

HHS402-G
Muscle Biology
Fall, 2017
3 credits

Meeting times: M,W 8:30 AM to 9:45 AM
Meeting Place: NUR502A

Instructors:

[Timothy Butterfield](#), PhD. Associate Professor, Dept. Rehabilitation Sciences
[Robin L. Cooper](#), PhD. Associate Professor, Biology
[Esther E. Dupont-Versteegden](#), PhD. Professor, Dept. Rehabilitation Sciences
[Kenneth S. Campbell](#), PhD. Associate Professor, Dept. of Physiology
[Charlotte Peterson](#), PhD. Professor, Dept. Rehabilitation Sciences
[John McCarthy](#), PhD. Associate Professor, Dept. Physiology
[Dr. Grace Walton](#), PhD, Research Faculty, Dept. of Rehabilitation Sciences

This is a *team-taught* course: The hyperlinks above include contact information for each instructor.

Course Director: Timothy Butterfield, PhD

Office: C.T. Wethington Building, Room 210D (Dr. Butterfield's office)

Office phone: 859.218.0840

Cell Phone: 859.536.1640

E-mail: tim.butterfield@uky.edu

Office hours: Course Director has an open door policy, so feel free to stop by the office any time to ask questions, or to clarify something from class or the reading materials. However, when otherwise occupied a meeting should be set up. All other instructors are available by appointment also. It might be useful to form study groups and study together regularly and formulate questions early.

Course Description:

This course examines the gross as well as microscopic structural properties and the physiological function of skeletal muscle. Students will gain in-depth knowledge about not only normal muscle function, but also about the adaptability and plasticity of skeletal muscle under different environmental circumstances. The comparative biology of structure and function of skeletal muscle will be covered; also the relationship between muscle structure and function as it relates to human health-related issues will be examined and discussed. This course is for undergraduate as well as graduate students and will benefit those interested in health care-related fields (e.g. pre-physical therapy, pre-medicine) as well as students interested in the basic functioning of skeletal muscle.

Prerequisite: One course of general biology (BIO148 or BIO 152), a general anatomy/physiology (i.e., PGY206) course or permission of instructor.

Student Learning Outcomes

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

1. Describe concepts related to muscle structure and function and limitations that are shaped by their evolutionary history as assessed by examination
2. Demonstrate understanding of the physiological function of muscles
3. Illustrate how muscles can be studied experimentally
4. Critically analyze research papers in the field of muscle biology
5. Discuss and develop new ideas and suggest future research directions in the field of muscle biology.

Course goals/objectives

The goals of this course are that the learning outcomes will be met by the students

Required materials:

Textbook

Skeletal Muscle Structure, Function, and Plasticity. The physiological basis of rehabilitation. Richard L. Lieber PhD

Publication Date: Sep 23, 2009

Format: Book

Edition: Third 2010

ISBN/ISSN: 978-0-7817-7593-9

Cost: ~ \$60

Supplementary Materials

1. Readings from the primary literature will be assigned on occasion. These articles will be posted on Canvas for you to download and print.

2. *Fundamental Biology and Mechanisms of Disease* (two volume series). Hill & Olson (ed.) 18 Jul 2012. Academic Press. ISBN: 978-0-1238-1510-1. 1392 pages. A copy will be held in reserve in the UK Library for student access

Course Website

Canvas will contain the syllabus, course announcements, study advice, class notes etc

Description of Course Activities and Assignments:

The course will be a mix of lecture and student-led discussions. Readings will be taken from the text and from the primary research literature. The instructors will provide greater detail on the term paper, but basically a student will read recent primary research papers on one subject and will explain their meaning and how the topics relate to the field in muscle biology.

Course Assignments:

All students

1. Summary of a primary research article or research of a muscle disease or comparative muscle review (<500 word undergraduate, 700-1000 word graduate, article for the public, i.e. newspaper or magazine)- 15 points
2. Class participation (questions in class, paper discussions)- 10 pts
Students are expected to participate in Discussions and ask a question or comment on a discussion at least 2-3 times (5 points each) during each discussion period.
3. Three Exams, 25 pts each = 75 pts
*Undergraduate students will be provided with a Midterm Evaluation (by the midterm date) of course performance based on criteria in syllabus.

Graduate students

1. All assignments listed above
2. One research paper
 - a. First draft = 30 pts
 - b. Final version = 60 pts
 - c. Presentation = 10 pts

Writing assignments for course

Summary of a primary research article. Summarize a primary research paper in the format of an article/newspaper type report:

Undergraduate assignment: Write a summary article for the public, i.e. newspaper or magazine: <500 words

Graduate assignment: Write a 700-1000 word article for the public, i.e. newspaper or magazine.

Review article/term paper **For graduate students only**

There will be one formal manuscript written for this class. The manuscript is intended to mimic the review manuscript writing and submission processes required for scientific publication, and it will utilize results from reviewing scientific literature. The manuscript must be written independently (no group submissions). The draft and final submission dates are listed below in class schedule. The writing format described by the Journal of Comparative Biochemistry and Physiology - Part A: Molecular & Integrative Physiology will be used or Annual Reviews in Physiology. As an example, go to the journal's web

page and look up information for authors at:

http://www.elsevier.com/wps/find/journaldescription.cws_home/525464/description

The “guide to authors” provided by the journal provides the formatting guidelines that must be followed for this assignment. Additional information for this assignment will be made available through the course website.

The manuscript must include a thorough analysis and evaluation of a topic of interest within the field of muscle biology and the synthesis of a new research question pertaining to the discussed topic.

Assignments are considered late after 5pm on the due date and a full letter grade will be subtracted for a late assignment.

Grading:

A total of 100 (undergraduate) or 200 (graduate) points can be earned in this class:

	Undergraduate	graduate
Summary paper	15	15
participation	10	10
Exams (3 at 25 points each)	75	75
draft term paper		30
final version term paper		60
presentation of term paper		10
total points	100	200

Final grades will be based on total points earned and will be assigned as follows:

Undergraduate:

- A = 90 - 100 %
- B = 80 – 89.99 %
- C = 70 – 79.99 %
- D = 60 – 69.99 %
- E = less than 60 %

Final grades will be based on total points earned and will be assigned as follows:

Graduate:

- A = 92 - 100 %
- B = 82 – 91.99 %
- C = 72 – 81.99 %
- E = less than 72 %

Course policies

The exams will allow you to demonstrate your understanding of the material presented in class and in the textbook. Each exam will last 60 min and will involve short answers of a few sentences and/or diagrams and/or multiple choice questions and/or essay

questions. Make-up exams are given only in cases that meet criteria for acceptable reasons for excused absences, as stated below in the policy on “Excused Absences.” Unexcused absence from an exam will result in a score of zero for that exam. All make-up exams must be completed within one week of the scheduled exam date. Failing to make up exams will result in a failing grade.

A grade of incomplete (I) can only be given if a *major* portion (>70%) of the course has been completed at a *passable* level (>70% for undergraduates and >72% for graduates). An ‘I’ grade will not be given for poor performance or for lack of attendance. Documentation is required to justify a grade of ‘I.’ See the University catalog or schedule of classes for information on withdrawal from the course.

Canvas/Class Communications

Course announcements, assignments, lecture outlines and additional materials will be posted online using Canvas. Exams and homework dates will remain fixed. Updates to this syllabus (regarding topics and reading) will be posted; please check periodically.

You will also receive important course announcements from Canvas via your UK e-mail account. If you do not use your UK e-mail account, you need to activate it. It is strongly recommended that you check your e-mail regularly. Instructors may send messages—sometimes with attachments—to the class using this medium. You should also feel free to e-mail instructors if you have any questions or problems. Feel free to call Dr. Butterfield as well, if you prefer a more personal communication or set up an appointment.

Attendance policy

Attendance is mandatory for all classes and discussion. Instructor needs to be notified in case of absence. If a class is missed without notification and is an unexcused absence, 5 points will be deducted from the total overall score.

Excused Absences

Students need to notify the professor of absences prior to class when possible. S.R. 5.2.4.2 defines the following as acceptable reasons for excused absences: (a) serious illness, (b) illness or death of family member, (c) University-related trips, (d) major religious holidays, and (e) other circumstances found to fit “reasonable cause for nonattendance” by the professor.

Students anticipating an absence for a major religious holiday are responsible for notifying the instructor in writing of anticipated absences due to their observance of such holidays no later than the last day in the semester to add a class. Information regarding dates of major religious holidays may be obtained through the religious liaison (859-257-2754).

Students are expected to withdraw from the class if more than 20% of the classes scheduled for the semester are missed (excused or unexcused) per university policy.

Verification of Absences

Students may be asked to verify their absences in order for them to be considered excused. Senate Rule 5.2.4.2 states that faculty have the right to request “appropriate verification” when students claim an excused absence because of illness or death in the family. Appropriate notification of absences due to university-related trips is required prior to the absence.

Academic Integrity:

You must abide by UK’s Code of Conduct

(<http://www.uky.edu/StudentAffairs/Code/index.html>), which prohibits:

1. Academic dishonesty and impropriety, including plagiarism and academic cheating.
2. Interfering or attempting to interfere with or disrupting the conduct of classes or any other normal or regular activities of the University.

Per university policy, students shall not plagiarize, cheat, or falsify or misuse academic records. Students are expected to adhere to University policy on cheating and plagiarism in all courses. The minimum penalty for a first offense is a zero on the assignment on which the offense occurred. If the offense is considered severe or the student has other academic offenses on their record, more serious penalties, up to suspension from the university may be imposed.

Plagiarism and cheating are serious breaches of academic conduct. Each student is advised to become familiar with the various forms of academic dishonesty as explained in the Code of Student Rights and Responsibilities. Complete information can be found at the following website: <http://www.uky.edu/Ombud>. A plea of ignorance is not acceptable as a defense against the charge of academic dishonesty. It is important that you review this information as all ideas borrowed from others need to be properly credited.

Part II of *Student Rights and Responsibilities* (available online

<http://www.uky.edu/StudentAffairs/Code/part2.html>) states that all academic work, written or otherwise, submitted by students to their instructors or other academic supervisors, is expected to be the result of their own thought, research, or self-expression. In cases where students feel unsure about the question of plagiarism involving their own work, they are obliged to consult their instructors on the matter before submission.

When students submit work purporting to be their own, but which in any way borrows ideas, organization, wording or anything else from another source without appropriate acknowledgement of the fact, the students are guilty of plagiarism. Plagiarism includes reproducing someone else’s work, whether it be a published article, chapter of a book, a paper from a friend or some file, or something similar to this. Plagiarism also includes the practice of employing or allowing another person to alter or revise the work which a student submits as his/her own, whoever that other person may be.

Students may discuss assignments among themselves or with an instructor or tutor, but when the actual work is done, it must be done by the student, and the student alone. When a student's assignment involves research in outside sources of information, the student must carefully acknowledge exactly what, where and how he/she employed them. If the words of someone else are used, the student must put quotation marks around the passage in question and add an appropriate indication of its origin. Making simple changes while leaving the organization, content and phraseology intact is plagiaristic. However, nothing in these Rules shall apply to those ideas which are so generally and freely circulated as to be a part of the public domain (Section 6.3.1).

Please note: Any assignment you turn in may be submitted to an electronic database to check for plagiarism.

Accommodations due to disability:

If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (859) 257-2754 or visit us at 725 Rose Street, Suite 407 Multidisciplinary Science Building, Lexington, KY 40536-0082 (Building 82 on the Campus Map) for coordination of campus disability services available to students with disabilities.

Classroom behavior policies:

Use of personal recording devices in class: If a student finds it necessary to photograph, video or audio record portions of a lecture or lab, it is required that the student get the permission of the instructor. It is also expected that such recording will be used as a study aid for the student and not posted in any manner on the internet. Use by other students in the class is allowed, but ALWAYS requires permission of the instructor. Photographs or recordings meant to be used for historical purposes by the class historian should have the permission of faculty members as well.

The use of cellular telephones is not permitted in class.

Tentative Class Schedule:

Exams will be given during class time in the weeks indicated. All material covered in class up until the exam date will be covered on the exam.

	DATE	TOPIC	ASSIGNMENT	INSTRUCTOR
Week 1	Aug 23	Introduction to the course Library research methods		Dr. Butterfield
	Aug 28 Aug 30		TEXT Chapter 1, pp. 1-39	Dr. Cooper

Week 2		Introduction to skeletal muscle anatomy / Cellular organization		
Week 3	Sept 4 Sept 6	Labor Day (no class) Cellular Organization	TEXT Chapter 1, pp. 1-39 & supplemental material	Dr. Cooper Dr. Butterfield
Week 4	Sept 11 Sept 13	Skeletal muscle physiology / Research Paper 1 discussion	TEXT Chapter 2, pp. 41-90	Dr. Cooper
Week 5	Sept 18 Sept 20	Skeletal muscle physiology/ Sarcomere forces One lecture/one discussion session	TEXT Chapter 2, pp. 41-90	Dr. Campbell
Week 6	Sept 25 Sept 27	Exam 1 Research Paper 2 discussion The production of movement	TEXT Chapter 3, pp.93-137	Dr. Butterfield
Week 7	Oct 2 Oct 4	Article Summary DUE / The production of movement / biomechanics (lecture & lab)	TEXT and supplemental material	Dr. Butterfield
Week 8	Oct 9 Oct 11	Comparative review of skeletal muscle function (lecture & lab)	TEXT and supplemental material	Dr. Cooper
Week 9	Oct 16 Oct 18	Skeletal muscle adaptation to increased use-overload	TEXT Chapter 4, pp.141-180	Dr. McCarthy
Week 10	Oct 23 Oct 25	Skeletal muscle adaptation to increased use- exercise	TEXT Chapter 4, pp.141-180	Dr. McCarthy
Week 11	Oct 30 Nov 1	EXAM 2 Skeletal muscle adaptation to decreased use/ disuse	TEXT Chapter 5, pp.183-226	Dr. Dupont- Versteegden

Week 12	Nov6 Nov 8	Draft of term paper due Skeletal muscle adaptation to decreased use/ aging and disease.	TEXT Chapter 5, pp.183-226	Dr. Dupont-Versteegden Dr. Peterson
Week 13	Nov 13 Nov 15	Skeletal muscle response to injury and satellite cell function	TEXT Chapter 6, pp.229-268	Dr. Peterson
Week 14	Nov 20 Nov 22	Adaptation to metabolic changes in muscle	TEXT Chapter 7, pp.271-290	Dr. Grace Walton
Week 15	Nov 27 Nov 29	Presentation of term papers (Graduate students only)	Supplemental material	All Instructors
Week 16	Dec 4 Dec 6	Current research in areas of muscle biology Final term paper DUE	Supplemental material	All Instructors
Week 17		EXAM 3 1:00 pm, Wednesday, Dec 13		