

# Advanced Exercise Physiology

APK4112 | Class # 10573 | 3 Credits | Fall 2022

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## Course Info

### INSTRUCTOR

**Leonardo F. Ferreira, PhD, PT**  
Office: FLG 110  
Office Phone: 352-294-1724  
Email: ferreira@ufl.edu  
Preferred Method of Contact: email  
Preferred pronouns: he, him, his

### OFFICE HOURS

Location: Zoom (link on Canvas)  
Tentative: Mon (12:30pm – 01:30pm)  
Wed (09:00am – 10:00am)

### MEETING TIME/LOCATION

T | Period 1 (7:25 AM - 8:15 AM)  
R | Period 1 - 2 (7:25 AM - 9:20 AM)

Meetings will be held in room 230 FLG

Provided the room has functioning capability for hybrid instruction, a Zoom link will be available on Canvas for those who cannot attend in person (must be arranged in advance with instructor).

## COURSE DESCRIPTION

This advanced course provides a detailed understanding of acute and chronic responses to exercise. Particular attention is placed upon understanding the physiological responses to exercise at both a systems and cellular level. Emphasis is placed on muscle contractile properties, muscle bioenergetics and the endocrine responses to exercise.

## PREREQUISITE KNOWLEDGE AND SKILLS

APK 3110C or similar with minimum C grade.

## REQUIRED AND RECOMMENDED MATERIALS

The instructor will post lecture slides, videos, and reading material as appropriate on Canvas. The student does not need to identify additional resources to complement the material provided or solve problems posed in the course.

Lecture notes and materials posted on the class website are the property of the instructor or the publishers of the material. They are posted solely for students in this course, for educational purposes, and to facilitate note-

taking and studying. No part of the materials may be re-distributed, reproduced, or used for any purpose other than note-taking and studying.

Textbook: A custom e-book titled 'University of Florida custom e-book Advanced Exercise Physiology' is required for the course. Students can purchase the e-book using UF All Access. Login at the following website and Opt-In to gain access to your required course materials - <https://www.bsd.ufl.edu/AllAccess> – UF All Access will provide you with your required materials digitally at a reduced price and the charge will be posted to your student account. This option will be available starting 1 week prior to the start of the semester and ending 3 weeks after the first day of class. The publisher's website is included here for convenience (Human Kinetics: <http://www.humankinetics.com/products/all-products/University-of-Florida-Custom-eBook-Advanced-Exercise-Physiology>).

There will be reading assignments from the book's chapters and other sources as needed. Topics covered in the reading assignments will be assessed in various forms, included exams or quizzes, even if not covered in lecture or discussions. Questions on reading topics not covered in lecture or discussions will be general and assess the students' ability to define and describe concepts in bioenergetics and exercise physiology. Questions on topics covered in lectures or class discussions will involve in-depth concepts and problem solving.

Suggested book on introductory material for review of basic concepts: Powers, S. and E. Howley. Exercise Physiology: theory and application to fitness and performance. McGraw Hill. 9th edition. ISBN-13: 978-0073523538.

## **COURSE FORMAT**

The course includes two meetings in the classroom per week. One day of the week will be dedicated to live lectures (also available online and recommended for viewing prior to the live lecture), the other day the class will meet for a quiz followed by active learning. Active learning sessions include discussion of questions and presentation of concepts or solving applied problems related to physiology.

## **COURSE LEARNING OBJECTIVES:**

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

- Define, describe, and illustrate basic and advanced bioenergetics and physiological processes involved in the regulation of metabolism, skeletal muscle contraction and fatigue, blood flow and blood pressure, and breathing.
- Explain the integration of multiple systems in response to exercise and solve problems in that context
- Interpret and propose explanations for the metabolic, muscle, and cardiovascular responses to exercise in health, disease, and environmental challenges
- Defend and critique material or ideas related to bioenergetics, performance, and integrative exercise physiology

## **Course & University Policies**

### **ATTENDANCE POLICY**

Make every effort to attend all class meetings. Missing classes will likely have an impact on participation grade. The rubric for participation points is included below under 'GRADING'. Attendance via Zoom (if possible) must be arranged and approved by the instructor. Approval for zoom attendance must be done in advance (except for emergencies or illness that will be addressed on a case-by-case basis).

Students called for participation in lectures or discussion sessions and not present will receive a zero for participation. Students who receive a zero in participation for unexcused absence will not be able to earn full credit for participation. Students who need to miss a class should communicate and discuss with the instructor, in advance of missing a class, to avoid penalties on participation.

## **PERSONAL CONDUCT POLICY**

Students are expected to exhibit behaviors that reflect highly upon themselves and our University. UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obliged to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult the instructor or TA in this class.

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

## **PRIVACY**

Our class sessions may be audio-visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

## EXAM MAKE-UP POLICY

A student experiencing an illness should visit the UF Student Health Care Center or their preferred healthcare provider to seek medical advice and obtain documentation. If you have an illness, family emergency or death, please contact the Dean of Students Office ([www.dso.ufl.edu](http://www.dso.ufl.edu)) and follow the DSO Care Team procedures for documentation and submission of a request for make-up assignment (<https://care.dso.ufl.edu/instructor-notifications/>). The DSO will contact the instructor. Do not provide any documentation to the instructor regarding illness or family emergency. This is your personal and protected information. The DSO is qualified to receive and verify the documents you provide. The instructor will follow the recommendations from the DSO.

Students who have occasional extra-curricular or academic activities that conflict with exams or quizzes should contact the instructor in advance to make arrangements to make-up the assignments. Unexcused absences/availability for exams will result in a zero on the exam. Make-up exams are offered at reasonable times in agreement with the instructor.

In all cases, students must make-up quizzes from each module within one week of the end of the module, unless impeded by extenuating circumstances. Overall, requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found in the online catalog at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>."

## ACCOMMODATING STUDENTS WITH DISABILITIES

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the Disability Resource Center by visiting their Get Started page at <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

## COURSE EVALUATIONS

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

## Getting Help

### HEALTH & WELLNESS

- U Matter, We Care: If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) or 352 392-1575
- Counseling and Wellness Center: <https://counseling.ufl.edu/>, 352-392-1575
- Sexual Assault Recovery Services (SARS) - Student Health Care Center, 392-1161
- University Police Department, 392-1111 (or 9-1-1 for emergencies) <http://www.police.ufl.edu/>

### ACADEMIC RESOURCES

- E-learning technical support, 352-392-4357 (select option 2) or e-mail to [Learning-support@ufl.edu](mailto:Learning-support@ufl.edu). <https://lss.at.ufl.edu/help.shtml>
- Career Connections Center, Reitz Union, 392-1601. Career assistance and counseling. <https://career.ufl.edu/>

- Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.
- Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. <http://teachingcenter.ufl.edu/>
- Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. <http://writing.ufl.edu/writing-studio/>
- Student Complaints On-Campus: <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/> On-Line Students Complaints: <http://distance.ufl.edu/student-complaint-process/>

## INCLUSION, DIVERSITY, EQUITY, AND ACCESSIBILITY RESOURCES

For suggestions or concerns related to IDEA, please reach out to any of the following:

- Dr. Linda Nguyen, APK IDEA Liaison, [linda.nguyen@hnp.ufl.edu](mailto:linda.nguyen@hnp.ufl.edu)
- Dr. Rachael Seidler, APK Graduate Coordinator, [rachaelseidler@ufl.edu](mailto:rachaelseidler@ufl.edu)
- Dr. Joslyn Ahlgren, APK Undergraduate Coordinator, [jahlgren@ufl.edu](mailto:jahlgren@ufl.edu)

## GRADING

*Students in the course will be assessed through quizzes in class, reading assignment summaries, participation in discussion sessions, exams, and reflection assignments. Quizzes are administered weekly. Reading assignment summaries and submission of responses to problems/questions are due weekly. There are three exams and three reflection assignments in the course (one per module). Discussion sessions for participation are held weekly.*

**Quizzes (35% final grade)** – There will be quizzes administered in class using Canvas. The quiz addresses a topic that has been presented through video lectures, slides in class, and assigned reading. The quizzes are at the beginning of the class and will consist of short-questions or simple problem-solving exercises. Students will take the quiz individually and any type of collaboration with other students, opening of non-quiz related website, or checking material from self or other during the quiz is prohibited. There will be 1-10 questions per quiz.

There will be a quiz on Tuesday and one on Thursday. The quizzes on Tuesdays will be based on material presented in online lectures. The quiz on Thursday will be similar to the quiz on Tuesday, but also covers components of the reading assignment. Scores from the quizzes on Tuesdays account for 10% of the final grade, and score from quizzes on Thursdays accounts for 25% of final grade.

**Exams (30% of final grade)** – Exams will be at the end of a module (three exams, one per module). Each exam will contain 20 to 25 questions and will last 50-75 min. Exams will be based on reading assignments and content covered in discussions and lectures. Questions will be multiple choice and true/false. Students will take exams in the same room where weekly class meetings are held or online. The exam can be completed in groups of 2-3 students (no more than 3 per group). Students can collaborate within their groups, but communication with other groups or checking course-related material on the web or any notes is prohibited. Each student will complete their own exam and should submit their individual answers independently. In case of disagreement, students can answer questions differently from the group in their individual submission. In case of accidental submission of a different answer from others in the group, the submitted answer will stand as there is no way of confirming intentional vs accidental discrepancy in answers. Students who need accommodation for extra time can choose to complete the exam with other students who have accommodations, with other students without accommodation, or individually. Students who need a make-up will take the exam individually. The exams are designed for individual completion and there is no disadvantage by completing the exam individually.

**Reading summary (10% of final grade)** – Each week there is a reading assignment from the textbook or material uploaded on canvas. Students must submit a brief 1-page summary of their reading. The summary must focus

on information the students learned beyond what was described in the classroom or what aspects of the reading helped them better understand material covered in class. The instructor will provide details in class and on canvas regarding the structure and grading.

**Reflection (10% of final grade)** - It is important for deep and meaningful learning that students reflect on what they study and their experiences in a course. The reflection assignment will be focused on the physiological and bioenergetics concepts learned in each module, the student's experiences, and how this process impacted the way the students think about physiology, bioenergetics, study, and assimilate ideas. The reflection assignment is not a space to evaluate or criticize the course or the instructor. The instructor will provide details in class and on canvas regarding the structure and grading.

**Participation (15% final grade)** – This will be determined based on the student's preparedness assessed by quality and correctness of submission of hand-written answers (submitted online) and drawings to discussion questions, involvement in class activities or lectures, and contribution in classroom discussions. Students are required to participate through presentation of a lecture slide, providing answers on the board, and discussion of applied questions in front of class. Students should participate at least once in each module to receive all points. Students can be called for further participation in each module, after earning full points, at the discretion of the instructor. The instructor will select a student to participate, but students can also volunteer to participate. There are no pre-arrangements of questions or topics for specific students. Students should be prepared to present all slides, answer all questions, and discuss all problems assigned for the day.

Students will receive participation points for presenting their understanding of concepts, complementing comments from other students, or responding to questions from the instructor following the rubric outlined below. If the instructor calls a student who is absent, the student will receive a zero on participation unless the absence is justified according to UF policies as outlined above. If there are hindrances for students to participate in class, the instructor will meet with the student (individually or in small group) to discuss the topic or rely on the online submission of hand-written answers and drawings to assign participation points.

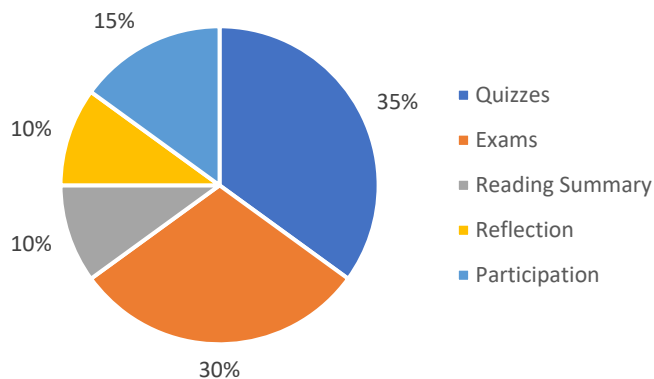
The instructor will use the rubric in the table below to assign points based on participation in class and online submissions

Excellent	10 pts	<ul style="list-style-type: none"> <li>- Defines, describes, and illustrates concepts</li> <li>- Explains, assesses, and criticizes ideas</li> <li>- Demonstrates preparation and reading of assignments</li> </ul>
good	8 pts	<ul style="list-style-type: none"> <li>- Defines, describes, and illustrates concepts</li> <li>- Explains, assesses, and criticizes ideas</li> <li>- Evidence of reading assignments, but not fully prepared</li> </ul>
reasonable	6 pts	<ul style="list-style-type: none"> <li>- Defines, describes, and illustrates concepts</li> <li>- Explains, assesses, or criticizes some ideas</li> <li>- Evidence of incomplete reading of assignments and preparation</li> </ul>
basic	4 pts	<ul style="list-style-type: none"> <li>- Defines and describes some concepts</li> <li>- Explains but cannot assess and criticize ideas</li> <li>- Clearly unprepared and lacking evidence of reading assignments</li> </ul>
bare minimum	2 pts	<ul style="list-style-type: none"> <li>- Defines and describes some concepts</li> <li>- Unable to explain, assess, or criticize ideas</li> <li>- Clearly unprepared and lacking evidence of reading assignments</li> </ul>
unacceptable	0 pt	<ul style="list-style-type: none"> <li>- Refuses to engage in discussion or answer questions when asked</li> <li>- Engages in inappropriate behaviors (cell phone, social media, irrelevant websites)</li> <li>- Not present or no submission of hand-written answers and drawings</li> </ul>

Online submissions of weekly assignments of problems/questions: The hand-written answers and drawings that the instructor will evaluate to grade participation must provide a comprehensive response, be neatly organized

and legible, and include drawings and concise text explaining the concepts and rationale for each answer. Points will be deducted from answers that do not include schematic or diagram drawings.

Grade Breakdown



### GRADING SCALE

Students take exams and quizzes using Canvas and scores are available immediately upon submission. Students should contact the instructor as soon as possible if they feel there is an error in the grading of individual questions or submission of final grades. Final course grades will be assigned based on the table below. The grade achieved by the student and showing on Canvas is final. There is no rounding of grades in any circumstance. Any requests for additional extra credit or special exceptions to these grading policies will be interpreted as an honor code violation (i.e., asking for preferential treatment) and will be handled accordingly.

“More detailed information regarding current UF grading policies can be found here:

[https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/.](https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/)”

Letter Grade	A	B+	B	C+	C	D+	D	E
Percent of Total Points	90.00-100%	85.00-89.99%	80.00-84.99%	75.00-79.99%	70.00-74.99%	65.00-69.99%	60.00-64.99%	0-59.99%
GPA of Each Letter Grade	4	3.33	3	2.33	2	1.33	1	0



## Weekly Course Schedule

The course includes three modules: I) Energetics, Metabolism, and Endocrine Exercise Physiology; II) Skeletal Muscle Excitation, Contraction, and Fatigue; and III) Cardiovascular and Hemodynamics Regulation. The modules emphasize exercise and physiological responses to environmental challenges in health and disease.

### Module 1

- Topic 1 – Enzyme Kinetics
- Topic 2 – Energy Systems and Bioenergetics
- Topic 3 – Glucose Uptake
- Topic 4 – Glycogen Metabolism
- Topic 5 – Glycolysis
- Topic 6 – Pyruvate and Lactate Metabolism
- Topic 7 – Lipolysis
- Topic 8 – Citric Acid Cycle and Oxidative Phosphorylation

### Module 2

- Topic 1 – Skeletal Muscle, Macro, Micro, and Molecular Structure
- Topic 2 – Sarcomere and SR Structure-Function
- Topic 3 – Neuromuscular Junction, Neuromuscular Transmission, and EC Coupling
- Topic 4 – Calcium-activated force and cross-bridge cycle
- Topic 5 – Passive Muscle Mechanics
- Topic 6 – Active Contractile Properties
- Topic 7 – Muscle Fatigue

### Module 3

- Topic 1 - Cardiovascular Autonomic and Hormonal Control
- Topic 2 – Baroreflex and Exercise Blood pressure
- Topic 3 – Smooth Muscle: Structure-Function and Extrinsic Control
- Topic 4 – Intrinsic Control and Exercise Hyperemia
- Topic 5 – Cardiovascular Responses to Resistance Exercise

Tentative dates and course plan are on the next page.

## SUCCESS AND STUDY TIPS

To succeed in this course, students need to prepare regularly and in advance of attending lecture and discussion sessions. Lectures are available online for previewing and reviewing content. Students should check topics and assignments on the course schedule above, watch online lectures, read assigned text, and attend class to ask questions. Reading of assigned text should be done once, paying attention to the content. **Students should avoid seeking sources beyond those provided in the course to supplement their reading. This can lead to confusion and overloading**

During lectures and discussions, students should write key concepts in ‘bullet point’ style, while following the discussion and presentation of concepts. The goal is to understand, not memorize, the material. The best forms of studying are: 1) to draw diagrams and figures to help understand and remember physiological processes, 2) discuss course material with classmates, 3) review points presented in the discussion session. Items 1 and 2 should be done before lecture and discussion sessions. Item 3 should be done after the discussion on the same or immediately following day. This will help retain the concepts learned.



## WEEKLY SCHEDULE

Date	Class activity	Note	
<b>10-Jan</b>	<b>No class</b>		<b>Module 1</b>
12-Jan	Course Intro		
17-Jan	topics 1-3	lecture	
<b>19-Jan</b>	<b>topics 1-3</b>	<b>Discussion</b>	
24-Jan	topics 4-6	lecture	
<b>26-Jan</b>	<b>topics 4-6</b>	<b>discussion</b>	
31-Jan	topics 7-8	lecture	
<b>02-Feb</b>	<b>topics 7-8</b>	<b>discussion</b>	
07-Feb	Review		
<b>09-Feb</b>	<b>Exam</b>	<b>Reflection Due</b>	
14-Feb	topic 1	lecture	<b>Module 2</b>
<b>16-Feb</b>	<b>topic 1</b>	<b>discussion</b>	
21-Feb	topics 2-4	lecture	
<b>23-Feb</b>	<b>topics 2-4</b>	<b>discussion</b>	
28-Feb	topics 5-6	lecture	
<b>02-Mar</b>	<b>topics 5-6</b>	<b>discussion</b>	
07-Mar	topic 7	lecture	
<b>09-Mar</b>	<b>topic 7</b>	<b>discussion</b>	
21-Mar	Review		
<b>23-Mar</b>	<b>Exam 2</b>	<b>Reflection due</b>	
28-Mar	topics 1-2	lecture	<b>Module 3</b>
<b>30-Mar</b>	<b>topics 1-2</b>	<b>discussion</b>	
04-Apr	topics 3-4	lecture	
<b>06-Apr</b>	<b>topics 3-4</b>	<b>discussion</b>	
11-Apr	topic 5	lecture	
<b>13-Apr</b>	<b>topic 5</b>	<b>discussion</b>	
18-Apr	Review		
<b>20-Apr</b>	<b>Exam 3</b>	<b>Reflection due</b>	