

McGill University
Department of Kinesiology & Physical Education
EDKP 652: Advanced Cardiopulmonary Exercise Physiology (3 credits)
Course Outline, Winter 2023

INSTRUCTOR

Prof. Dennis Jensen, PhD

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Office hours: Held virtually *via* Zoom or in-person and by appointment. Contact Prof. Jensen by email for appointment

LECTURE DAY, TIME & LOCATION

- Tuesdays from 2:35-5:25 pm EST
- Currie Memorial Gymnasium, Room 304, Department of Kinesiology and Physical Education, 475 Pine Avenue West, H2W 1S4.

COURSE DESCRIPTION

Studied through the lens of cardiorespiratory limitations to human exercise performance, this course will focus on integrative aspects of cardiovascular and respiratory system adjustments related to acute and chronic exercise.

COURSE OBJECTIVES

Overarching objective: For students to develop an enthusiasm for learning and a deeper appreciation of human exercise physiology!

Specific objectives: For students to develop...

1. Understanding for the role of oxygen in determining muscle metabolic and contractile function.
2. Expertise in the application of four essential models (Mass Flow; Conservation of Mass; Integrated Control; and Elastic Recoil) that can be used to define how structural and functional characteristics of the cardiovascular and respiratory systems permit “*purposeful regulation*” of key physiological parameters such as arterial blood pressure.
3. Understanding for how the structure and function of the cardiovascular and respiratory systems can limit human exercise performance in health and disease, and how these limitations are affected by exercise training and therapeutic intervention (e.g., pharmacotherapy).

HOW TO GET THE MOST OUT OF EDKP 652

- 1) Attend each and every lecture.** This course will push students to develop their ability to think critically about what exercise is and how the body deals with that challenge. Students should come to each lecture (i) having already reviewed the slides and read the required and perhaps also supplemental readings and (ii) prepared to think and ask and answer questions to develop their understanding and ability to “think” as a cardiorespiratory exercise physiologist!
- 2) Ask and answer questions.** One of the biggest barriers to learning how to think is the fear of being wrong. Asking or answering a question means taking a perceived risk – a risk that someone may not be correct and feel foolish in front of others. Taking that risk is important to a student’s learning experience because life is not about being right all the time, but rather being comfortable with being wrong if that helps improve their understanding. The questions a student asks and/or answers will almost always help to develop their own and others’ understanding of the course material. Consider EDKP 652 as a chance for students to be in an environment where they learn the benefit of taking the risk of being wrong (or not knowing something) without any negative consequences.
- 3) Students should take the quizzes seriously and do their best to answer the questions, i.e., put in the effort!**

COURSE MATERIALS, READINGS & RESOURCES

- Lecture slides, and selected required and supplemental readings will be posted to the EDKP 652 *MyCourses* site in advance of each lecture.
- The following textbooks provide additional (supplemental) understanding of topics discussed in class:
 - ***Physiological Bases of Human Performance During Work and Exercise***, 1st Edition, 2008, Churchill Livingstone. Editors: Nigel Taylor, Herbert Groeller.
 - A copy of this textbook has been put on reserve in the Humanities and Social Sciences Library, McLennan Library Building, 3459 rue McTavish, Montreal, QC, H3A 0C9.
 - A copy of this textbook is also available through *Internet Archive*. Students will need to create a free *Internet Archive* account, unless they already have one: https://archive.org/details/physiologicalbas0000unse_d1r3/mode/2up.
 - *Note: If you are not able to register an account using Google Chrome, try another browser such as Firefox, which worked for me.*
 - ***ACSM’s Advanced Exercise Physiology***, 2nd Edition, 2012, Lippincott Williams & Wilkins. Editors: Peter A. Farrell, Michael Joyner, Vincent Caiozzo.
 - A .PDF copy of this textbook has been posted to the EDKP 652 *MyCourses* site.

COURSE SCHEDULE & CONTENT

- The topics outlined in the table below are subject to change as the course dictates with prior notification. Students will be notified of such changes *via* email and/or an announcement posted to the EDKP 652 *MyCourses* site with as much advance notice as possible.

Week	Date	Topic
1	January 10	Course Introduction & Defining Human Performance and the Role of the Cardiovascular and Respiratory Systems in Exercise
2	January 17	Muscle Metabolism and Contractile Function: ATP Supply Systems and the Muscle Fiber Environment
3	January 24	Essential Models for Understanding Cardiovascular and Respiratory System Function during Exercise
4	January 31	Characteristics and Regulation of the Muscle O ₂ Delivery Response to Exercise: Feedforward and Feedback Mechanisms
5	February 07	Regulation of Arterial Blood Pressure during Exercise: Feedforward and Feedback Mechanisms
6	February 14	Impact of Muscle Oxygenation on Metabolic and Contractile Function: The “O ₂ Conformer Response”
7	February 21	Impact of Muscle Oxygenation on Metabolic and Contractile Function: The “Net Drive Hypothesis”
8	February 28	McGill Reading Break: No Class
9	March 07	Convective and Diffusive Oxygen Transport Limitations to Exercise Performance
10	March 14	Effects of Arterial Oxygen Content (CaO ₂) on Peripheral Locomotor Muscle Fatigue and Human Exercise Performance
11	March 21	Respiratory System Structure and Function: Back to Basics
12	March 28	The Ventilatory Response to Exercise: From Feedforward and Feedback Control Mechanisms to the Behavior of Dynamic Operating Lung Volumes
13	April 04	Respiratory System Limitations to Exercise Tolerance: From Exercise-Induced Arterial Hypoxemia to Respiratory Muscle “Steal” of Peripheral Skeletal Muscle Blood Flow
14	April 11	Application of Knowledge to Understand the Mechanisms of Exercise Intolerance in COPD with Implications for Therapy

COURSE EVALUATION

COMPONENT	WEIGHT
1. Quizzes (exact number TBD)	90% total with weight of each quiz equally distributed across all quizzes; for example, 10 quizzes worth 9% each or 12 quizzes worth 7.5% each.
2. Class Attendance and Participation	10% total with weight of each class equally distributed across all 13 classes

Quizzes: Quizzes are a learning tool and will provide students an opportunity to examine and further develop their understanding of the lecture material. Specifically, quizzes will provide students with questions that (i) challenge their understanding of lecture material, (ii) provide them the opportunity to apply their knowledge and solve problems, and (iii) hold them accountable for actively engaging in their own learning experience.

Quizzes will be posted to the EDKP 652 *MyCourses* site by no later than 11:59 pm EST on the day of class. Students will have until the start of the subsequent class (i.e., 6-7 days) to prepare and submit their written responses *via* the Assignments tab/tool on the EDKP 652 *MyCourses* site. Written responses submitted after the start of the subsequent class will be considered 1 day late. Late submissions will be penalized **1% of the total percentage value of each quiz per day, including Saturday and Sunday, and will not be accepted after 5 days**. Written responses can be submitted in .DOCX or .PDF format; however, the preferred format for submission is .DOCX because it allows for feedback to be provided *via* track changes.

When preparing their written responses, students are expected to study and apply the background physiology, including course notes, required and supplemental readings. Students are encouraged to meet and discuss, as a group, the background physiology relevant to the questions asked in each quiz; however, **each student must prepare and submit their own written responses** (*refer to McGill's policy on Academic Integrity below*).

No deadline extensions will be granted, although valid exceptions such as illness may be considered by Prof. Jensen and may require supporting documentation (e.g., doctor's note). If a student feels there is a problem and they need help or accommodation(s), they should advise Prof. Jensen as early in the semester as possible.

Class Attendance and Participation: 5% of the 10% total term mark will be for class attendance. The other 5% of the 10% total term mark will be based on the student's level of preparation for and engagement in each class: Did the student prepare for each class by reading the required [and supplementary] readings? Did the student ask informed questions in class? Did the student provide evidence that they spent a reasonable amount of time thinking about the course material? Did the student answer and/or participate in discussion of questions in class?

ACADEMIC INTEGRITY

“McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures” (see www.mcgill.ca/students/srr/honest/ for more information).

« L'université McGill attache une haute importance à l'honnêteté académique. Il incombe par conséquent à tous les étudiants de comprendre ce que l'on entend par tricherie, plagiat et autres infractions académiques, ainsi que les conséquences que peuvent avoir de telles actions, selon le Code de conduite de l'étudiant et des procédures disciplinaires (pour de plus amples renseignements, veuillez consulter le site www.mcgill.ca/students/srr/honest/).»

LANGUAGE OF SUBMISSION

“In accord with McGill University’s Charter of Students’ Rights, students in this course have the right to submit in English or in French any written work that is to be graded.”

« Conformément à la Charte des droits de l'étudiant de l'Université McGill, chaque étudiant a le droit de soumettre en français ou en anglais tout travail écrit devant être noté (sauf dans le cas des cours dont l'un des objets est la maîtrise d'une langue). »

ADDITIONAL STATEMENTS

- ✓ The [University Student Assessment Policy](#) exists to ensure fair and equitable academic assessment for all students and to protect students from excessive workloads. All students and instructors are encouraged to review this Policy, which addresses multiple aspects and methods of student assessment, e.g. the timing of evaluation due dates and weighting of final examinations.
- ✓ As the instructor of this course, I endeavor to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with Professor Jensen and the [Office for Student Accessibility & Achievement](#), 514-398-6009.
- ✓ [End-of-course evaluations](#) are one of the ways that McGill works towards maintaining and improving the quality of courses and the student’s learning experience. You will be notified by e-mail when the evaluations are available. Please note that a minimum number of responses must be received for results to be available to students.
- ✓ Mobile computing and communication devices are permitted in class insofar as their use does not disrupt the teaching and learning process.
- ✓ In the event of extraordinary circumstances beyond the University’s control, the content and/or evaluation scheme in this course is subject to change.
- ✓ Instructor generated course materials (e.g., lecture notes, handouts, summaries, exam questions, etc.) are protected by law and may not be copied or distributed in any form or in any medium without explicit permission of the instructor. Note that infringements of copyright can be subject to follow up by the University under the Code of Student Conduct and Disciplinary Procedures.
- ✓ McGill University is on land which has long served as a site of meeting and exchange amongst Indigenous peoples, including the Haudenosaunee and Anishinabeg nations. We acknowledge and thank the diverse Indigenous people whose footsteps have marked this territory on which peoples of the world now gather.