 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

Live online lab attendance is NOT mandatory. This time will be used for students to interact and ask questions regarding lab protocols in real time however. All live labs will be recorded, for students to view on their own time.

NOTE the following important dates:

Fall 2020

Wed Sept 9/20:	First term begins
Mon Oct 12/20:	Thanksgiving
Mon Nov 2 to Sun Nov 8/20:	Fall Study Break
Wed Dec 9/20	Last Day of Class

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

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. **Accommodation, Illness Reporting and Academic Considerations**:
http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_12

Accommodation Policies

Students with disabilities work with Accessible Education (formerly SSD) which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The accommodation policy can be found here: Academic Accommodation for Students with Disabilities.

Academic Consideration for Student Absence
https://www.uwo.ca/fhs/kin/undergrad/academic/consideration/index.html

Students will have up to two (2) opportunities during the regular academic year to use an on-line portal to self-report an absence during the term, provided the following conditions are met: the absence is no more than 48 hours in duration, and the assessment for which consideration is being sought is worth 30% or less of the student's final grade. Students are expected to contact their instructors within 24 hours of the end of the period of the self-reported absence, unless noted on the syllabus. Students are not able to use the self-reporting option in the following circumstances:

- for exams scheduled by the Office of the Registrar (e.g., December and April exams)
- absence of a duration greater than 48 hours,
- assessments worth more than 30% of the student's final grade,
- if a student has already used the self-reporting portal twice during the academic year

If the conditions for a Self-Reported Absence are *not* met, students will need to provide a Student Medical Certificate if the absence is medical, or provide appropriate documentation if there are compassionate grounds for the absence in question. Students are encouraged to contact their Faculty academic counselling office to obtain more information about the relevant documentation.

Students should also note that individual instructors are not permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons. **All documentation required for absences that are not covered by the Self-Reported Absence Policy must be submitted to the Academic Counselling office of a student's Home Faculty.**

For Western University policy on Consideration for Student Absence, see
Policy on Academic Consideration for Student Absences - Undergraduate Students in First Entry Programs
and for the Student Medical Certificate (SMC), see:
http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf.

Religious Accommodation
Students should consult the University's list of recognized religious holidays, and should give reasonable notice in writing, prior to the holiday, to the Instructor and an Academic Counsellor if their course requirements will be affected by a religious observance. Additional information is given in the Western Multicultural Calendar.

7. **Examination Conflicts**: A student with examinations having flexible submission times (e.g., where one or more examination is a take-home examination) 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 accommodation with their academic counselling unit prior to the deadline to drop a course without academic penalty

In the case of online examinations, an "Examination Conflict Room," which may be assigned when a student is scheduled to write two proctored exams concurrently, will be interpreted as arrangements for continuous proctoring.

8. **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 12th, 2020 (for first term half-courses)
- □ November 30th, 2020 (for full-year courses)
- □ March 7th, 2021 (for second term half-or full year courses)

A+	90-100	*One could scarcely expect better from a student at this level*
A	80-89	*Superior work that is clearly above average*
B	70-79	*Good work, meeting all requirements and eminently*
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. **This practice will not occur here.** The edges of this course are clear and sharp. The mark attained is the mark you achieved and the mark assigned; 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".

9. **Contingency Plan for an In-Person Class Pivoting to 100% Online Learning:** In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, 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

10. **Online Etiquette**: Some components of this course will involve online interactions. To ensure the best experience for both you and your classmates, please honour the following rules of etiquette:

- please "arrive" to class on time
- please use your computer and/or laptop if possible (as opposed to a cell phone or tablet)
- ensure that you are in a private location to protect the confidentiality of discussions in the event that a class discussion deals with sensitive or personal material
- to minimize background noise, kindly mute your microphone for the entire class until you are invited to speak, unless directed otherwise
- [suggested for classes larger than 30 students] In order to give us optimum bandwidth and web quality, please turn off your video camera for the entire class unless you are invited to speak
- [suggested for cases where video is used] please be prepared to turn your video camera off at the instructor's request if the internet connection becomes unstable
- unless invited by your instructor, do **not** share your screen in the meeting

The course instructor will act as moderator for the class and will deal with any questions from participants. To participate please consider the following:

- if you wish to speak, use the "raise hand" function and wait for the instructor to acknowledge you before beginning your comment or question
- remember to unmute your microphone and turn on your video camera before speaking
- self-identify when speaking.
- remember to mute your mic and turn off your video camera after speaking (unless directed otherwise)

General considerations of “netiquette”:

- Keep in mind the different cultural and linguistic backgrounds of the students in the course.
- Be courteous toward the instructor, your colleagues, and authors whose work you are discussing.
- Be respectful of the diversity of viewpoints that you will encounter in the class and in your readings. The exchange of diverse ideas and opinions is part of the scholarly environment. “Flaming” is never appropriate.
- Be professional and scholarly in all online postings. Cite the ideas of others appropriately.

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.

11**. 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