

University of Southern California

GERO510 Syllabus
Physiology of Development and Aging
Spring 2023
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Class meeting time: GER115 Tuesday 9:00-11:50AM

Office Hours: by appointment.

Class Description: Aging is the inevitable breakdown of health and fitness that impacts almost all living organisms. This course covers several aspects of biological aging at the theoretical, molecular, cellular, and whole-body level. There will be discussions on cutting-edge research and the latest discoveries focusing both on fundamental biology research in aging and clinical research in age-associated diseases.

Course Objectives: The primary aim of this class is to provide a background of aging biology at the molecular, cellular, and whole-body level so that students are able to provide informed opinions in biological gerontology relevant to fundamental biology research, health care, and policy.

Learning Strategies

The learning objectives will be accomplished by means of several strategies, including-but not limited to- the following:

- attending seminar lectures
- participating in meet the speaker Q&A discussions
- participating in sessions on literature review of invited speaker
- preparing and delivering a research presentation
- preparing and delivering a research proposal

Colloquium Schedule:

Date	Class Topic	Material
01/10/2023	Orientation Lecture 1: Introduction to Gerontology.	-Cover class structure and syllabus. -Overview of the study of aging. -Significance of gerontology. -Demography of aging. -Models for biological aging.
01/17/2023	Lecture 2: The Biology of Aging – Molecules and Cells	-Overview of cell biology. -Overview of genetics. -Biological hallmarks of aging.
01/24/2023	Lecture 3: Nutrition, Metabolism, and Aging	-Nutrient Signaling Pathways and Aging - Mitochondria and Aging - Vitamins and Minerals - Guidelines for Healthy Eating - Current Research on Nutrition in the Elderly

01/31/2023	Lecture 4: The Digestive System	<ul style="list-style-type: none"> - Oral Region - Components, Functions, and Age Changes - The Esophagus: Common Issues in the Elderly - The Stomach and Small Intestine: Motility and Absorption Problems in the Elderly - The Colon: Functional and Anatomic Problems in the Elderly - The Microbiome and Aging
02/7/2023	Lecture 5: The Endocrine System	<ul style="list-style-type: none"> - The Endocrine Glands in Youth and Aging - Diabetes and the Metabolic Syndrome - Hormones and Healthy Lifespan - Endocrine Aging
02/14/2023	Lecture 6: The Immune System	<ul style="list-style-type: none"> - Basic Components of the Immune System - Age Related Changes in the Immune System - Self-Recognition in the Immune System (Autoimmunity) - Infectious Diseases in the Elderly (Shingles, Pneumonia, Candida, etc) - The Role of Immunity in Aging
02/21/2023 Exam 1 dispersed	Lecture 7: The Skeletomuscular System	<ul style="list-style-type: none"> - Anatomy of Bone - Physiology of Bone Growth and Renewal - Anatomy of Muscles - Physiology of Contraction and Movement
02/28/2023	Lecture 8: The Urinary and Reproductive System	<ul style="list-style-type: none"> - Anatomy and Physiology of the Urinary Tracts and Changes with Age - Incontinence in Males and Females - Other Age-Related Changes in the Urinary System - Anatomy and Physiology of the Reproductive Systems and Changes with Age - Diseases of the Reproductive System
03/07/2023 Exam 1 due	Lecture 9: The Nervous System	<ul style="list-style-type: none"> - Basic Anatomy of the Nervous System - The Synapse: Target of Drug Therapy and of Drug Abuse - How Neurons Communicate - Normal Age-Related Changes in

		the Central and Peripheral Nervous Systems - Dementias, Alzheimer's Disease, and Parkinson's Disease
03/14/2023	Lecture 10: The Respiratory System	- Anatomy and Physiology of the Respiratory System - Age-Related Changes in Function - Age-Related Disorders of the Respiratory System - Respiratory Infection in the Elderly
03/21/2023	Spring Break – No Class	
03/28/2023	Lecture 11: The Sensory System	- The Visual System and the Effects of Age - The Auditory System and the Effects of Age - The Olfactory System and the Effects of Age - Touch and Balance and the skin - Main Functions for Homeostasis
04/04/2023 Custom topic for term paper must be approved by today.	Lecture 12: Cancer Biology	-Review central dogma of biology. -Review of mutations. -Review of cell division. -Biological causes of cancer. -Physiological consequences of cancer. -Therapeutic interventions for cancer.
04/11/2023	Lecture 13: The Cardiovascular System	- Anatomy and Physiology of the Cardiovascular System - Atherosclerosis - Stroke - Other Common Cardiovascular Diseases Related to Age
04/18/2023 Exam 2 dispersed	Student Presentations	-All remaining student presentations that are incomplete.
04/25/2023 Term papers due!	Student Presentations	-All remaining student presentations that are incomplete.
05/02/2023 Exam 2 due!	Final Exam Due: No class.	

Grading:

Note that all due date cut offs are at 5:00 PM pacific time, NOT MIDNIGHT.

Attendance (Extra 5%): Attendance to class is not mandatory, but attendance and participation in class will be considered extra credit. For those who attend all classes and participate during class discussions, this will boost your final grade. For those attending class asynchronously, you can obtain extra credit by submitting discussion posts on blackboard – 2-3 sentence write-ups about what you've learned in each lecture will suffice.

Your grades will be determined based on your performance for the following class

materials: A weighted average of all your classroom materials will be calculated based on how well you do in each assignment at 10%, 20%, 30%, and 40% of your final grade. For example, if you score the highest on exam 1, it will count as 40% of your final grade and if you score the lowest on your term paper, it will count as 10% of your grade, etc.

Term paper:

Each student will write a term paper on one of the following topics:

1. Pick an “anti-aging” drug, such as metformin, hyaluronic acid, rapamycin, etc. or an intervention, such as calorie restriction, fasting, etc. Scientifically validate or antagonize usage of this drug/intervention. You must refer to at least one physiological system we have covered in class.
2. Discuss an age-associated disease that is caused by one (or more) of the biological hallmarks of aging and describe a potential therapeutic intervention.
3. Pick one of the whole-body systems we learned in class (e.g., respiratory, reproductive, etc.) and discuss a disease associated with the breakdown of this system and a potential therapeutic intervention.
4. Submit a request for a personal topic. All personal topics must be approved by 4/4/2023.

The term paper should include sufficient background and introduction on the topic, what is currently known in the field, and provide justification for why it is an important topic. For those suggesting a therapeutic intervention, you must discuss a feasible therapeutic intervention and describe how you might design an experiment to test this intervention. The term paper cannot exceed 2 pages, arial, 11-point font, single-spaced, 0.5-inch margins. There is no penalization for using less than 2 pages as long as the required materials are all present, but any submission exceeding the allotted space or using smaller fonts or margins will get an immediate failure with no chance for a revision. All documents must be submitted as a Microsoft Word document or equivalent. References can be put on a separate page and do not have any space limitations. Students will be graded on innovation, feasibility, and clarity. While grammar will generally not be a focus of grades, major errors in grammar/punctuation that make the material incomprehensible will affect the grade. Absolutely no late work will be accepted under any circumstances, but students can submit their term paper earlier than the due date. All term papers are due by 4/25/2023 at 5:00 PM pacific time.

Presentations:

Each student will do a short, 5-minute presentation on their term paper topic. Students are free to present in any style of their choosing, but should generally provide background, rationale/justification, potential experiments, and expected results. Presentations will be timed. While there is no minimum requirement for time, there will be a hard stop at 5 minutes, followed by Q&A. The students will be graded on slide quality, presentation quality, clarity, and ability to field questions. Students attending classes asynchronously can provide a zoom or camera-recording of their presentation. For those with a justifiable excuse for not being able to prepare a presentation, students can submit a second term paper in lieu of a presentation. Students are allowed to work in groups of up to 2 people for presentations, but keep in mind that separate and unique term papers must be submitted by each student. Joint presentations can be the topic of either term paper or a combination of both topics. Presentations can be done on any day when there is class and will be done daily after lecture. Please discuss with the instructor to decide a date for your presentation. All presentations not completed by the last lecture will be

done on 04/1/2023 or 04/25/2023. If you volunteer to do your presentation before 4/1/2023, you will gain 1 point of extra credit for every week it is early.

Exams:

There are two take-home exams that will be dispersed on 02/21/2023 and 04/18/2023. You will have two weeks to complete each exam. Each exam will contain at least 7 questions and you are required to choose 4 questions to answer. Your exam must be submitted as a Microsoft Word document or equivalent and must be written in 1 page arial, 11-point font, single-spaced, 0.5-inch margins. There is no penalization for using less than 1 page as long as the required materials are all present, but any submission exceeding the allotted space or using smaller fonts or margins will get an immediate failure with no chance for a revision. Absolutely no late work will be accepted under any circumstances. Exams are due at 5:00 PM pacific time 2 weeks after they are dispersed (3/7/2023 and 05/02/2023).

Prerequisites:

The only pre-requisite for this course is scientific curiosity. Students are not expected to know anything specific about molecular biology or genetics. This class is not meant to teach advanced molecular biology or genetics (such classes are already in existence). The emphasis in this course is on practical implementation of scientific concepts into the biology of aging.

Statement for Students with Disabilities:

Any student requesting academic accommodations based on a disability is 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 as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.-5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

Statement on Academic Integrity:

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. Scampus, the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A:

<http://www.usc.edu/dept/publications/SCAMPUS/gov/>. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: <http://www.usc.edu/student-affairs/SJACS/>.

Policy against Cheating:

We follow a zero-tolerance policy: any student engaging in cheating will fail the course and will be reported to the USC Student Judicial Affairs and Community Standards. All USC students are responsible for reading and following the Student Conduct Code.

<https://sjacs.usc.edu/students/academic-integrity/>

This policy does not apply to discussion or exchange of ideas. On the contrary, such interactions represent an important way to thoroughly understanding complex questions in molecular genetics. Students must write their own papers. All written assignments will be turned in through blackboard and analyzed for plagiarism.

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Resources:

Web page: A class website will be setup on Blackboard containing information about the course: syllabus, laboratory handouts, grades, miscellaneous information about weekly class activities, and an email directory of all people in the class. Use it as much as you find it useful. The web page can be accessed through the main stem <https://Blackboard.usc.edu>.