



HK*4550 Human Cardio-respiratory Physiology

Fall 2019

Section(s): C01

Department of Human Health and Nutritional Sciences

Credit Weight: 0.50

Version 1.00 - September 04, 2019

1 Course Details

1.1 Calendar Description

The central focus of this course is a comprehensive examination of the effects of a variety of work parameters on normal cardio-respiratory adjustments required to meet metabolic demands. Immediate adjustments to increase metabolic rate as well as long term cardio-respiratory adaptability will be discussed.

Pre-Requisites: HK*3810 or HK*3940

1.2 Course Description

The goal of the course is to understand how these systems of energy and substrate delivery – the respiratory and cardiovascular systems – maintain or meet energy demands that occurs while engaging in exercise or physical activity.

1.3 Timetable

Day and Time: Monday, Wednesday and Friday, 11:30-12:20

Location: MCLN, Room 102

1.4 Final Exam

Exam time and location is subject to change. Please see WebAdvisor for the latest information.

2 Instructional Support

2.1 Instructional Support Team

Instructor: Dr. Jeremy Simpson

Email: jeremys@uoguelph.ca
Telephone: 5198244120 x56629
Office: ANNU 349

Office Hours:

- No appointment required for the hour after lecture
- In class time
- By appointment
- Wednesday 4:30–5:30PM (Tentative)

2.2 Teaching Assistants

Teaching Assistant: Jade Marrow
Email: jmarrow@uoguelph.ca
Office Hours: By appointment only

3 Learning Resources

This course will consist of 12 weeks of lectures (3 lectures per week, each lasting 50 minutes). The course is taught in lecture format with handouts of lecture notes available online.

3.1 Additional Resources

Respiratory Physiology: The Essentials. (Textbook)

West, JB. and Luks **Respiratory Physiology: The Essentials**. 10th Ed,

Lippincott, Williams, Wilkins (LWW), Baltimore, 2012.

\$60.00 for used and \$80.00 for new

(9th edition was published in 2011 and contains much of the same information that we will be using in this course; copies are also available at the library reserve)

Cardiovascular Physiology (Textbook)

Mohrman, DE, & LJ Heller. **Cardiovascular Physiology**. 9th Ed. Lange Physiology Series, McGraw-Hill, Toronto. 2018. ~\$40.00 for used and \$52.00 for new

7th edition was published in 2010 and 8th edition was published in 2014 (copies are also available at library reserve)

4 Learning Outcomes

4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. Identify and explain the different hemoglobin isoforms and be able to demonstrate knowledge of how changes in their ratio impact exercise performance.
2. Demonstrate an understanding of how hemoglobin is acutely and chronically regulated to optimize Oxygen delivery to a working muscle.
3. Analyze the oxygen content of blood in response to various physiological situations.
4. Demonstrate knowledge of how carbon dioxide is transported from a contracting muscle to the lung.
5. Diagram or illustrate the control of ventilation
6. Summarize the structural components of the lung at the cellular level.
7. Demonstrate an ability to analyze oxygen diffusion across the alveolar surface.
8. Understand how blood flow (and resistance) is controlled within the pulmonary circulation. Explain both circulatory and non-circulatory functions of the lung.
9. Describe the limitation of current models and serum markers for studying respiratory function. Define central vs peripheral vs neuromuscular fatigue/failure. Explain direct and indirect measures of muscle function, including what limitations each have in an experimental and clinical setting.
10. Evaluate pulmonary system response to various stresses.

11. Summarize the structural components of the Cardio-vascular system
 12. Analyze the cardiac cycle through the use of electrocardiogram, echocardiographs and pressure-volume loops.
 13. Understand contractile reserve and how it is modulated.
 14. Summarize the major cell types of the heart and demonstrate an understanding of their physiological significance.
 15. Evaluate cardiac compliance in response to various stresses.
 16. Analyze the hypertrophic response of the heart to various stresses.
 17. Explain how respiratory physiology affects cardiac physiology and vice versa.
 18. Develop basic critical thinking skills that correlate the abnormal functions of body systems with the disease process.
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5 Teaching and Learning Activities

The lecture material will introduce the physiological concepts using resting and exercise situations to examine how the respiratory and cardiovascular (CV) systems respond to the stress of increasing substrate demand and by-product production while moving about during daily living. The primary goals of the respiratory and CV systems are to maintain the blood gas status and blood pressure in the vascular system within a “normal” or homeostatic range.

5.1 Lecture

Topics: Introduction to Respiratory and Cardiovascular Physiology
Interaction with the Environment – Homeostasis, Systems Design, Blood Volume, Factors Limiting Exercise Performance, Control Principles

Carriage of Oxygen and Carbon Dioxide in the Blood

Topics: Respiratory Physiology

Control of ventilation

Structure and function of the lungs

Ventilation – how gas gets to the lungs

Diffusion – how gas gets across the blood/gas barrier

Lung blood flow – systemic and local

Ventilation/perfusion relationships

Mechanics of breathing

Acid base regulation and the lung

Response of the pulmonary system to exercise and exercise training

Diseases of the pulmonary system

Topics: Cardiovascular Physiology

Anatomical design and terminology of the CV system

Cardiovascular regulation – maintaining blood pressure

Structure and function of the heart

Cardiac cycle and the electrocardiogram

Control of cardiac output.

Control of peripheral resistance and flow

Longer term regulation of blood pressure – interaction with fluid volume

Diseases of the cardiovascular system

Response of the CV system to exercise and exercise training

6 Assessments

6.1 Assessment Details

Midterm 1 (20%)

Date: Wed, Oct 2, 5:30 PM - 7:00 PM, tba
Lectures 1 to 10 (Sept 6th – Sept 27th)

Oct 2nd -Review class for those who are interested at 11:30 AM

Midterm 2 (30%)

Date: Wed, Oct 30, 5:30 PM - 7:00 PM, tba
Lectures 11 to 20 (Sept 30th – Oct 23th)

Oct 30th - review class at 11:30 AM.

Final Exam (50%)

Date: tba
Cumulative - Lectures 1 to 36

6.2 Method of Assessment

	Weight (%)	Learning Objectives	Lectures on exam	Info
Midterm I	20%	1-4	1-10	The mid-term is not cumulative (directly). The midterm will be short answer questions. Any students not writing the midterm (without prior consent from the course instructor) will receive zero on the midterm.
Midterm II	30%	4-10 & 17	11-19	The mid-term is not cumulative (directly). The midterm will be short answer questions. Any students not writing the midterm (without prior consent from the course instructor) will receive zero on the midterm.
Final Exam	50%	1-18	1-36	<u>The final exam is cumulative.</u> The final exam will be a combination of short and long answer questions and will also have integrative questions. The final exam will

Weight Learning (%)	Lectures Objectives	Info on exam
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assess the students understanding of all course content and their ability to integrate and apply the various concepts presented during the semester.

7 Course Statements

7.1 Attendance Expectations

Since lecture content will be assessed in the midterm and final exam, it is strongly encouraged that students attend all lectures. The structural overview of lectures will be made available on the website and students who have missed classes will need to interact with their fellow students to obtain the material. While appointments can be made to discuss course content with the instructor or TA, do not contact us requesting lecture notes for missed lectures. There will be a section online where you can post request for any missed lecture notes.

8 Department of Human Health and Nutritional Sciences Statements

8.1 Academic Advisors

If you are concerned about any aspect of your academic program:

- Make an appointment with a program counsellor in your degree program. [B.Sc. Academic Advising](#) or [Program Counsellors](#)

8.2 Academic Support

If you are struggling to succeed academically:

- Learning Commons: There are numerous academic resources offered by the Learning Commons including, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills. You can also set up individualized appointments with a

learning specialist. <http://www.learningcommons.uoguelph.ca/>

- Science Commons: Located in the library, the Science Commons provides support for physics, mathematic/statistics, and chemistry. Details on their hours of operations can be found at: <http://www.lib.uoguelph.ca/get-assistance/studying/chemistry-physics-help> and <http://www.lib.uoguelph.ca/get-assistance/studying/math-stats-help>

8.3 Wellness

If you are struggling with personal or health issues:

- Counselling services offers individualized appointments to help students work through personal struggles that may be impacting their academic performance. <https://www.uoguelph.ca/counselling/>
- Student Health Services is located on campus and is available to provide medical attention. <https://www.uoguelph.ca/studenthealthservices/clinic>
- For support related to stress and anxiety, besides Health Services and Counselling Services, Kathy Somers runs training workshops and one-on-one sessions related to stress management and high performance situations. <http://www.selfregulationskills.ca/>

9 University Statements

9.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

9.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Graduate Calendar - Grounds for Academic Consideration

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

9.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Graduate Calendar - Registration Changes

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml>

Associate Diploma Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml>

9.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

9.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance and not later than the 40th Class Day.

More information can be found on the SAS website

<https://www.uoguelph.ca/sas>

9.6 Academic Integrity

The University of Guelph is committed to upholding the highest standards of academic integrity, and it is the responsibility of all members of the University community-faculty, staff, and students-to be aware of what constitutes academic misconduct and to do as much as

possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff, and students have the responsibility of supporting an environment that encourages academic integrity. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

Undergraduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Graduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

9.7 Recording of Materials

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

9.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars

<https://www.uoguelph.ca/academics/calendars>
