

Applied Physiology and Kinesiology 6118

## **Neuromuscular Adaptation**

Instructor: Elisabeth Barton, Ph.D. Professor of Applied Physiology and Kinesiology

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Office Hours: Thursdays 2 – 3 pm, or appointments may be scheduled in person or by email.

*ROOM 250 FLG Thursdays Periods 8-10 3:00 P.M. to 6:00 P.M.*

### ***Overview of the Course:***

This course will combine a highly cellular and molecular approach to muscle and nerve function and then apply these to integrative views of muscle behavior in the context of adaptation to exercise, disuse atrophy and disease states. Although there is a heavy emphasis on skeletal muscle, the course will incorporate some introductory aspects of neuronal function and adaptation.

Throughout the course we will review cell physiology and elementary biophysics as we enter into each topic. It is not required that students have an extensive background in advanced physiology, biophysics or biochemistry, but these will be incorporated in a "ground up" approach to understanding fundamental principles. Students taking the course and mastering the material should be prepared to enter into more advanced muscle physiology research or physical therapy research and will have a sufficient background to explore a wide range of topics from a cellular perspective in physiology.

Due to the overlap of the course schedule with the Center for Exercise Science Seminar Series, we will incorporate these seminars into lecture time when appropriate. These will be noted in the schedule. Following the end of the seminar, we will regroup to discuss the points made by the speaker. This opportunity will expose students to experts in the neuromuscular field, and provide potentially different perspectives on the topics discussed in class.

### ***Course objectives:***

1. To provide students with an overall background in cell molecular physiology as it applies to skeletal muscle and nerve tissue. Students will be given sufficient background to be able to communicate fluently and understand the work of investigators studying basic muscle cell biology and to apply this knowledge to areas related to exercise and muscle adaptation. Very introductory material will be coupled with state-of-the art concepts and developments.
2. To provide students with a deep understanding of fundamental principles of muscle and neuromuscular adaptation to stresses imposed from exercise, stretch, injury, fatigue, and genetic disease.
3. To provide exposure to methodology, terminology and instrumentation used in muscle cell culture, microscopy, fluorescent proteins, PCR, membrane potential measurements, patch clamping, protein measurements, among others.
4. To develop the ability to critically review, understand and appreciate a wide breadth of cellular and molecular physiology literature, largely related to striated muscle. To interpret this literature and to discuss it in the context of fundamental physiological principles.

**Preliminary Course Schedule:**

Date	Activity	CES Seminar
11th January	Introduction/ Organization/Lecture	
18th January	Online material and quiz (No Lecture)	Scott Lephart U.Kentucky "A Decade of Injury Mitigation Research with US Special Forces
25th January	Load signaling and hypertrophy I	Jeffrey Karpicke Purdue Univ "Retrieval-Based Learning: Active Retrieval Promotes Meaningful Learning
1st February	Load signaling and hypertrophy II	Doug Seals U Colorado "How Aerobic Exercise Protects Your Arteries from Aging"
8th February	Atrophy and Proteostasis I	Jerry Dempsey U Wisconsin "Competition for Exercise-Induced Blood Flow Distribution"
15th February	Atrophy and Proteostasis II	
22rd February	Emerging Factors in muscle mass regulation	Philippe Noirez U Paris "Hemochromatosis HFE gene mutations and sport performance"
1st March	MIDTERM (No Class)	
8th March	Spring Break	
15th March	Muscle Plasticity Signaling	
22nd March	Muscle Fatigue I	
29th March	Muscle Fatigue II	
5th April	Neural Plasticity	
12th April	Muscle Secretome	
19th April	Final Exam (Take home)	

### **Textbook:**

There is no required text for this course. All lectures and outside reading material will be in the form of review articles and research articles provided on the Canvas, e-learning platform. One text, which is not required, but has useful information for students of Muscle Biology is "Skeletal Muscle Structure, Function and Plasticity" by Richard L. Lieber, Third edition. I will use information from the text throughout the course. I will also use Molecular Biology of the Cell by Alberts et al., Fourth edition for portions of the class, a standard text in cell biology. Finally, I will provide several papers that are comprehensive reviews of topics within the course modules that will serve of background material.

### **Student Presentations:**

There will be ~1 lecture hours per week by the instructor. The remaining time will be discussions of both classic and cutting edge research publications led by students or problem solving sessions led by the instructor. The student presentations will be a critical review of a relevant paper, consisting of a presentation of the goals/hypothesis, methodology and results, and interpretation of the findings. The instructor will provide an example presentation of an article so that students have an understanding of the scope of the presentation.

It is anticipated that each student will present at least once during the semester, and these will be organized early in the course. In addition, all students in the class will be required to submit the description of 1 figure and/or table from the paper to be discussed, in order to ensure involvement in the class discussions.

### **Grading:**

There will be a midterm and a final exam. The final will not be comprehensive. Both exams will be open book/notes. These exams will comprise 60% of the grade. Class discussion and student presentations will comprise 30% of the grade. Submitted assignments will count for another 10%. Grading will be determined by a standard conversion of a percent score to a letter grade using the transformation below.

<b>Letter Grade</b>	<b>Grade Point</b>	<b>Percentage</b>
A	4.0	94 - 100%
A-	3.7	90 - 93%
B+	3.3	87 - 89%
B	3.0	83 - 86%
B-	2.7	80 - 83%
C+	2.3	77 - 79%
C	2.0	73 - 76%
C-	1.7	70 - 72%
D+	1.3	67 - 79%
D	1.0	60 - 66%
F	0.0	0 - 59%

### **Students with Disabilities and Special Needs:**

Students requesting classroom accommodation must first register with the Dean of Student's Office. The Dean of Students Office will then provide documentation to the student who will provide this documentation to the instructor when requesting accommodation.

### **Policy on Classroom Demeanor, Missing Class/ Exams:**

In general, for small graduate classes, graduate students are expected to show up. In grad school, you are missed when you are not there. Learning discipline is part of the graduate education experience. As you move up in your education, your teachers become more and more like colleagues. Missing class is like missing a meeting with a colleague in business; you just don't do it unless it is necessary. However, I understand that sometimes experiments in the lab cannot be postponed on a given day, or you need to be at a national meeting presenting a paper. I will also have commitments that will conflict with classtime. I also understand if you are sick...no one wants you to be in class when you are sick, so stay home. You will be excused from class if you have a legitimate reason to be gone and all I ask is that you send me an email before class starts as to why you need to miss the class. That email is dated and I can keep a record of it. Please note: the University has specific reasons that are acceptable for missing class which apply to both undergrad and grad students. You can find this at <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>:

*"In general, acceptable reasons for absence from or failure to participate in class include illness, serious family emergencies, special curricular requirements (e.g., judging trips, field trips, professional conferences), military obligation, severe weather conditions, religious holidays and participation in official university activities such as music performances, athletic competition or debate. Absences from class for court-imposed legal obligations (e.g., jury duty or subpoena) must be excused. Other reasons also may be approved."*

The following types of excuses are **NOT** acceptable:

"I had to miss class because someone left me at the beach over the weekend"

"I had to leave early this week because I bought my flight to go home a month ago."

To be excused from exams (2 for the semester) you will require a note from the doctor or from a University official who has required that you work in some other capacity for the University at that specific time. Your request to be excused needs to reach me by email BEFORE the exam and I will investigate it and make a decision at a later time.

If you feel need for taking advantage of the University counseling services or mental health services, please call 392-1575 <http://www.counseling.ufl.edu/cwc/Default.aspx>

The University Police can be contacted at 392-1111 or 911 for emergencies.

In general I do not discourage you from having cell phones or computers in class, in fact I very much encourage you to bring your computer to follow along with the lectures and assignments. However, please put your phone on "silent" or airplane mode during class and do not answer the phone or respond to a text message during class. If whatever you are doing is disturbing the class or me, I will ask you to leave. I am tolerant of special needs. So, come to me if you feel you need extra help or extra time to completing an assignment or tests.

### **Policy on Ethics and Plagiarism and Cheating:**

For written assignments the instructor submits all material to TURNITIN.com, which is designed to determine whether what you have written is original material. Penalties for plagiarism will be enforced in this class. It may have extreme consequences such as receiving an F (failure) for the entire class, depending on the severity of the infraction. Understanding this aspect of scholarship is required to prepare you as a scientist, scholar and professional. Please review the UF Honor Pledge Code for

students <https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/> which specifies a number of behaviors that are in violation of the code and possible sanctions. Furthermore, you are obliged to report any condition that facilitates academic misconduct in others. Please contact me directly if you have any concerns about ongoing misconduct.

### ***Course Evaluation***

Students are expected to provide feedback on the quality of instruction in this course based on 10 criteria. These evaluations are conducted online at <https://evaluations.ufl.edu>. Evaluations are typically open during the last 2-3 weeks of the semester but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu>. Good participation in these evaluations is extremely important for maintaining and improving the quality of coursework at UF. Consider it a privilege to participate in UF's future by doing your evaluations. The outcome of these is used in many ways to make this a better environment for you and future students.