

## PHYSIOLOGY OF EXERCISE AND TRAINING

APK 3110C (COURSE #21071) 3 HRS CREDIT ~ SPRING 2021

Updated: January 2, 2021

**INSTRUCTOR:**

**Scott K. Powers**

Office: 112 FLG

Office Phone: 352-294-1713

Email: [spowers@hhp.ufl.edu](mailto:spowers@hhp.ufl.edu)

Preferred Method of Contact: email

**OFFICE HOURS:** Monday and Wednesday: 2PM-3PM (virtual-zoom)

Other hours by appointment.

**MEETING TIME/LOCATION:** FLG 0230, MWF, 12:50PM-1:40PM (6<sup>th</sup> period)

**COURSE DESCRIPTION:** Survey course in exercise physiology that provides an overview of the acute and chronic responses to exercise. Particular attention is placed on understanding muscle bioenergetics and metabolism as well as the cardiopulmonary responses to exercise. Special topics include exercise in hot environments, exercise and the immune system, and exercise and weight management.

**PREREQUISITE KNOWLEDGE AND SKILLS:** APK 2105C (C grade or better) along with junior standing or above

**REQUIRED AND RECOMMENDED MATERIALS:** Purchase of a textbook is not required; however, I recommend that students read a suggested textbook as lectures, study questions, and most (>90%) of the exam content will be based on material contained in the following textbook:

Powers, S. K. Howley, E.T. and Quindry, J. (2021) *Exercise Physiology: theory and application to fitness and performance*, McGraw-Hill, New York. 11e

Students: Please note that this course will be participating in the UF All Access program and therefore, you can purchase both print and electronic copies of the text at a discounted price.

Login and Opt-In to gain access to your required course materials - UF All Access will provide you with your required materials digitally at a reduced price and the charges will post directly to your student account, allowing any available Financial Aid funds to cover the cost of your materials. This option will be available starting 1 week prior to the first day of classes and ending 3 weeks after the first day of class."

Copies of the lecture slides will be posted on the course website (on Canvas) prior to each lecture.

**COURSE TEACHING ASSISTANTS (TA):** This class is fortunate to have several outstanding undergraduate teaching assistants to provide learning support outside of the classroom setting. Specifically, your TAs will host "virtual" weekly office hours to address questions about course material and to assist students in learning specific exercise physiology concepts. Finally, prior to each examination, your TAs will schedule a review session to provide students an opportunity to ask questions about material that will be covered in each examination.

Teaching assistant for APK 3110c spring 22021 include:

Kaitlin Fogarty- Office hours Tuesday 9:35-10:25

[k.forgarty@ufl.edu](mailto:k.forgarty@ufl.edu)

Isabel Lteif- Office hours Tuesday 10:40AM-11:40AM

[ilteif@ufl.edu](mailto:ilteif@ufl.edu)

Addison Butler-Office hours Wednesday 9:35AM-10:25AM

[addison.butler@ufl.edu](mailto:addison.butler@ufl.edu)

**TA office hours will be held virtually via zoom meeting-please email TA (in advance) to schedule a zoom office meeting**

**COURSE FORMAT:** This course will meet three times a week for an informal lecture/discussion. Students enrolled in the face-to-face section of the course will meet in the classroom and will follow CDC guidelines for reducing the risk for spread of COVID (i.e., wearing masks at all times/appropriate distanced seating). Students enrolled in the online course will view the live lecture via video. Please note that the class discussion will focus on an integrative approach toward understanding exercise physiology and incorporate a problem-based learning method that will emphasize the importance of critical thinking skills. Questions are encouraged at any time during the lecture.

**COURSE LEARNING OBJECTIVES:** Following completion of this course, you should be able to do the following:

- Discuss techniques to measure energy expenditure and describe the process of calculating both work and power during exercise
- Define the terms homeostasis and steady state and explain the design and operation of biological control systems
- Describe and explain biochemical pathways involved in ATP production in skeletal muscle during exercise of varying intensities
- Discuss the factors that regulate fuel selection during exercise
- Define the lactate threshold and discuss the potential mechanisms responsible for the rise in blood lactate concentration during exercise
- Describe the hormone-receptor interaction and discuss the major hormones that influence fuel selection during exercise
- Discuss the structure and function of somatic motor and autonomic nervous system during exercise
- List and discuss the function of key muscle proprioceptors
- Describe the structure and contractile function of skeletal muscle fibers and satellite cells
- Discuss the biochemical and contractile properties of the different skeletal muscle fiber types
- Outline the structure and function of the circulatory system during exercise
- Discuss the regulation of cardiac output, stroke volume, blood pressure, and blood distribution during exercise
- Describe the control and function of the respiratory system during exercise
- Define the terms acid, base, and pH; Explain how the body regulates acid-base balance during exercise
- Discuss how the body regulates temperature during exercise in both hot and cold environments
- Explain the physiological adaptations that occur in response to endurance exercise training

- Discuss the signaling events that lead to endurance exercise training-induced adaptations in skeletal muscle
- Describe the role that the nervous system and fiber hypertrophy plays in adaptation to resistance exercise training
- Discuss the signaling pathways that regulate resistance training-induced skeletal muscle hypertrophy
- Explain how concurrent resistance and endurance exercise training impacts signaling pathways involved skeletal muscle hypertrophy

## COURSE AND UNIVERSITY POLICIES:

**ATTENDANCE POLICY:** Class attendance is not mandatory and there are no points associated with attendance. However, missing class will likely have a negative impact on learning and therefore, could negatively influence your exam scores and final grade in the course.

**COMMUNICATION WITH INSTRUCTOR:** The best way to communicate with your instructor is face-to-face before or after class. Outside of class, please contact your instructor by email ([spowers@hhp.ufl.edu](mailto:spowers@hhp.ufl.edu)) to schedule a time to meet. Please do not use the email address in e-learning. You are responsible for checking course postings on eLearning (CANVAS).

**PERSONAL CONDUCT POLICY:** Students are expected to exhibit behaviors that reflect highly upon themselves and our University. Moreover, students are expected to join the lecture on time but tardiness is acceptable when personal conflicts require the student to enter the classroom or zoom lecture later than the scheduled time.

Laptop computers and tablet devices for note taking are welcome for use during the course. Upon entry into the virtual lecture, **please silence your cell phone**, or mute your microphone.

Failure to adhere to the UF Honor Code will result in disciplinary action by the 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.

**EXAM MAKE-UP POLICY:** Make-up exams will be available for students that cannot take exams during the assigned period due to health problems or an emergency. Documentation of the illness or emergency will be required. Please contact instructor in advance for approval of make-up exams. 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.ua.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.ua.ufl.edu/public-results/>.

**COVID-RELATED:** For face-to-face courses a statement informing students of COVID related practices such as:

- We will have face-to-face instructional sessions to accomplish the student learning objectives of this course. In response to COVID-19, the following policies and requirements are in place to maintain your learning environment and to enhance the safety of our in-classroom interactions.
- You are required to wear approved face coverings at all times during class and within buildings. Following and enforcing these policies and requirements are all of our responsibility. Failure to do so will lead to a report to the Office of Student Conduct and Conflict Resolution.
- This course has been assigned a physical classroom with enough capacity to maintain physical distancing (6 feet between individuals) requirements. Please utilize designated seats and maintain appropriate spacing between students. Please do not move desks or stations.
- Sanitizing supplies are available in the classroom if you wish to wipe down your desks prior to sitting down and at the end of the class.

- Follow your instructor's guidance on how to enter and exit the classroom. Practice physical distancing to the extent possible when entering and exiting the classroom.
- If you are experiencing COVID-19 symptoms ([Click here for guidance from the CDC on symptoms of coronavirus](#)), please use the UF Health screening system and follow the instructions on whether you are able to attend class. [Click here for UF Health guidance on what to do if you have been exposed to or are experiencing Covid-19 symptoms](#).
- Course materials will be provided to you with an excused absence, and you will be given a reasonable amount of time to make up work. [Find more information in the university attendance policies](#).

**PRIVACY:** For online course with recorded materials a statement informing students of privacy related issues such as: 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. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

## GETTING HELP:

Students requiring assistance with health and/or wellness or students seeking academic help can use the following sources:

### Health and 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. Leo Ferreira, APK IDEA Liaison, [ferreira@hnp.ufl.edu](mailto:ferreira@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)
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### **GRADING:**

**Grading-big picture:** Students will be evaluated based on grades from four lecture examinations worth 25 points each (4 X 25 points = 100 points total). Exams will consist of multiple choice and/or true-false questions. Please bring pre-sharpened pencils to exams. Exams will be administered during the regular class period using honorlock.

In addition to the points earned from four regular exams, students will also have an opportunity to earn extra credit points by completion of thirteen homework assignments during the semester. Each homework assignment (associated with each chapter of the textbook) will be posted on canvas at regular intervals during the semester. Successful completion of one homework assignment will be worth 0.21 points. Therefore, there is an opportunity to earn 4.0 extra credit points that will be added to the point total earned from lecture exams (i.e., 14 homework assignments X 0.21 pts = 3 pts).

Details of exam content and homework assignments follow.

**Lecture exams:** More than 90% of the exam content will come directly from the recommended textbook (Powers, Howley, Quindry Exercise Physiology, 11e). Note that the 11<sup>th</sup> edition of this book contains significant new material (i.e., four new chapters and many updates) that is NOT contained in the 10<sup>th</sup> edition of the book. In addition to material from the textbook, selected lectures will contain “new” information found in scientific publications. **If you plan to purchase the 11<sup>th</sup> edition of the textbook, please consider an electronic edition of the book that also contains the “connect” package. The “E” edition of the text will save you a significant amount of money and the connect package contains learning tools that will assist you in mastering the material.**

Each of the four lecture exams will consist of 50 questions worth 0.5 points per question.

**Homework for extra points:** During the semester, you will have the opportunity to earn up to three extra points by completing 14 homework assignments (worth 0.21 points each). These homework assignments are NOT required and therefore, completion is voluntary. These assignments will be posted on the course website (canvas) and will correspond with each chapter covered in the recommended textbook. The due date of the assignment to get full credit will be provided in the announcement. Successful completion of each homework project will result in the addition of 0.21 points to your total point total.

Grades will be assigned based on points earned in the course. The relative point value of the four examinations and four quizzes are as follows:

Evaluation Components (number of each)	Points Per Component	Approximate % of Total Grade
Lecture Exams (4)	25 pts each = 100 pts	100%
Homework (14 assignments) (Extra credit)	Total of 3 extra points possible-will be added on top of exam grades	Home-work provides bonus points-failure to complete homework does not negatively impact your final point total

**Total possible points in course = 103**



**GRADING SCALE:** Note that lecture exam scores and homework grades will be posted on the canvas course website typically within 48-96 hours after the date of the exam. Final grades in the class will be determined by the total points earned during the semester. Final point totals that are not whole numbers will be handled in the following way. Any point total with a fraction of another point will be rounded up if the fraction reaches 0.5 points or higher. More detailed information regarding current UF grading policies can be found here: <https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/>.

Please note that 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.

The letter grading scale for the course is as follows:

Letter Grade	Total points Needed to Earn Each Letter Grade	GPA Impact of Each Letter Grade
A	≥ 93	4.0
A-	90-93	3.67
B+	87-89.99	3.33
B	80-86.99	3.0
C+	77-79.99	2.33
C	70-76.99	2.0
D+	67-69.99	1.33
D	60-66.99	1.0
E	<59.99	0

## WEEKLY COURSE SCHEDULE:

**Tentative Exercise Physiology-Spring 2021 lecture schedule\***

**\*Note that the lecture schedule is subject to change. Changes will be announced in class and online during the e-Learning website.**

**January-March**

Date	Topic	Texbook Chapter	Study questions
1/11	Course introduction and history of exercise physiology	0	1,3,4,6-10

1/13	Research in exercise physiology	0	1,3,4,6-10
1/15	Control of internal environment	2	1-9
1/18	Holiday-no class		
1/20	Bioenergetics	3	1-17
1/22	Bioenergetics	3	1-17
1/25	Bioenergetics	3	1-17
1/27	Exercise metabolism	4	1-11
1/29	Exercise metabolism	4	1-11
2/1	Exercise metabolism	4	1-11
2/3	Cell signaling and hormonal response	5	2-10
2/5	Cell signaling and hormonal response	5	2-10
2/8	Cell signaling/review for exam		2-10
2/10	Exam 1	0, 1,2,3,4,5	Chapters 0-5
2/12	Nervous system	7	10-17
2/15	Nervous System	7	10-17
2/17	Skeletal muscle-exercise	8	1-8,10
2/19	Skeletal muscle-exercise	8	1-8,10
2/22	Skeletal muscle-exercise	8	1-8, 10
2/24	Skeletal muscle-exercise	8	1-8, 10
2/26	Cardiovascular function-exercise	9	1-10
3/1	Cardiovascular function-exercise	9	1-10
3/3	Cardiovascular function-exercise	9	1-10
3/5	Cardiovascular function-exercise/review exam	7,8,9	
3/8	Exam 2		

Date	Topic	Chapter	Study questions
3/10	Respiratory system and exercise	10	1-12
3/12	Respiratory system and exercise	10	1-12
3/15	Respiratory system and exercise	10	1-12
3/17	Respiratory system/Immune	10	1-12
3/19	Exercise and Immune System	6	1-8
3/22	Temperature regulation	12	1-14
3/24	Temperature regulation		
3/26	Temperature regulation	12	1-14
3/29	Review Exam 3	6,10,12	
3/31	Exam 3	6, 10, 12	1-18

<b>4/2</b>	<b>Training adaptation-aerobic</b>	<b>13</b>	<b>1-18</b>
<b>4/5</b>	<b>Training adaptation-aerobic</b>	<b>13</b>	<b>1-18</b>
<b>4/7</b>	<b>Training adaptation-anaerobic</b>	<b>13</b>	<b>1-18</b>
<b>4/9</b>	<b>Training adaptation-strength</b>	<b>14</b>	<b>1-11</b>
<b>4/12</b>	<b>Training adaptation-strength</b>	<b>14</b>	<b>1-11</b>
<b>4/14</b>	<b>Weight management</b>	<b>18 (pages 471-483)</b>	<b>22-25</b>

Date	Topic	Chapter	Study questions
4/16	Weight management	18 (pages 471-483)	22-25
4/19	Review exam 4		
4/21	Exam 4	13,14,18	

- Exam 1 will cover chapters 0-5**
- Exam 2 will cover chapters 7,8,9**
- Exam 3 will cover chapters 10,6,12**
- Exam 4 will cover chapters 13,14,18**

### **SUCCESS AND STUDY TIPS:**

Success in any university course requires dedication and hard work on the part of the student. Attending class regularly and studying on a daily basis is essential to excel in learning exercise physiology. Here are 8 tips for learning exercise physiology:

1. Learn the vocabulary of exercise physiology
2. Don't just memorize-learn concepts and principles of exercise physiology
3. Read the chapter before class
4. Go to class and focus on key points presented in the lecture
5. Ask questions of the instructor if you don't understand a concept presented during the lecture
6. Study daily-start small and learn sections of material in the text (don't get overwhelmed by reading the entire chapter)
7. Review material in small section over and over again-start with a blank sheet of paper and draw and/or write out the answers to study questions assigned for each chapter
8. Develop problem solving skills and improve your critical thinking about exercise physiology concepts