

University of Southern California – Department of Biological Sciences
Human Biology 320 – Muscle Physiology (3 units), Spring 2019

Instructor: Kurt E. Kwast, Ph.D.

Office Hours: Monday 12:00 pm - 1:30 pm & Wednesday 12:30 pm – 2:00 pm (AHF B39)

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Lecture: MWF 11:00 - 11:50 am; LVL 17

Course Description:

Analysis of the skeletal muscular system (anatomy, physiology, biochemistry, and development) and its functional properties under both normal and pathological conditions.

Learning Objectives:

The primary objective of HBIO 320 is to ensure that students have a fundamental understanding of the structure and function of the body's muscular and neuromusculoskeletal systems.

- Students should be able to identify and explain the functional attributes of the contractile, cytoskeletal, and connective tissue components that comprise skeletal muscle.
- Students should be able to identify and explain the functional attributes of the components involved in excitation-contraction coupling, muscle contraction, motor unit recruitment, and their physiological and mechanical outcomes (e.g., force and movement).
- Students should be able to model and explain skeletal muscle mechanics, the functionality of differential arrangement and organization of muscle fiber types, and the bioenergetics of muscle contraction.
- Students should be able to model and explain skeletal muscle plasticity in response to changes in use, injury, aging, and pathological conditions that affect neuromuscular function.

Course Outline:

1. Skeletal muscle and motor neuron anatomy/composition, and excitation contraction coupling.
2. Skeletal muscle mechanics, motor unit recruitment, and muscle energetics.
3. Skeletal muscle blood flow, fatigue, and muscle adaptation under normal and pathological conditions. Comparison skeletal muscle with cardiac and smooth muscle.

I. Text:

Required:

1. ***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

II. Grading Outline:

Midterm 1	200 pts.
Midterm 2	200 pts.
Midterm 3	200 pts.
Final Exam	400 pts.
TOTAL	1000 pts.
JEP Extra Credit	+25 pts.

- Individual exams will be scored but not assigned a letter grade. Only the final point tally will be assigned a letter grade. The grading scale will be based on a traditional grading scale as follows:

Letter Grade	Point Ranges	Grade Point Value
A	930-1025	4.000
A-	900-929	3.667
B+	870-899	3.333
B	830-869	3.000

B-	800-829	2.667
C+	770-799	2.333
C	730-769	2.000
C-	700-729	1.667
D+	670-699	1.333
D	630-669	1.000
D-	600-629	0.667
F	<600	0.000

- A request to take a make-up exam must be accompanied by evidence of a university-sanctioned excused absence (i.e., a letter from a doctor, athletic release, etc.) and must be made before the date of the scheduled exam. Make-up exams may be different from the scheduled exam (e.g., essay) and may be proctored by other personnel.

III. Tentative Lecture and Exam Schedule:

Date	Lecture Topic	Brooks et. al
Jan. 7	Introduction/Overview: Muscle Architecture	Ch. 17 (p. 383 – 386)
Jan. 9	Skeletal Muscle Proteins: Contractile	Ch. 17 (p. 363 – 377)
Jan. 11	Skeletal Muscle Proteins: Contractile	Ch. 17 (p. 363 – 377)
Jan. 14	Skeletal Muscle Proteins: Cytoskeleton	Ch. 17 (p. 396 – 404)
Jan. 16	Skeletal Muscle Proteins: Cytoskeleton	Ch. 17 (p. 396 – 404)
Jan. 18	Skeletal Muscle Proteins: Cytoskeleton	Ch. 17 (p. 396 – 404)
Jan. 21	MARTIN LUTHER KING JR HOLIDAY	
Jan. 23	Motor Neuron: Structure & Proteins	Ch. 18 (403 – 405)
Jan. 25	Motor Neuron: Neural Transmission	Ch. 18 (405 – 408)
Jan. 28	Neuromuscular Junction & Transmission	Ch. 18 (405 – 408)
Jan. 30	Excitation Contraction Coupling	Ch. 18 (405 – 408)
Feb. 1	Excitation Contraction Coupling	Ch. 18 (405 – 408)
Feb. 4	MIDTERM I	
Feb. 6	Skeletal Muscle Mechanics	
Feb. 8	Skeletal Muscle Mechanics	
Feb. 11	Skeletal Muscle Mechanics	
Feb. 13	Motor Unit & Fiber Types Motor Unit Recruitment	Ch. 18 (p. 408-414)
Feb. 15	Motor Unit & Fiber Types Motor Unit Recruitment	Ch. 18 (p. 408-414)
Feb. 18	PRESIDENT'S DAY HOLIDAY	
Feb. 20	Muscle Energetics: ATP/CP & Glycolysis	Ch. 2,3 & 5
Feb. 22	Muscle Energetics: ATP/CP & Glycolysis	Ch. 2,3 & 5
Feb. 25	Muscle Energetics: TCA	Ch. 6
Feb. 27	Muscle Energetics: TCA/ETC	Ch. 6
Mar. 1	Muscle Energetics: ETC	Ch. 6
Mar. 4	MIDTERM II	
Mar. 6	Muscle Energetics: Blood-Borne Substrates	Ch. 7 & 9
Mar. 8	Skeletal Muscle Blood Flow	Ch. 15, 16
Mar. 10 - 17	SPRING BREAK	
Mar. 18	Skeletal Muscle Blood Flow	Ch. 15, 16

Mar. 20	Skeletal Muscle Fatigue	Ch. 33
Mar. 22	Skeletal Muscle Fatigue	Ch. 33
Mar. 25	Muscle Receptors	Ch. 18 (p. 417 – 421)
Mar. 27	Muscle Receptors	Ch. 18 (p. 417 – 421)
Mar. 29	Adaptations to Decreased Use	Ch. 19 (p. 430 – 440)
Apr. 1	Adaptations to Decreased Use	Ch. 19 (p. 430 – 440)
Apr. 3	Adaptations to Decreased/Increased Use	Ch. 19 (p. 430 – 442)
Apr. 5	Adaptations to Increased Use	Ch. 19 (p. 4441 – 442)
Apr. 8	MIDTERM 3	
Apr. 10	Muscle Injury, Degeneration & Regeneration	Ch. 19 (p. 442 – 443)
Apr. 12	Muscle Injury, Degeneration & Regeneration	Ch. 19 (p. 442 – 443)
Apr. 15	Muscle Degeneration	
Apr. 17	Muscle Degeneration	
Apr. 19	Muscle Degeneration	
Apr. 22	Cardiac Muscle	Ch. 14
Apr. 24	Cardiac & Smooth Muscle	Ch. 14
Apr. 26	Smooth Muscle	Ch. 14
May 1	FINAL EXAMINATION 11:00 am – 1:00 pm	

IV. Relevant Human Biology BS & BA degree objectives addressed in part by this course:

- Students should develop a deeper comprehension of the central and cross-disciplinary concepts of human biology, which include bioenergetics, the interrelationship of human form and function, physiological homeostasis, and biomechanics.
- Students should develop proficiency in modern methodologies pertinent to research in biological and medical sciences.
- Students should be able to think critically, analyze, synthesize, and use information to solve real-world problems.
- Students should develop sufficient depth of knowledge and skill for graduate study in the health professions or other biology-related disciplines or entry-level employment in a wide variety of health-related fields.

V. Academic Accommodations:

Any student requesting academic accommodations based on a disability are required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (the instructor) as early in the semester as possible. DSP is located in Student Union (STU) 301 and is open 8:30 - 5:00 pm Monday – Friday. The phone number for DSP is (213) 740-0776.

VI. Academic Integrity:

Students who violate University standards of academic integrity are subject to disciplinary sanctions, including failure in the course and suspension from the University. Since dishonesty in any form harms the individual, other students and the University, academic integrity policies will be strictly enforced. I expect you will familiarize yourself with the Academic Integrity guidelines found in the current SCampus.

VII. Academic Integrity Violations:

- Academic dishonesty/misconduct (plagiarism, cheating, unauthorized collaboration, etc.) will not be tolerated. All academic integrity violations will result in a grade sanction and will be reported to the Office for Student Judicial Affairs. It is your responsibility to “reasonably” protect your own work from the plagiarism of others.
- If plagiarism is detected on a group project, all members of the group will be held responsible.
- You are expected to be familiar with the Academic Integrity guidelines found in the current SCampus (student guidebook). An electronic version is available at <http://usc.edu/scampus>.

VIII. Disruptive and Threatening Student Behavior:

Behavior that persistently or grossly interferes with classroom activities is considered disruptive behavior and may be subject to disciplinary action. Such behavior inhibits other students' ability to learn and an instructor's ability to teach. A student responsible for disruptive behavior may be required to leave class pending discussion and resolution of the problem and may be reported to the Office of Student Judicial Affairs for disciplinary action.

IX. Blackboard:

Notes will be periodically posted on blackboard. However, the information posted on blackboard is not the only material that will be on the exam. If you attend class regularly you will be updated on the status of lecture notes and course material/announcements.

X. Electronic Devices:

Please turn off or disable all cell phones or other electronic communication devices during class time. Using a laptop in class to take lecture notes is permitted. However, please turn off your browser, email, messaging and any other programs that do not involve the course material.