

School of Kinesiology
Faculty of Health Sciences
Western University

**KIN 4432A - Physiology of Exercise
Fall 2018**

Instructor: Dr. Baraa Al-Khazraji

Office Hours: TBD

Email: balkhaz@uwo.ca

Lectures: Tu 9:30AM-10:30AM
Social Sciences Centre
Rm 2028

Th 9:30AM-11:30AM
Social Sciences Centre
Rm 2028

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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:

A study of the integration of neural, metabolic and vascular factors that compete to simultaneously regulate blood pressure and blood flow during physical exercise in health and disease..

My Course Description: This course evaluates the integration of neural and vascular factors in regulating blood pressure and blood flow during physiological stressors. An emphasis is placed on understanding these regulatory mechanisms during exercise, and how modifications made during aging, some disease states, and extreme physiological stressors impact blood pressure and/or flow regulation. A major component of the course involves discussing the interaction of cardiovascular neural reflexes with local tissue vascular control during the adjustment of blood pressure and/or blood flow. The course challenges the student to take on an integrative approach to learning in order to appreciate how several systems interact to sustain cardiovascular homeostasis.

Anti-requisite(s)/Pre-requisite(s)/Co-requisite(s) if applicable:

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 the course department 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.

Course Format:

Lectures: Tuesdays 9:30 - 10:30 a.m., and Thursdays 9:30 – 11:30 a.m.

Location: Social Sciences Centre, Room 2028

Learning Objectives:

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

1. **Identify and explain** theoretical terms, concepts, and ideologies related to systemic and local cardiovascular and autonomic nervous system adjustments in the context of exercise. (Knowledge & Understanding)
2. **Utilize** theoretical terms, concepts and ideologies to experimental approaches to the study of reflex cardiovascular control and how these (and other) systems work together in complex integrative physiology during cardiovascular homeostasis. (Application)
3. **Outline and distinguish** theoretical and experimental approaches to the study of cardiovascular homeostasis and how such variations in approaches affect interpretations. (Analysis)
4. **Compare and appraise** research and theoretical knowledge (both from class and existing literature) as it relates to the regulation of blood pressure and blood flow at rest and during exercise in various populations. (Evaluation)
5. **Apply** acquired skills in evaluating research (through assignments and class discussion) to investigate how the body accomplishes goals such as elevating blood pressure, or adjusting blood flow to skeletal muscle during exercise, and how such options vary from person to person. Students will **assemble** research findings and concepts from class and relate these to the topics discussed in class (e.g., via schematic mind-map). (Creation)

Readings:

Course materials, including course outline, readings and lecture notes, are available on the OWL website for this course. Past exams or exam questions are not available. Readings that parallel the lectures are assigned. The readings are in journal article or book chapter format. The readings labelled "REQUIRED" address major components of the course and are examinable. These readings are published comprehensive reviews on relevant topics. It is your responsibility to extract parts of these readings that are pertinent to the course. These directions will also be provided during lectures. Readings labelled "SUPPLEMENTAL" are for more directed readings on weekly lectures and may be targeted for assignments. The weekly readings will emphasize the physiology, methodology and/or clinical aspects regarding reflex cardiovascular control. You are responsible for obtaining and reading all course readings.

Required Course Material:

All required readings and lecture slides will be posted on OWL. No textbooks are required for this course.

Course Evaluation Summary:

1. Assignment 1: Critical evaluation of literature <u>Date:</u> September 28th, 2018 (submit via OWL) <u>Description:</u> Working as a group, you will be asked a question related to class content and will be required to draw on literature to defend your answer.	15%
2. Midterm Examination <u>Date:</u> October 18th, 2018 (in-class) <u>Description:</u> Maximum 5 multiple choice, with mostly short answer question	30%
3. Assignment 2: Critical evaluation of literature. <u>Date:</u> November 16th, 2018 (submit via OWL) <u>Description:</u> Working as a group, you will be asked a question related to class content and will be required to draw on literature to defend your answer.	15%
4. Final Examination: <i>Minimally cumulative</i> <u>Date:</u> TBD <u>Description:</u> Maximum 5 multiple choice, with mostly short answer questions	40%

Assignment Information

The two assignments in this course are intended to provide you with the opportunity to perform a literature search for a given research question derived from class content. You will learn how to extract *relevant* information from these manuscripts such that you are able to provide a summary of arguments that are in support and against the overall conclusion.

Tentative List of Topics Covered in Class (dates subject to change)**1. Course Introduction & Basic Description of Vascular Mechanics (Sept. 6 – 11)**

Course introduction, expected course learning outcomes, and description of assignments/mid-term are presented, followed by discussion on biophysics of the cardiovascular system, vascular mechanics and blood flow.

2. Vasodilation: Increasing blood flow and oxygen delivery (Sept. 13 – 20)

What is the blood flow responses to exercise? What are some hypotheses of potential mechanism(s) mediating exercise vasodilation?

3. Autonomic Cardiovascular Control During Exercise:**3.1. The Sympathetic Nervous System: (Sept. 25 – Oct. 4)**

Neuroanatomy, Neurotransmitters, Cellular Vasoconstriction Pathways, Measurement.

3.2. The Baroreflex (Oct. 23 – 25)

The basic physiology of acute baroreflex-mediated neurovascular adjustments to orthostasis.

3.3. The Exercise Pressor Response (the Metaboreflex) (Oct. 30 – Nov. 6)

Sensory nerve fibres from skeletal muscle signal changes in muscle metabolism that elicit a cardiovascular response.

4. Central Command (Nov. 8 – 13)

The brain remains a frontier area of research in many aspects, including exercise science. How are muscle activation and cardiovascular responses coordinated during exercise? This lecture will expose students to the concept of central command, and touch on recent neuroimaging studies that examine the cortical organization for cardiovascular control during exercise.

5. Sympatholysis: Balancing the field between vasodilation and vasoconstriction during exercise. (Nov. 15 – 22)

This lecture will attempt to tie many aspects of this course together by addressing the following question: How does one reconcile the considerable vasodilation to satisfy blood flow needs of exercising muscle with the competitive need to defend blood pressure in the face of limited cardiac output? Is muscle blood flow or blood pressure the regulated variable during exercise?

6. Regulation of Heart Rate and Methods Related to Research into Exercise-Induced Bradycardia. (Nov. 27 – 29)

How does the brain control heart rate? What is the specific role of the autonomic nervous system in heart rate control during exercise? What are some research methods used to characterize the role of the autonomic nervous system in heart rate control?

7. Cerebral Blood Flow Control (Nov. 29 – Dec. 4)

The control of blood flow to the brain differs markedly from skeletal muscle. Yet, some believe that failure to meet adequate perfusion of the brain is the fundamental determinant of exercise fatigue.

Disclaimer Note: Time may not permit complete coverage of all topics outlined above. The timing and content of lectures might change depending on classroom discussions.

Course/University Policies

1. **Lateness/Absences:** Assignments are due at the times indicated at the time of announcement and 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. Appropriate documentation for assignments worth less than 10% should be submitted to the Undergraduate office. A missed mid-term examination without appropriate documentation will result in a zero (0) grade. The course policy is not to allow make-ups for scheduled midterms, presentations or final exams, nor to assign a grade of Incomplete without acceptable and verifiable medical (or equivalent compassionate) reasons. Acceptable reasons might include hospital stays, serious illness, family emergencies (like serious accidents or illness, death) or similar circumstances.

2. Documentation for Accommodation (Illness, Medical/Non-Medical Absences)::

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_illness.pdf

The University recognizes that a student's ability to meet his/her academic responsibilities may, on occasion, be impaired by medical illness. Illness may be acute (short term), or it may be chronic (long term), or chronic with acute episodes. The University further recognizes that medical situations are deeply personal and respects the need for privacy and confidentiality in these matters. However, in order to ensure fairness and consistency for all students, academic accommodation for work representing 10% or more of the student's overall grade in the course shall be granted only in those cases where there is documentation indicating that the student was seriously affected by illness and could not reasonably be expected to meet his/her academic responsibilities.

A UWO Student Medical Certificate (SMC) is required where a student is seeking academic accommodation. This documentation should be obtained at the time of the initial consultation with the physician or walk-in clinic. An SMC can be downloaded under the Medical Documentation heading of the following website:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf

Documentation is required for non-medical absences where the course work missed is more than 10% of the overall grade. Students may contact their Faculty Academic Counselling Office for what documentation is needed.

Whenever possible, students who require academic accommodation should provide notification and documentation in advance of due dates, examinations, etc. stating specific reasons and dates. Students must follow up with their professors and their Academic Counselling office in a timely manner. Documentation for medical requests for accommodation must be submitted within two (2) business days after the end date on the documentation, to the appropriate Academic Counselling Office of the student's Faculty of registration. For KIN students, you may go to the School of Kinesiology in 3M Centre room 2225 **NOT** to the instructor. It will be the Academic Counselling office that will determine if accommodation is warranted.

An "Accommodation Consideration Request Form" found online https://www.uwo.ca/fhs/kin/undergrad/files/accommodation_request.pdf or in the Kinesiology Undergraduate Office" for ALL accommodation requests must be submitted into the appropriate Academic Counselling office of the student's Faculty/School of registration. 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.

3. **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 the Professor's attention immediately.

15% of course grades will be posted by the last day to drop a course.

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</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>

4. **Scholastic 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 might 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.

5. **Formatting** (as recommended by the course instructor): example- APA style is the approved style of writing for all assignments produced for this course. Please refer to Western University Library webpage for information on citation style and format or consult the APA publication manual: Publication manual of the American Psychological Association (6th ed.). (2009). Washington, DC: American Psychological Association.

6. According to the **Examination Conflict policy**, Please see the Office of the Registrar policy on Exam Conflict and Multiple Exam Situations
www.registrar.uwo.ca/examinations/exam_schedule.html

7. **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.

8. **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.**

9. **Health and Wellness**: As part of a successful undergraduate experience at Western, we encourage you to make your health and wellness a priority. Western provides several on-campus health-related services to help you achieve optimum health and engage in healthy living while pursuing your degree. For example, to support physical activity, all students receive membership in Western's Campus Recreation Centre as part of their registration fees. Numerous cultural events are offered throughout the year. Please check out the Faculty of Music web page (<http://www.music.uwo.ca/>), or the McIntosh Gallery <http://www.mcintoshgallery.ca/>

Further 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.

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>

ENGLISH PROFICIENCY FOR THE ASSIGNMENT OF GRADES

Visit the website http://www.uwo.ca/univsec/pdf/academic_policies/exam/english.pdf

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/>