HBIO 320L – Muscle Physiology
Department of Biological Sciences: Human & Evolutionary Biology
Fall 2015

Instructor: Casey Donovan, Ph.D., Professor & Section Head
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Office Hrs: Tuesday 12:30 - 1:30PM and by appointment
Phone: (213) 740-2492

Textbooks:
Required: Skeletal Muscle Structure, Function, and Plasticity. 3rd edition, Lieber, R.L., Wolters Kluwer, Lippincott Williams & Wilkins, Baltimore, MD, 2010. ISBN 13-9780736045179
Recommended: Exercise Physiology. Human Bioenergetics and Its Applications. 4th edition. Brooks, G.A., T.D. Fahey, and K.M. Baldwin. McGraw-Hill Companies, New York, NY, 2005. ISBN 9780781775939

Course Objectives:
- To gain an understanding of skeletal muscle and motor neuron structure.
- To understand the mechanism of skeletal muscle contraction, motor unit recruitment, and physiological/mechanical outcomes, e.g. force production, movement, energy consumption/supply.
- To gain an understanding of those factors that impact upon skeletal muscle structure under normal and pathological conditions.

Course Outline:
I Skeletal muscle and motor neuron anatomy/composition, excitation contraction coupling, motor unit recruitment and mechanical output
II Production of movement, muscle energetics, blood flow & protein turnover.
III Skeletal muscle adaptation under normal and pathological conditions; comparison with cardiac and smooth muscle

Lecture: T & TH: 11:00AM - 12:20PM in GFS 101

Laboratory: 3 hours/week (PED B16)
Lab Lecturers: Bara Floyd, M.S. (gbfloyd@usc.edu) M: 11-2PM & 5-8PM
Tamara Espinet, M.S. (espinet@usc.edu) W: 5-8PM

Instructional Lab Manager: Emi Embler, Ph.D. (eembler@usc.edu)

Grading:

Exam #1	25%
Exam #2	25%
Final Exam	25%
Lab Grade	25%

TENTATIVE LECTURE & EXAM SCHEDULE

Date	Lecture Topic	Readings/Chapters	
		Lieber	*Brooks (optional)*
Aug. 23	Introduction/Overview: Muscle Architecture	1	*17 (p.383-386)*
Aug. 25	Skeletal Muscle Proteins: Contractile	1	*17 (p.363-377)*
Aug. 30	Skeletal Muscle Proteins: Cytoskeleton	1	
Sept. 1	Skeletal Muscle Proteins: Cytoskeleton		*18 (p.396-404)*
Sept. 6	Motor Neuron		*18 (p.405-407)*
Sept. 8	Neuromuscular Junction & Transmission	2	*17 (p.377-379)*
Sept. 13	Excitation-Contraction Coupling	2	*17 (p.386-393)*
Sept. 15	Skeletal Muscle Mechanics	2	
Sept. 20	Skeletal Muscle Mechanics	2	
Sept. 22	**Exam #1**		
Sept. 27	Motor Unit & Fiber Types Motor Unit Recruitment	2	*18 (p.408-414)*
Sept. 29	Motor Unit & Fiber Types Motor Unit Recruitment	2	
Oct. 4	Muscle Energetics: ATP and CP	2	*2,3*
Oct. 6	Muscle Energetics: Glycolysis	2	*5*
Oct. 11	Muscle Energetics: TCA cycle		*6*
Oct. 13	Muscle Energetics: ETC		*6*
Oct. 18	Muscle Energetics: Blood Borne Substrates		*7 & 9*
Oct. 20	Skeletal Muscle Blood Flow		*15, 17 (p.379-383)*
Oct. 25	Skeletal Muscle Blood Flow		*15, 17 (p.379-383)*
Oct. 27	**Exam #2**		
Nov. 1	Skeletal Muscle Fatigue		*33*
Nov. 3	Muscle Receptors		*18 (p.417-421)*
Nov. 8	Production of Movement	3	
Nov. 10	Adaptations to Increased Use	4	*19 (p.430-440)*
Nov. 15	Adaptations to Decreased Use	5	*19 (p.441-442)*
Nov. 17	Muscle Injury, Degeneration & Regeneration	6	*19 (p.442-443)*
Nov. 22	Muscle Denervation & Re-innervation	6	
Nov. 26	***Thanksgiving Day***		
Dec. 1	Cardiac Muscle		*14*
Dec. 3	Smooth Muscle		*14*
Dec. 13	**FINAL EXAM – 8AM – 10AM**		

Make-up Exams

*Make-up exams will **not** be given unless preapproved by the instructor or written/ verifiable evidence of a medical emergency is provided. In general, make-up exams will not be preapproved unless University policy provides for such accommodations (e.g. religious holidays, athletic competition, etc.) or extenuating circumstances are involved. Where accommodations can be anticipated (e.g. religious holidays, athletic competition) requests must be made within the first 3 weeks of the semester. In most cases, verification of such requests will be required. **Note:** While covering the same material, make-up exams will be distinct from the main exam.*

Degree Learning Objectives *(relevant Human Biology BS & BA degree objectives addressed in part by this course)*

- *To develop a deeper comprehension of the central and cross-disciplinary concepts of human biology, which include, but are not limited to bioenergetics, the interrelationship of human form and function, physiological homeostasis, and biomechanics.*
- *To demonstrate proficiency in modern methodologies pertinent to research in biological and physical sciences.*
- *To develop the ability to think critically, analyze, synthesize, and use information to solve problems.*
- *To provide sufficient depth of knowledge and skill for entry-level employment in a wide variety of fields, or for graduate study in the health professions or other biology-related disciplines.*

Statement on Academic Conduct and Support Systems

Academic Conduct

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Section 11, *Behavior Violating University Standards*https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions/. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct/.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the *Office of Equity and Diversity* http://equity.usc.edu/ or to the *Department of Public Safety* http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us. This is important for the safety whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. *The Center for Women and Men* http://www.usc.edu/student-affairs/cwm/ provides 24/7 confidential support, and the sexual assault resource center webpage sarc@usc.edu describes reporting options and other resources.

Support Systems
A number of USC's schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the *American Language Institute* http://dornsife.usc.edu/ali, which sponsors courses and workshops specifically for international graduate students. *The Office of Disability Services and Programs* http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.htmlprovides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, *USC Emergency Information http://emergency.usc.edu/* will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.