

Evolutionary Biology PCB 4683

Spring 2023

BY ENROLLING IN THIS CLASS YOU AGREE TO EVERY ITEM IN THIS SYLLABUS.

PCB 4683 Evolutionary Biology, Spring Semester 2023 (4 credits)

Understanding evolutionary biology is critical for biologists and important for all biological organisms, including humans. To quote two notable evolutionary theorists, "Nothing in biology makes sense except in the light of evolution" (*Theodosius Dobzhansky, 1973*) and "Man is descended from a hairy, tailed quadruped, probably arboreal in its habits" (*Charles Darwin, 1871*). In this class we take an analytical approach to explore the pattern and process of evolution in all life forms, from HIV to single celled organisms to *Homo sapiens*. Evolutionary genetics will be considered as the foundation underlying all aspects of evolutionary biology, and concepts in speciation, adaptation, classification, population genetics, and macroevolution will be covered in depth. The importance of evolutionary concepts to all facets of biology will be emphasized, particularly the interplay between evolution and ecology, genetics, development, and medicine.

Course Objectives

- To understand evolutionary patterns and how evolutionary relationships are estimated.
- To become a skilled reader and critic of scientific literature.
- To understand the principles of population genetics, including selection, genetic drift, mutation, linkage, and gene flow.
- To understand the mechanisms of speciation and diversification.
- To understand the relevance of evolutionary biology to human society, particularly human health.

Prerequisites:

A grade of C or better in undergraduate genetics or consent of the instructor. A good understanding of basic genetics and ecology are vitally important to success in this class.

Class Meetings:

Lecture: 11:30 AM – 1:20 PM

Location: HS1 O119

Lecture Instructor:

Dr. Anna E. Savage

Office: BIO 424, phone: 407-823-4504

E-mail: Anna.Savage@ucf.edu

Office Hours: Tues 3:00 –5:00 pm in my office (BIO 424), Weds 11:00 am –1:00 pm in Zoom.

I will do my best to be available during those times, but things occasionally come up requiring me to be away – I will let you know if/when there are any changes to office hours.

In the past I've found different students prefer different styles of office hours – some like to drop by without planning, and sometimes group reviews can work well, but for others a more private meeting is better, or one that can happen over zoom on days you might not be on campus. For these reasons, I offer different options on different days:

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Office hours on Tuesdays are in person in my office, first come first served (groups are also welcome to join simultaneously to go over exam prep, for example).

Office hours on Wednesdays are by sign-up appointments over zoom so that we have privacy to discuss anything you like and you can join from anywhere. If you wish to attend, please sign up for a 10 minute slot using this google doc (if no one is signed up after you, we can use as much time as is open):

<https://docs.google.com/spreadsheets/d/1eA80Id5kmse3UhtKwIKCZaZfJ6SdAJ89O8c3dXZooJg/edit?usp=sharing>

Wednesday office hours will be held over Zoom. Use the office hours link under the Zoom tab in webcourses to attend office hours. You will be placed in the waiting room until it is your turn. If you cannot make scheduled office hours, please email me for alternate times and I will do my best to accommodate you.

Lab course:

PCB 4683L, 1 credit.

The Evolutionary Biology lab is a separate 1 credit course and is not required. However, the laboratory content is coordinated with the lecture course, and concepts from lecture are reinforced with laboratory activities. When possible, you are encouraged to enroll in the lab during the same semester you take the lecture.

Mondays

Section 0011: Monday 8:30 – 10:20 am

Section 0012: Monday 10:30 am – 12:20 pm

Section 0013: Monday 3:30 – 5:20 pm

Graduate Teaching Assistant: Veronica Urgiles

Vero teaches one of the lab sections and also assists with lecture. You will see her occasionally in class and she also holds weekly office hours and exam review sessions.

E-mail: vurgiles@Knights.ucf.edu

Vero's office hours: Monday 9:00 am – 10:30 am, Tuesday: 2:00pm–3:30pm

<https://ucf.zoom.us/j/95675350305>

Undergraduate Teaching Assistant: David Gomez-Fandino

We are lucky to have an undergraduate TA this semester! David took the course in person last spring and is familiar with all details of this course. You will see David occasionally in class and he will also provide weekly office hours and exam review sessions.

E-mail: david5354355911@Knights.ucf.edu

David's office hours: Wednesday 2:00 – 4:00 pm

<https://ucf.zoom.us/j/94426331839?pwd=aVZCWCTJUKw5Q0kyUExvbUNUZ0FvZz09>

Webcourses Site:

I have a course web site set up on Webcourses (<https://webcourses.ucf.edu>) that I will use to post all materials for the course, including the syllabus, calendar dates, PowerPoints, quizzes, exams, and your grades. All quizzes and exams will be available through webcourses and will be open book and open

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notes. Feel free to contact me via webcourses or email me directly. Make sure to set your webcourses so that you get notified of new announcements for our class; if you don't do this, you can miss important time-sensitive information.

Required Text:

Herron, J. C., and S. Freeman. 2014. *Evolutionary Analysis*, 5th edition. Pearson Education, Boston, USA. ISBN 0-321-61667-7
Companion Website: www.pearsonhighered.com/herron

Online materials affiliated with this textbook, including quizzes, activities, and answers to the questions at the end of each chapter are now available for free at this site:

http://wps.pearsoned.com/bc_freeman_evol_5/239/61342/15703574.cw/index.html

Textbook First Day Inclusive Access Program:

This course is part of an inclusive access model called First Day™. You can easily access the required materials for this course at a discounted price, and benefit from single sign-on access with no codes required in UCF Webcourses.

UCF Student Accounts will bill you at the discounted price as a course charge for this course.

It is recommended that you Opt-In as these materials are required to complete the course. You can choose to Opt-In on the first day of class, right within Canvas. Be sure to Opt-In before the Add/Drop deadline to have access to your course materials at the discounted price.

Attention: VA/VR/DBS and Dual Enrollment students, DO NOT Opt-In. You will need to contact the bookstore for your course materials.

By placing your digital course materials on Webcourses@UCF, the UCF Campus Store and the publisher of your textbooks have discounted your course materials to bring you the **lowest price available**. To take advantage of this **discounted rate**, you will need to **Opt-In** to have the cost of these materials billed to your UCF Student Account under a fee called "Digital Course Materials". This means you can access the course materials today, and will not have to pay for them until the UCF fee payment deadline on your UCF Student Account. The Opt-In deadline is this Friday of the first week of class at 11:59pm.

Class Policies:

1. Lectures will take place **in person**, there is no longer any remote/zoom option for traditional courses. Attendance is not strictly required, but many studies have shown that students who do not attend class do poorly. There will also be occasional in-class discussions that you will not get points for if you do not attend.
2. Assignment make ups will always be considered (please ask!) but are not guaranteed unless you have documentation presented prior to the absence or within 24 hours of the assignment due date. *Please do not hesitate to ask me for extra time or other accommodations, I will always try to work with you if you have something going on that impacts your attendance/performance in this course.*
3. Assigned readings should be completed before attending class. Quizzes will assess your reading knowledge **based on the textbook specifically**, whereas exams cover any concepts we discussed during lecture.

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4. You are encouraged to discuss any and all portions of the class with me. Please feel free to come to office hours or make an appointment to discuss the class, especially if you are having trouble in the class.
5. Respect should be given to fellow students and the instructor. Please try not to arrive late to class, walk out in the middle of class, or leave early unless you've discussed this with me in advance. I offer a 5-10 minute break after the first hour of class for restroom needs, etc.
6. Hateful or offensive speech or writing will not be tolerated.
7. I encourage you to bring a laptop or tablet to class if you like to take notes on my posted powerpoint slides. Please make sure phones and other electronic devices are on mute/silent or vibrate so that you do not disrupt class.
8. Academic dishonesty (cheating and plagiarism) is strictly prohibited and will be taken very seriously and will result at least in an "F" for that assignment (and may, depending on the severity of the case, lead to an "F" for the entire course) and may be subject to appropriate referral to the Office of Student Conduct for further action. See the UCF Golden Rule for further information. All quizzes and exams are open book and open note, but you are not permitted to communicate with any other people during exams and quizzes.

Course Accessibility:

It is my goal that this class be an accessible and welcoming experience for all students, including those with disabilities that may impact learning in this class. If anyone believes the design of this course poses barriers to effectively participating and/or demonstrating learning in this course, please meet with me to discuss reasonable options or adjustments. You may also contact SAS (Ferrell Commons 185; 407-823-2371; sds@ucf.edu) to talk about academic accommodations.

Respect for Diversity:

It is my intent that students from all diverse backgrounds and perspectives be well-served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful of diversity: gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally or for other students or student groups. Specifically:

- If you have a name and/or set of pronouns that differ from those that appear in your UCF records, please let me know.
- If any of our class meetings conflict with your religious events, please let me know so that we can make arrangements for you.
- If you feel like your performance in the class is being impacted by your experiences outside of class, please don't hesitate to come and talk with me. I want to be a resource for you. If you prefer to speak with someone outside of the course, you can contact UCF's Office of Diversity and Inclusion (diverse@ucf.edu or 407-823-6479) or the Biology Department Undergraduate Coordinator Dr. Josh King (Joshua.King@ucf.edu).
- I (like many people) am still in the process of learning about diverse perspectives and identities. If something was said in class (by me or anyone else) that made you feel uncomfortable, please talk to me about it (or contact the resources listed above if you feel more comfortable).

Despite aiming to be objective, science has been historically built on and biased by a small subset of privileged voices. Many of the readings for this course, including the textbook, were authored by white men. Furthermore, the course often focuses on historically important evolution experiments which were

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mostly conducted by white men. I strive to include more diverse perspectives and studies in my lectures and in the reading assignments outside of the textbook. However, I acknowledge that there may be both overt and covert biases in the material due to the lens with which it was written, even though the material is primarily of a scientific nature. Integrating a diverse set of experiences is important for a more comprehensive understanding of science. Please contact me if you have any suggestions to improve the quality of the course materials.

Grading:

Grades will be assigned according to the following scale:

	92-100 = A	90-91 = A-
87-89 = B+	82-86 = B	80-81 = B-
77-79 = C+	72-76 = C	70-71 = C-
	60-69 = D	
	≤ 59 = F	

The grade for this course will be based on four aspects:

1. Exams:	72%
2. Online quizzes:	16%
3. Paper discussion assignments:	9%
4. Pre- and post-test:	<u>3%</u>
Total:	100%

(1) Four **exams** will be given on the dates indicated on the schedule, administered online through Webcourses (**NO IN PERSON EXAMS**). Exams will primarily consist of multiple choice questions, covering concepts from lecture, examples from lecture, new scenarios you will need to interpret, population genetic math problems, and other quantitative problems. I will sometimes include 1-2 short answer questions that you will type directly into a text box. The first three exams will take place during the semester and will not be cumulative, covering only those chapters assigned since the previous exam. The fourth exam will take place during the final exam period and will be 50% new material and 50% cumulative. All exams will be delivered in webcourses, will take place during regular class time or final exam time during the semester, and will be **open book and open notes**. However, *communicating with any other people during the exam is strictly prohibited and is grounds for failing the exam and/or class*. **The lowest of your four exam grades will be dropped**. This means that if you are satisfied with your three semester exam grades, you will not be required to take the final exam. (24% each; 72% total)

(2) Textbook reading assignment **quizzes** will be administered online through Webcourses every 1-2 weeks. Quizzes will always be due on Fridays (by 11:59pm) and will be available by the previous Wednesday if not earlier. You will be expected to read each assigned chapter (or in some cases, chapter sections) and take a short quiz to assess your knowledge of the chapter material. This will reinforce or prepare you for material covered in lecture, depending on whether you choose to complete the quiz before or after lecture based on your personal preference. You will have 15 minutes to complete each quiz, sometimes longer. You may take each quiz twice and the *most recent* of the two scores will be your grade for that quiz. **The lowest quiz grade for each student will be dropped**. All quizzes are due by **11:59 pm** on their due dates. (2% each; 16% total)

(3) Four **paper discussion assignments** will take place during class throughout the semester. Dates will be announced in advance, but are subject to change, so pay attention to Webcourses Announcements. Discussions will take place during the last ~30 minutes of class on the assigned dates. Your assignment

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will be to read a recent scientific paper (provided at least a week in advance) covering a topic relevant to class, then answer a series of 3-4 questions provided to you about key features of the paper. During the in-class discussion I will go over the key points of the paper and answer questions, and **one question on each exam will be about the paper we discuss**, so you are responsible for understanding the main points. The discussion will take place during class, and I encourage you to write your answers during the class period. However, the actual assignment will be submitted on Webcourses into a text box, and will be due by 11:59PM the day of the discussion. Full points are given for legitimate attempts at answering each question, regardless of whether your provided answers are correct. **The lowest discussion assignment will be dropped.** (3% each; 9% total)

(4) **Pre- and post-tests** will assess your general knowledge of evolutionary biology and will be administered online through Webcourses during the first and last weeks of class, respectively. You will earn 100% on the pre-test and post-test for completing the online questions, regardless of your score. (1.5% each; 3% total)

Schedule:

The following schedule is approximate and dates may be changed at any time. Please check webcourses Announcements frequently and look at the webcourses homepage for updates to the schedule as we move through the semester.

Date	Topic	Assignments
10 January T	Class intro ~ Why study evolution? ~ Begin A Case for Evolutionary Thinking	Chapter 1
12 January Th	Finish A Case for Evolutionary Thinking ~ Begin The Pattern of Evolution	Chapter 2.1-2.2; Pre-test (due Friday)
17 January T	Finish The Pattern of Evolution ~ Scientific Method	Chapter 2.2-2.5; Quiz 1: Ch 1 (due Friday)
19 January Th	Evolution by Natural Selection	Chapter 3
24 January T	Natural Selection continued ~ begin Phylogenetics	Quiz 2: Ch 2 & 3 (due Friday)
26 January Th	Continue Phylogenetics ~ Paper Discussion 1	Chapter 4; Paper Discussion 1
31 January T	Finish Phylogenetics ~ Genetic & Environmental Variation	Chapter 5.1-5.2; Quiz 3: Ch 4 (due Friday)
2 February Th	Mutation	Chapter 5.3-5.5
7 February T	*EXAM 1*	Ch 1-5 exam
9 February Th	Population Genetics: HWE & Selection	Chapter 6.1-6.2
14 February T	Population Genetics: Selection & Mutation	Chapter 6.3-6.5; Quiz 4: Ch 6 (due Friday)
16 February Th	Population Genetics: Migration & Drift	Chapter 7.1-7.2
21 February T	Population Genetics: Molecular Evolution & NRM	Chapter 7.3-7.5
23 February Th	Linkage and Sex	Chapter 8; Quiz 5: Ch 7 (due Friday)
28 February T	Finish Linkage and Sex ~ Paper Discussion 2	Paper Discussion 2
2 March Th	*EXAM 2*	Ch 6-8 exam
7 March T	Methods for studying adaptation	Chapter 10
9 March Th	Sexual Selection I: Dimorphism and Males	Chapter 11.1-11.2; Quiz 6: Ch 10 (due Friday)

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14 March T	SPRING BREAK ~ NO CLASS	
16 March Th	SPRING BREAK ~ NO CLASS	
21 March T	Sexual Selection II: Females, Plants and Humans	Chapter 11.3-11.6
23 March Th	Kin Selection	Chapter 12
28 March T	Finish Kin Selection ~ Start Life History Evolution	Chapter 13.1-13.3; ; Quiz 7: Ch. 11 & 12 (due Friday)
30 March Th	Finish Life History Evolution ~ Paper Discussion 3	Chapter 13.4-end; Paper Discussion 3
4 April T	*EXAM 3*	Ch. 9-13 exam
6 April Th	Evolution and Human Health	Chapter 14
11 April T	Mechanisms of Speciation I: Species Concepts and Isolation	Chapter 16.1-16.2
13 April Th	Mechanisms of Speciation II: Drivers of Divergence	Chapter 16.3-16.5; Quiz 8: Ch. 14 & 16 (due Friday)
18 April T	Human Evolution	Chapter 20; Quiz 9: Ch. 20; Post-test
20 April Th	Finish Human Evolution ~ final paper discussion	Paper discussion 4
27 April Th	*FINAL EXAM* 10 AM – 12:50 PM	~50% Chapters 14, 16, 20; ~50% cumulative