

COURSE INFORMATION

Course Title	Course Code Number	Credit Value
Pulmonary Physiology of Exercise	KIN 435	3

Time:

Mode of Delivery: In-Person

Requires In-Person Attendance: Yes

Land Acknowledgements: We acknowledge that the UBC Vancouver Campus is located on the traditional, ancestral, and unceded territory of the $\chi\omega\mu\alpha\theta\kappa\omega\gamma\prime\alpha\mu$ (Musqueam) people. The land it is situated on has always been a place of learning for the Musqueam people, who for millennia have passed on their culture, history, and traditions from one generation to the next on this site. We acknowledge the traditional owners and caretakers of this land.

Equity & Diversity: I intend for students from diverse backgrounds and perspectives to be well-served by this course; diversity is viewed as a resource, strength, and benefit of this class. It is my intent to present materials and activities that are respectful of gender identity, gender expression, sex, race, ethnicity, class, sexual orientation, ability, age, etc. Your suggestions are encouraged and appreciated.

CONTACT

Course Instructor(s)	Contact Details	Office Location	Office Hours
Bill Sheel, PhD	bill.sheel@ubc.ca	Chan Gunn Pavilion, 221B	<ul style="list-style-type: none"> Immediately following class By appointment Zoom with TA's

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 for a 'zoom' or in-person meeting. ***Please note:** if you have a question please feel free to ask during class – I will be pleased to answer. It is likely that another student will benefit from hearing your question.

Email: attempting to teach or explain complex material over e-mail can be difficult and is sometimes ineffective. **If you have detailed questions about course material or concepts, those questions should be addressed in class, 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 and use your UBC email address.

OTHER INSTRUCTIONAL STAFF

Teaching Assistants: (i) Viviana Shiffman (ii) Chloe Matthews

COURSE 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 20-30 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.

LEARNING OBJECTIVES

- Describe the anatomical and physiological processes that allow the respiratory stem to be an effective in exchanging oxygen and carbon dioxide.
- Understand and characterize the adjustments that occur during exercise in health that permit arterial blood gas homeostasis to occur.
- Apply the fundamental principles of respiratory physiology to exercise under different environmental conditions and human populations.

COURSE STRUCTURE

Canvas: Course information, additional readings, 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 textbook: West JB and Luks AM. Respiratory Physiology – The Essentials. 11th Edition

Lectures: Lectures are in-person and are not recorded. Lectures include discussion of course content and interactive activities. It is highly recommended to attend these lectures, otherwise you are responsible

for obtaining notes from your peers. You are responsible for all material covered in class and any information given whether in attendance or not.

Attendance: 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."*

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

SCHEDULE OF TOPICS

September

3. Classes begin. "Imagine Day". **No classes**
5. The course in a nutshell – challenges to the respiratory system during exercise
10. Structure and function: how the architecture of the lung subserves its function. Text Ch.1.
Ventilation: how gas gets to the alveoli and Text Ch. 2
12. Ventilation: how gas gets to the alveoli. Text Ch. 2. and 'chalk talk'
17. *** Quiz # 1 – in class**
19. Control of ventilation: how gas exchange is regulated. Text Ch. 8
24. Control of exercise hyperpnea
26. Diffusion: how gas gets across the blood-gas barrier. Text Ch. 3

October

1. *** Quiz #2 – in class**
3. Blood flow and metabolism: how the pulmonary circulation removes gas from the lung and alters some metabolites. Text Ch. 4
8. Ventilation-perfusion relationships: how matching of gas and blood determines gas exchange. Text Ch. 5
10. Gas transport by the blood: how gases are moved to the peripheral tissues. Text Ch. 6
15. In class activity & midterm review
17. *** Midterm exam – in class**
22. Mechanics of breathing: how the lung is supported and moved. Text Ch. 7
24. Integration of topics -- Respiratory influences on cardiovascular control
29. The pulmonary physiology of human pregnancy
31. Disordered breathing in heart failure

November

5. *** Quiz # 3 – in class**
7. The highly trained endurance athlete
12. ***No class**
14. The pulmonary physiology of healthy ageing
19. Geese at high altitude
21. Current controversy: facemasks and exercise
26. *** Quiz # 4 – in class**
28. Chronic obstructive pulmonary disease (COPD)

December

3. No class.

5. Final exam review

10-21 * **Final exams. Inclusive of Sat & Sun. * do not schedule travel during this period**

**** Note that the University sets the date for the Final examination. This course will adhere to the date set by the University. As per University regulations, there will be no exceptions to the date of the Final.**

ASSESSMENTS OF LEARNING

Quizzes **30%**

- 4 quizzes, top 3 highest marks will count. There are no 'make up' quizzes.
- The format will include multiple choice, reading & interpretation, short answer/paragraph, and calculations

Midterm Examination **30%**

- The midterm will not be rescheduled for any reason. Midterm test values can be re-weighted to the Final exam **only** if written documentation is provided for a University-approved reason for your absence, such as a medical issue or family emergency. If you do not contact your instructor and provide written documentation for an absence from a Midterm, you will be given a score of zero on the assessment.

Final Examination **40%**

- The final examination is cumulative with a greater emphasis on material after the midterm.

NOTE: Occasionally students will have questions or disagree with the grade they received on an assignment. Students should contact the TA's no sooner than 48 hours, and no later than one week after the assignment is returned. If students still have a question about how their assignment was evaluated, they are welcome to submit a re-grade request to the instructor within one week of meeting with their TA. Please note that when a grade is reviewed, the final re-graded assignment may receive a higher, lower, or the same mark from the originally assigned grade.

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 on 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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IN-TERM CONCESSION

If you need to apply for academic concession for in-term work, apply online through the KIN Advising Office.