

# Advanced Exercise Physiology

APK 4112 | Class # 10492 | 3 Credits | Fall 2024

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## Course Info

### INSTRUCTOR

**Ashley J. Smuder, PhD**  
Office: FLG 112  
Office Phone: 352-294-1765  
Email: [asmuder@ufl.edu](mailto:asmuder@ufl.edu)  
Preferred Method of Contact: Email

### OFFICE HOURS

Tuesday 8:30am – 9:30am  
Wednesday 9:30am – 10:30am

### MEETING TIME/LOCATION

FLG 245  
Tuesday | Period 1 (7:25am – 8:15am)  
Thursday | Period 1 – 2 (7:25am – 9:20am)

## COURSE DESCRIPTION

This advanced course provides a detailed understanding of acute and chronic response 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 response 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 in 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 per week. One day of the week will be dedicated to live lectures, 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'. 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 & ACADEMIC INTEGRITY**

University of Florida students are bound by the Honor Pledge. On all work submitted for credit by a student, the following pledge is required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The [Student Honor Code and Conduct Code \(Regulation 4.040\)](#) specifies a number of behaviors that are in violation of this code, as well as the process for reported allegations and sanctions that may be implemented. All potential violations of the code will be reported to Student Conduct and Conflict

Resolution. If a student is found responsible for an Honor Code violation in this course, the instructor will enter a Grade Adjustment sanction which may be up to or including failure of the course.

### **APPROPRIATE USE OF AI TECHNOLOGY**

The UF Honor Code strictly prohibits [cheating](#). The use of any materials or resources prepared by another person or Entity (inclusive of generative AI tools) without the other person or Entity's express consent or without proper attribution to the other person or Entity is considered *cheating*. Additionally, the use of any materials or resources, through any medium, which the Faculty / Instructor has not given express permission to use and that may confer an academic benefit to a student, constitutes *cheating*. The use of any AI enabled tool in this course substantially compromises the student's ability to achieve the stated learning objectives and are strictly prohibited throughout the entirety of the course.

### **IN-CLASS RECORDING**

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 guest 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.

### **EXAM MAKE-UP POLICY**

Students who are ill or have an emergency that prevents them from taking the exam during the designated time are responsible for contacting the instructor as soon as possible. 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. Students must make-up quizzes from each module within one week of the missed quiz, unless impeded by extenuating circumstances. "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. Accommodations are not retroactive, therefore, students should contact the office as soon as possible in the term for which they are seeking accommodations. Several activities in the course are performed in group. The instructor will work closely with the DRC and the students registered therein to make suitable arrangements for group assignments.

## 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 someone you know is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu), 352-392-1575, or visit [U Matter, We Care website](#) to refer or report a concern and a team member will reach out to the student in distress.
- **Counseling and Wellness Center:** Visit the [Counseling and Wellness Center website](#) or call 352-392-1575 for information on crisis services as well as non-crisis services.
- **Student Health Care Center:** Call 352-392-1161 for 24/7 information to help you find the care you need, or visit the [Student Health Care Center website](#).
- **University Police Department:** Visit [UF Police Department website](#) or call 352-392-1111 (or 9-1-1 for emergencies).
- **UF Health Shands Emergency Room / Trauma Center:** For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; or visit the [UF Health Emergency Room and Trauma Center website](#).
- **GatorWell Health Promotion Services:** For prevention services focused on optimal wellbeing, including Wellness Coaching for Academic Success, visit the [GatorWell website](#) or call 352-273-4450.

### ACADEMIC RESOURCES

- **E-learning technical support:** Contact the [UF Computing Help Desk](#) at 352-392-4357 or via e-mail at [helpdesk@ufl.edu](mailto:helpdesk@ufl.edu).
- **Career Connections Center:** Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services.
- **Library Support:** Various ways to receive assistance with respect to using the libraries or finding resources.
- **Teaching Center:** Broward Hall, 352-392-2010 or to make an appointment 352-392-6420. General study skills and tutoring.
- **Writing Studio:** 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers.
- **Student Complaints & Grievances:** Students are encouraged to communicate first with the involved person(s), but [here](#) is more information on the appropriate reporting process.

## APK ADMINISTRATORS

For suggestions or concerns related to APK courses or programming, please reach out to any of the following:

- Dr. David Vaillancourt (he/him), APK Department Chair, [vcourt@ufl.edu](mailto:vcourt@ufl.edu)
- Dr. Demetra Christou (she/her), APK Department Vice Chair, [ddchristou@hwp.ufl.edu](mailto:ddchristou@hwp.ufl.edu)
- Dr. Steve Coombes (he/him), APK Graduate Coordinator, [rachaelseidler@ufl.edu](mailto:rachaelseidler@ufl.edu)
- Dr. Joslyn Ahlgren (she/her), APK Undergraduate Coordinator, [jahlgren@ufl.edu](mailto:jahlgren@ufl.edu)

## Grading

Students in the course will be assessed through quizzes in class, exams, and participation in discussion sessions. Quizzes are administered weekly. There are three exams in the course (one per module). Discussion sessions for participation are held weekly.

Evaluation Components (Number of each)	Points Per Component	Approximate % of Total Grade
Quizzes (10)	8 pts each = 80 pts	80/200 = 40%
Midterm Exams (3)	20 pts each = 60 pts	60/200 = 30%
Discussion Assignments (10)	10 pts per module = 30 pts	30/200 = 15%
Participation (3)	10 pts per module = 30 pts	30/200 = 15%
Extra Credit (6)	6 points possible	3%

**40% Quizzes (80 points total)** – 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. These quizzes will be at the beginning of the class. The quiz 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 8 questions per quiz and students will be given 12 minutes to complete the quiz.

**30% Exams (60 points total)** – Exams will be at the end of a module (three exams, one per module). Each exam will contain 20 questions and will last 50 minutes. Exams will be based on reading assignments and content covered in discussions and lectures. Questions will be multiple choice, matching and true/false.

**15% Discussion Assignments (30 points total)** – This will be determined based on the student's quality and correctness of submission of hand-written answers (submitted online) and drawings to discussion questions.

**15% Participation (30 points total)** – This will be determined based on the student's preparedness, involvement in class activities or lectures, and contribution in class discussions. Students are required to participate by providing answers on the board and discussing applied questions in front of class. Students need to 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 lack of time limits the possibility for all students to participate, the instructor will 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 discussion assignment submissions.

Excellent	90-100%	- Defines, describes, and illustrates concepts - Explains, assesses and criticizes ideas - Demonstrates preparation and reading of assignments
good	80-89.99%	- Defines, describes, and illustrates concepts - Explains, assesses and criticizes ideas - Evidence of reading assignments, but not fully prepared
reasonable	70-79.99%	- Defines, describes, and illustrates concepts - Explains, assesses, or criticize some ideas - Evidence of incomplete reading of assignments and preparation
basic	60-69.99%	- Defines and describes some concepts - Explains but cannot assess and criticize ideas - Clearly unprepared and lacking evidence of reading assignments
bare minimum	0-59.99%	- Defines and describes some concepts - Unable to explain, assess, or criticize ideas - Clearly unprepared and lacking evidence of reading assignments - Not present or refusal to engage or discuss

Online submissions of weekly assignments: The hand-written answers and drawings that the instructor will evaluate must provide a comprehensive response, be neatly organized and legible, and include drawings and concise text explaining the concepts and rationale for each answer.

**Extra Credit** - Students can earn up to 6 points (2 per module) of extra credit in the course. Extra credits are based on successful completion of the extra credit assignment for each module. Extra credit assignments must be completed before the exam for each module to count toward the grade.

### 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.

“More detailed information regarding current UF grading policies can be found here: <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%	87.00-89.99%	80.00-86.99%	77.00-79.99%	70.00-76.99%	67.00-69.99%	60.00-66.99%	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.

Date	Class activity	Note	Module
22-Aug	Intro; Topic 1-2	Lecture	1
27-Aug	Topics 3-4	Lecture	
<b>29-Aug</b>	<b>Topics 1-4</b>	<b>Quiz and Discussion</b>	
03-Sep	Topics 5-6	Lecture	
<b>05-Sep</b>	<b>Topics 5-6</b>	<b>Quiz and Discussion</b>	
10-Sep	Topics 7-8	Lecture	
<b>12-Sep</b>	<b>Topics 7-8</b>	<b>Quiz and Discussion</b>	
17-Sep	No Class	EC assignment due	
<b>19-Sep</b>	<b>Midterm Exam 1</b>		
24-Sep	Topics 1-2	Lecture	2
<b>26-Sep</b>	<b>Topics 1-2</b>	<b>Quiz and Discussion</b>	
01-Oct	Topics 3-4	Lecture	
<b>03-Oct</b>	<b>Topics 3-4</b>	<b>Quiz and Discussion</b>	
8-Oct	Topics 5-6	Lecture	
<b>10-Oct</b>	<b>Topics 5-6</b>	<b>Quiz and Discussion</b>	
15-Oct	Topics 7	Lecture	
<b>17-Oct</b>	<b>Topics 7</b>	<b>Quiz and Discussion</b>	
22-Oct	No Class	EC assignment due	
<b>24-Oct</b>	<b>Midterm Exam 2</b>		
29-Oct	Topic 1-2	Lecture	3
<b>31-Oct</b>	<b>Topic 1-2</b>	<b>Quiz and Discussion</b>	
05-Nov	Topic 3-4	Lecture	
<b>07-Nov</b>	<b>Topic 3-4</b>	<b>Quiz and Discussion</b>	
12-Nov	Topic 5	Lecture	
<b>14-Nov</b>	<b>Topics 5</b>	<b>Quiz and Discussion</b>	
19-Nov	No Class	EC assignment due	
<b>21-Nov</b>	<b>Midterm Exam 3</b>		
26-Nov	No Class	Thanksgiving Break	
28-Nov	No Class	Thanksgiving Break	



## **SUCCESS AND STUDY TIPS**

To succeed in this course, students need to prepare regularly and in advance of attending lecture and discussion sessions. Students should check topics and assignments on course schedule above, 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.