Evolutionary Environmental Physiology (IB 150, 3 units)

Department of Integrative Biology, University of California, Berkeley

Course Information

Course format	Two lectures (1.5h/lecture, 9:30 – 11am Tue/Thu, 120 Wheeler) and one hour of discussion per week (11am-12noon, 182 Dwinelle or noon-1pm, 108 Wheeler).
Instructor	TBD
GSI	TBD
Prerequisites	Bio1A and Bio1B or equivalent
Course overview	Why do animals function the way they function? The natural world is a treasure-trove of biological diversity, the vast majority of which has arisen through adaptation to novel environments. Fluctuations in oxygen, temperature, water availability and salinity challenge physiological systems and have driven remarkable evolutionary innovations. In this course, we will embark on a quest to discover how physiological traits arise and are modified during adaptation to the environment. This course consists of three parts: 1) big questions in evolutionary physiology and how they are addressed; 2) physiological evolution in specific environments; and 3) student symposium. This course will have relevance to human biology, but will not specifically focus on human health sciences.
Learning objectives	This course aims to foster both content-specific knowledge and scientific enquiry and reasoning skills. As a result, this course will stimulate interest in the field of evolutionary physiology, and will also provide a solid preparation for the new (2015) MCAT examination. The specific learning objectives are listed below. **Content-Specific Skills**: Develop the ability to answer the following questions, and illustrate with examples: · What is evolutionary physiology, what unique perspectives does it bring to the study of evolution, and what tools does it employ? · How is genetic variation transformed into phenotypes, via biochemical and physiological processes; and how do those phenotypes influence fitness and thus genotype frequencies in the next generation? · How does natural selection drive physiological evolution, and

how are these processes modulated by phenotypic plasticity, resource trade-offs, or physiological constraints?

· How have organisms responded to some of the primary environmental selective pressures? Are evolutionary responses to these selective pressures predictable? What are the mechanisms and consequences of these responses?

Scientific Enquiry and Reasoning Skills:

· Integrate and synthesize material from a variety of sources

· Analyze evidence, form inferences, evaluate strength of inferences

· Graphical analysis and interpretation

· Interpret common inferential statistics used in this field

· Communicating science (written and oral)

Methods of instruction

Lecture, discussion, team work, student research symposium, independent study.

Assessment

	% of Final Grade	Due date
Midterm I	10	2/6/18
News and Views article	10	3/2/18
Group article proposal	5 (team*)	3/16
Midterm II	20	3/22/18
Research symposium on physiological adaptation	25 (team*)	Weeks 12-14
Class participation	5	N/A
Final exam	25	May 9th 11:30am-2:30pm Wheeler 120

*Team final grade will be adjusted to reflect contributions to team

Textbook

Hill RW, Wyse GA, Anderson M (2014) Animal Physiology, Fourth

	edition. Sinauer Associates, Sunderland, MA, USA. Loose leaf edition acceptable.
Grading	If you are focused on obtaining a particular grade, planning ahead is key. Feel free to talk to me about the best strategies for obtaining the grade you need. Grade-focused conversations are welcome when they are proactive (still enough time in the course to impact the grade), realistic (the math adds up), and framed around concrete goals for the course.
Letters of Reference	If you want a letter of reference for medical school or graduate school, you will need to interact with me outside the classroom for me to get to know you sufficiently well to write a strong letter. Office hours are a great way to do this. If a request for a letter comes from someone who has not attended office hours, I will likely decline due to lack of first-hand information.
UC Berkeley Honor Code	As a member of the UC Berkeley community, I act with honesty, integrity, and respect for others.
Academic integrity	This class is a collaborative environment where we will work together on exciting challenges. Grading is not curved; you can all get excellent grades by working together and helping each other, thus fostering a vibrant learning community. Academic integrity is a fundamental component of achieving this goal. All students are expected to complete their work honestly. I will not tolerate acts of cheating, plagiarism, falsification, or attempting or assisting with an academic integrity violation. If I become aware of a potential academic integrity violation, I will meet with you following the procedures outlined in the Academic Integrity policy (http://sa.berkeley.edu/conduct/integrity). Should I determine that an academic integrity violation has taken place, I reserve the right to assign a grade penalty up to and including an F for the course. Students are expected to report possible academic integrity violations to me. As a tool to promote academic integrity in this course, written work submitted via bCourses may be checked for originality using Turnitin. Turnitin compares student work to a database of books, journal articles, websites, and other student papers. This creates an opportunity for students to improve their academic writing skills, by ensuring that other sources have been properly cited and attributed.
Accommodations for students with disabilities	Please see me as soon as possible if you need particular accommodations, and we will work out the details.

Tentative Course Schedule

		Principles of Evolutionary Physiology
1/16/18	Week 1	Lecture 1 – Intro. to Evolutionary Environmental Physiology
1/18/18		Lecture 2 – Environment, stress and plasticity
1/19/18		Discussion 1
1/23/18	Week 2	Lecture 3 – Physiological adaptation
1/25/18		Lecture 4 – Molecular evolution
1/26/18		Discussion 2
1/30/18	Week 3	Lecture 5 – Energy metabolism – genes to performance
2/1/18		Lecture 6 – Trade-offs and constraints
2/2/18		Discussion 3
2/6/18	Week 4	***Midterm I***
		Oxygen and carbon dioxide
2/8/18		Lecture 7 – Altitude I
2/9/18		Discussion 4
2/13/18	Week 5	Lecture 8 – Hypoxia
2/15/18		Lecture 9 – Ocean acidification
2/16/18		Discussion 5
2/19/18	Week 6	Lecture 10 – Terrestrial water balance
		Water and solutes
2/22/18		Lecture 11 – Aquatic osmoregulation

2/23/18		Discussion 6
		Temperature
2/27/18	Week 7	Lecture 12 – Ectotherm thermal performance curves
3/1/18		Lecture 13 – Behavioral thermoregulation
3/2/18		Discussion 7 - Peer-review of News and Views article
3/6/18	Week 8	Lecture 14 – Evolution of endothermy
3/8/18		Lecture 15 – Dormancy
3/9/18		Discussion 8
3/13/18	Week 9	Lecture 16 – Jose Pablo Vazquez-Medina: Evolution of diving response
		Seasonality
3/15/18		Lecture 17 – Migration
3/16/18		Discussion 9
3/20/18	Week 10	Lecture 18 – Midterm review session
3/22/18		***Midterm II***
3/23/18		Symposium prep
3/26-30		*Spring break*
		Physiological adaptation in the Anthropocene
4/3/18	Week 11	Lecture 19 – Guest lecture - Jonathon Stillman, Deep Sea
4/5/18		Lecture 20 – Guest lecture - Kevin Roberts, adaptation to climate change

4/6/18		Symposium prep
		student Symposia
4/10/18	Week 12	Symposium 1 (Teams 1 & 2)
4/12/18		Symposium 2 (Teams 3 & 4)
4/13/18		Discussion 10
4/17/18	Week 13	Symposium 3 (Teams 5 & 6)
4/19/18		No class
4/20/18		Discussion 11
4/24/18	Week 14	Symposium 4 (Teams 7 & 8)
4/26/18		Final lecture
4/27/18		Exam review session