



HBIO 309 – The Human Machine

Units: 4

Class Period: Fall 2024 TTH 2:00 – 3:20 pm

Location: DMC 252

Instructor: Dr Chrisandra Kufeldt

Email: kufeldt@usc.edu

Please contact me through email. I will respond to your emails immediately during working hours. Do not expect a response during evening hours or weekends.

Office: AHF B10C

Office Hours: TBD

I understand that my office hours may not accommodate everyone. I am happy to meet with students at an alternative time or through zoom. Please contact me to schedule a preferred time.

Course Description

The purpose of this course is to learn about biomechanics – the forces acting on and generated within the human body. We will examine human anatomy and function in an evolutionary context to understand how the human body works and how it differs from other animals, specifically non-human primates. In this course we will cover basic human anatomy, bone and tooth development and structure, and the biomechanics of walking, running, climbing, biting, chewing, respiration, vocalization, walking, running, birth, and manual dexterity. We will explore the biomechanics of these structures using an active approach. No prior knowledge of anatomy is required. In addition to covering basic anatomy, biomechanics, and evolution, this course will review the methods used to understand human movement patterns.

Learning Objectives

This is a lecture-based, active-learning course for students with a background in anthropology and biology with a focus on evolution and anatomy. As a result of completing this course, students will be able to:

- 1) Describe the role of evolutionary processes in generating modern human anatomy.
- 2) Discuss the interaction between form and function in human anatomy.
- 3) Explain how our evolutionary history interacts with anatomy and physiology to

determine health outcomes.

- 4) Identify and describe the structure/function of tissues, organs, and organ systems of the human body.
- 5) Apply cross-disciplinary scientific principles to explain how humans operate, adapt, or evolve.
- 6) To apply scientific knowledge as well as analytical and experimental skills to produce integrative original work independently and collaboratively.
- 7) Analyze, synthesize, and critique primary articles, and use discipline-related criteria to identify which opinions can be accepted, rejected, or need further study.
- 8) To discuss the interplay and relative influence of biology and social context on dimensions of human diversity and health.

Course Notes

All course materials including syllabus, pdfs of lecture, assigned readings, grades, and assignment rubrics can be found on Blackboard. Additionally, course announcements, assignment and scheduling amendments can also be found here.

Required Readings and Supplementary Materials

No textbook encapsulates all the material covered in this course and instead multiple resources are used. Readings for each week will be posted as PDFs on Blackboard. Readings are due **on the day they are listed** in the week-by week scheduled outline below and need to be completed before class.

Sharing of Course Materials Outside of the Learning Environment is Strictly Prohibited

USC has a strict policy (SCampus Section 11.12[B]) that prohibits sharing of **any** synchronous and asynchronous course content outside of the learning environment. Any student who violates this policy will be prosecuted to the maximum extent allowable by the USC Student Conduct Code, including failure of the course and suspension from the University.

Distribution or use of notes or recordings based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study is a violation of the USC Student Conduct Code. This includes, but is not limited to, providing materials for distribution by services publishing class notes. This restriction on unauthorized use also applies to all information, which had been distributed to students or in any way had been displayed for use in relationship to the class, whether obtained in class, via email, on the Internet or via any other media. (See Section C.1 Class Notes Policy).

Grading and Assessment

Participation in this course is very important since most of your grade is based on exams and in-class assignments, therefore regular attendance is crucial to maintain a high grade. Grades are based on in-class activities (Climbing gym, Lower limb, Upper limb, Jigsaws, Think Piece) and three exams.

Every student must complete all assignments. This course requires reading, writing, and critical thinking.

Final grades will be determined on the following rubric:

1. In-class activities: 10%
2. Out-of-class activities: 40%
3. Exams (3): 50%

1. In-class activities (10%)

In-class activities will include weekly questions, short quizzes, polls and surveys, think-pair-share activities.

2. Out-of-class activities (40%)

To get the most out of the class, it is essential that students stay on top of the readings and other material. Because this course is discussion-based, class participation and regular attendance are key components of final grades. Students are expected to contribute to every class. Such contributions should 1) demonstrate familiarity with the reading material, 2) offer critical assessment of the reading material, and 3) display openness in beginning and maintaining conversations with other students. Tardiness and lack of participation will result in a loss of points.

4. Exams (50%)

Students will be given three in-class exams which will evaluate your knowledge on the lectures of human anatomy and biomechanics through each section. See the schedule and make travel plans accordingly.

Final grades will be determined by the following grading scale:

94 – 100%	= A
90.0 – 93.99%	= A-
87.6 – 89.99%	= B+
84 – 87.5%	= B
80 – 83.99%	= B-
77.6 – 79.99%	= C+
74 – 77.5%	= C

70 – 73.99%	= C-
60 – 69.99%	= D
59% and below	= F

Course Specific Policies

This is an active-learning course, and most of the course will be discussion-based. Students are expected to contribute to the discussion in every class and should be familiar with the assigned readings. Like all research, some aspects of this course will be collaborative. The goal of team-based activities is to provide students with an opportunity for clarifying their own thoughts on course material, for synthesizing multiple opinions, and for accessing more information than can be accomplished alone. The instructor will determine small groups by assignment in the second week of the course.

A few ground rules are expected to promote full participation.

- Students will silence all cell phones/tablets/laptops during class. These items are only permitted for the taking of notes and accessing course material via the course website; any other use may result in a loss of this privilege.
- To promote a respectful, professional, and productive classroom environment, the following expectations will be maintained during all class sessions.
 - Do not interrupt when someone else is speaking.
 - You can criticize ideas, but not each other.
 - Avoid inflammatory language.
 - Support assertions with evidence from lectures or readings or speak from personal experience.
 - Do not dominate the discussion.
 - Make a single point each time you speak, rather than making a series.

Attendance

Students are permitted only excused absences from this class (see institutional guidelines). Unexcused absences receive no attendance points for the day. I understand that life gets in the way, so you are allowed two unexcused absences and if you miss an in-class assignment, there will be an alternative assignment for you to complete.

Academic Integrity

The University of Southern California is foremost a learning community committed to fostering successful scholars and researchers dedicated to the pursuit of knowledge and the transmission of ideas. Academic misconduct is in contrast to the university's mission to educate students through a broad array of first-rank academic, professional, and extracurricular programs and includes any act of dishonesty in the submission of academic work (either in draft or final form).

This course will follow the expectations for academic integrity as stated in the [USC Student Handbook](#). All students are expected to submit assignments that are original work and prepared specifically for the course/section in this academic term. You may not submit work written by others or “recycle” work prepared for other courses without obtaining written permission from the instructor(s). Students suspected of engaging in academic misconduct will be reported to the Office of Academic Integrity.

Other violations of academic misconduct include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see the [student handbook](#) or the [Office of Academic Integrity’s website](#), and university policies on [Research and Scholarship Misconduct](#).

Course Policy on AI

Since creating, analytical, and critical thinking skills are part of the learning outcomes of this course, all assignments should be prepared by the student working individually or in groups. Students may not have another person or entity complete any substantive portion of the assignment. Developing strong competencies in these areas will prepare you for a competitive workplace. Therefore, using AI-generated tools is prohibited in this course, will be identified as plagiarism, and will be reported to the Office of Academic Integrity.

Course Schedule

<u>Week 1</u>		
<i>Human Evolution</i>		
Tuesday	August 27	Introduction
Thursday	August 29	Functional Anatomy and Adaptation
		Readings: Overview of evolutionary concepts – Lewin, R., Foley, R., 2004. <i>The Principles of Evolutionary Theory</i>
<u>Week 2</u>		
Tuesday	September 3	Human Evolution
Thursday	September 5	Bones and Muscles: Development and Function
		Readings: Lieberman, D., 2013. <i>The Story of the Human Body</i> .
<u>Week 3</u>		
Tuesday	September 10	Biomechanics
Thursday	September 12	Activity: Climbing gym
		Readings: Aiello, L., Dean, M.C., 1990. Human Evolutionary Anatomy; Stern, J.T., 2000. <i>Climbing to the top: a personal memoir of Australopithecus afarensis</i> , <i>Evolutionary Anthropology</i> 9, 113-133.
<u>Week 4</u>		
<i>Upper Limb</i>		
Tuesday	September 17	Shoulder and Arm
Thursday	September 19	Activity: Archery
		Readings: Roach, N.T., Richmond, B.G., 2015. Clavicle length, throwing performance, and the reconstruction of the <i>Homo erectus</i> shoulder. <i>Journal of Human Evolution</i> 80, 107-113.
<u>Week 5</u>		
Tuesday	September 24	Hand: Structure and Function
Thursday	September 26	Evolution of the hand

		Readings: Kivell, T.L., et al., 2023. Form, function, and the evolution of the human hand. <i>Yearbook of Biological Anthropology</i> 181(76), 6 – 57.
<u>Week 6</u>		
Tuesday	October 1	Evolution of the hand cont.
Thursday	October 3	Exam I
<u>Week 7</u>		
<i>Lower Limb</i>		
Tuesday	October 8	Anatomy and Biomechanics of Bipedalism
Thursday	October 10	Fall Recess
		Readings: Bramble, D.M., Lieberman, D.L., 2004. Endurance running and the evolution of <i>Homo</i> . <i>Nature</i> 432, 345-348.
<u>Week 8</u>		
Tuesday	October 15	Anatomy and Biomechanics of Bipedalism cont.
Thursday	October 17	Activity: Treadmills
<u>Week 9</u>		
Tuesday	October 22	Foot and running
Thursday	October 24	Activity: Footprints
		Readings: McNutt, E.J., Zipfel, B., DeSilva, J.M., 2018. The evolution of the human foot. <i>Evolutionary Anthropology</i> 27, 197 – 217.
<u>Week 10</u>		
Tuesday	October 29	Body size
Thursday	October 31	Exam II
<u>Week 11</u>		

		<i>Sensory System and Head Biomechanics</i>
Tuesday	November 5	Spine and Thorax
Thursday	November 7	Circulation
<u>Week 12</u>		
Tuesday	November 12	Thermoregulation
Thursday	November 14	Digestion
		Readings: Aiello, L.C., Wheeler, P. The expensive tissue hypothesis. <i>Current Anthropology</i> 36, 199 – 213.
<u>Week 13</u>		
Tuesday	November 19	Reproduction and Life History
Thursday	November 21	The pelvis, bipedalism, and birth
		Readings: Tague, R.G., Lovejoy, C.O., 1986. The obstetric pelvis of A.L. 288-1 (Lucy). <i>Journal Human Evolution</i> 15, 237 – 255
<u>Week 14</u>		
Tuesday	November 26	The pelvis, bipedalism, and birth cont.
Thursday	November 28	Thanksgiving break
<u>Week 15</u>		
Tuesday	December 3	Eyes and vision, Ears, hearing, and balance
Thursday	December 5	Brain structure and function
		Readings: Kobayashi, H., Koshima, S., 2001. Unique morphology of the human eye and its adaptive meaning: comparative studies on external morphology of the primate eye. <i>Journal of Human Evolution</i> 40, 419 – 435.
<u>Week 16</u>		
TBA		Exam III

Statement on Academic Conduct and Support Systems

Students and Disability Accommodations:

USC welcomes students with disabilities into all of the University's educational programs. [The Office of Student Accessibility Services \(OSAS\)](#) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support Systems:

[*Counseling and Mental Health*](#) - (213) 740-9355 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

[*988 Suicide and Crisis Lifeline*](#) - 988 for both calls and text messages – 24/7 on call

The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

[*Relationship and Sexual Violence Prevention Services \(RSVP\)*](#) - (213) 740-9355(WELL) – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

[*Office for Equity, Equal Opportunity, and Title IX \(EEO-TIX\)*](#) - (213) 740-5086

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

[*Reporting Incidents of Bias or Harassment*](#) - (213) 740-5086 or (213) 821-8298

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

[The Office of Student Accessibility Services \(OSAS\)](#) - (213) 740-0776

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

[USC Campus Support and Intervention](#) - (213) 740-0411

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

[Diversity, Equity and Inclusion](#) - (213) 740-2101

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

[USC Emergency](#) - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

[USC Department of Public Safety](#) - UPC: (213) 740-6000, HSC: (323) 442-1200 – 24/7 on call

Non-emergency assistance or information.

[Office of the Ombuds](#) - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

[Occupational Therapy Faculty Practice](#) - (323) 442-2850 or otfp@med.usc.edu

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.