

COURSE INFORMATION

Course Title	Course Code Number	Credit Value
PULMONARY PHYSIOLOGY OF EXERCISE	KIN 435 (formerly 475)	3

Time: Tuesday and Thursday, 11:00 – 12:30
Mode of Delivery: In-Person
Requires In-Person Attendance: Yes
Class Location: Friedman Building (FRDM) 153

CONTACTS

Course Instructor(s)	Contact Details	Office Location	Office Hours
Bill Sheel, Ph.D.	bill.sheel@ubc.ca	Chan Gunn Pavilion, rm 221B	Immediately following class By appointment Zoom

Office hours: I am always happy to meet and discuss course content. This can often be done immediately before or after a lecture. In the event that does not agree with your schedule please speak to me to make an appointment.

Email: attempting to teach or explain material over e-mail can be difficult and ineffective. **If you have detailed questions about course material or concepts, those questions should be addressed in person or a scheduled meeting.**

Please seek clarification on course material in class, during breaks, after class, or during office hours with the instructor or teaching assistant.

E-mail should be used for: items of clarification, scheduling a time to meet during office hours, in cases of emergency that may cause you to miss an exam, or situations otherwise detailed in class.

It may take up to 48 hours to respond to your email during the week and **I do not check my email on weekends**, nor will your teaching assistants. Please keep this in mind around exam time.

Please include “KIN 435” in the subject line of emails.

OTHER INSTRUCTIONAL STAFF

Teaching Assistants: Viviana Shiffman viviana.shiffman@ubc.ca
 Rachel Jackman rajackma@student.ubc.ca

DESCRIPTION

The purpose of this course is to understand how it is the lungs, chest wall, and ventilatory control mechanisms operate during dynamic whole-body exercise. Additional emphasis is placed on how it is the respiratory and cardiovascular systems interact during exercise. Different human models will be used to illustrate key physiological principles and provide context (i.e., application of physiology). For example, elite athletes, pulmonary disease (i.e., asthma, obstructive lung disease, lung transplant) and environmental hypoxia will be discussed. Third year standing is a prerequisite.

There are at least four major challenges to the respiratory system during exercise. This course examines how the human respiratory system is structured and regulated to meet these exercise requirements.

1. Increased muscle metabolism causes mixed venous oxygen content to fall to less than one-fifth of its resting value and the partial pressure of mixed venous carbon dioxide to double.
2. Cardiac output increases 5 to 6 times resting values, and because all of the cardiac output must go through the lungs all of the time, this poses substantial threats, not only to the time available in the pulmonary capillaries for gas exchange but also to the regulation of pulmonary vascular resistance and capillary pressure and therefore to the containment of plasma water within the pulmonary vasculature.
3. Ventilatory requirements of 20 to 30 times that of rest must be met while the increase in mechanical work required for each breath is minimized. To these ends the medullary respiratory network must integrate a host of sensory feedback and feed-forward stimuli (a) to ensure that ventilation is driven precisely in proportion to metabolic requirements, and (b) to preserve precise synchronization of respiratory motor output to the upper airway and to the primary and accessory pump muscles of the chest and abdominal walls.
4. The work done by the locomotor muscles and the respiratory muscles increases several fold, and the blood flow requirements of both sets of these essential muscles must be met.

COURSE STRUCTURE

The course includes lectures, in-class discussions, tutorials and requires student participation

Canvas: Information about this course, lecture slides, and important reminders will be made available on the course website. This information can be accessed on Canvas, so please check the site regularly. *You are responsible for the information posted to Canvas.*

Required text: West J.B. Respiratory Physiology – The Essentials. 10th Edition

Assigned readings: available through Canvas. It is expected that readings will be completed **prior to** the assigned class

You should attend all lectures. You are required to attend all three labs. You are responsible for all material covered in class and any information given whether in attendance or not. You are also responsible for getting your own notes from class, as well as information pertaining to changes in the course outline, readings, assignments, and information related to labs or exams. If you will not be in class you must email **BEFORE** any assessment takes place to notify us of your absence, and then provide documentation to the instructor.

To avoid any confusion please consult the UBC Academic Calendar to review UBC's policies: *"It is a student's responsibility to arrange their scheduled non-academic activities to the best of their ability in a manner that enables full attendance and participation in their courses and programs, including required practica and internships."*

SCHEDULE OF TOPICS

Sept 6. Imagine Day. No class.

Sept 8. Intro, "the course" -- challenges to the respiratory system during exercise

Sept 13. Structure and function: how the architecture of the lung subserves its function. Text Ch. 1

Ventilation: how gas gets to the alveoli. Text Ch. 2

Sept 15. Ventilation: how gas gets to the alveoli. Text Ch. 2. and 'chalk talk'

Sept 20. Control of Ventilation: how gas exchange is regulated. Text Ch. 8

*** Quiz # 1 – in class (Sept 20)**

Sept 22. Control of exercise hyperpnea.

Sept 27. Diffusion: how gas gets across the blood-gas barrier. Text Ch. 3

Sept 29. Blood flow and metabolism: how the pulmonary circulation removes gas from the lung and alters some metabolites. Text Ch. 4

(Sept 30. UBC Closed. National Day for Truth and Reconciliation)

Oct 4. Ventilation-perfusion relationships: how matching of gas and blood determines gas exchange. Text Ch. 5

*** Quiz # 2 – in class (Oct 4)**

Oct 6. Gas transport by the blood: how gases are moved to the peripheral tissues. Text Ch. 6

Oct 11. Review

Oct. 13 MIDTERM EXAMINATION. In class.

Oct 18. Mechanics of breathing: how the lung is supported and moved. Text Ch. 7

Oct 20. Integration of topics.

Oct. 25. Respiratory influences on cardiovascular control.

Oct. 27. Disordered breathing in heart failure.

Nov 1. Disordered breathing in heart failure - continued

*** Quiz # 3 – in class (Nov 1)**

Nov. 3. The curious case of exercise-induced arterial hypoxaemia

Nov 8. Geese at high-altitude

Nov 10. **No class. Midterm break (Nov. 9-11 inclusive)**

(Nov 11. UBC Closed. Remembrance Day)

Nov 15. Current controversy: facemasks and exercise

Nov 17. Sex differences in the pulmonary physiology of exercise.

Nov 22. The pulmonary physiology of healthy aging

*** Quiz # 4 – in class (Nov 22)**

Nov 24. Chronic obstructive pulmonary disease (COPD)

Nov 29. Exercise-induced bronchoconstriction

Dec 1. No class.

Dec 6. Final exam review.

Dec 11-22. Final Exam Period. DO NOT SCHEDULE TRAVEL DURING THIS TIME.

ASSESSMENTS OF LEARNING

Quizzes **30%**

- 4 quizzes, top 3 highest marks will count.
- The format will include multiple choice, reading & interpretation, short answer/paragraph, and calculations

Midterm Examination **30%**

Final Examination **40%**

- The final examination is cumulative with a greater emphasis on material after the midterm. Content from the laboratory portion of the course is examinable.

UNIVERSITY POLICES

Resources to Support Student Success: UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious and cultural observances. UBC values academic honesty and students are

expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available from the UBC Senate Website.

Academic Accommodation for Students with Disabilities: The University's goal is to ensure fair and consistent treatment of all students, including students with a disability, in accordance with their distinct needs and in a manner consistent with academic principles. Students with a disability who wish to have an academic accommodation should contact Centre for Accessibility without delay.

Academic Integrity: All UBC students are expected to behave as honest and responsible members of an academic community of higher learning and research. Breach of those expectations or failure to follow the appropriate policies, principles, rules, and guidelines of the University with respect to academic honesty may result in disciplinary action. It is your responsibility, as the student, to become familiar with and understand the consequences of violating the University of British Columbia's:

- Academic Honesty and Plagiarism Policies
- Student Declaration
- Student Conduct during Examinations
- Any special rules for conduct set out by the course instructor or teaching assistants.

Online Communications: You are expected to communicate in a respectful and professional manner with your fellow students, teaching assistants, and instructors. Please ensure you review and are familiar with the Student Guidelines for Respectful Online Conduct from the UBC Equity & Inclusion Office.

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