

Fundamentals of Evolution (11:216:251), Spring 2025

Syllabus & Schedule

Wednesday 12:10 PM - 1:30 PM CDL 110

Friday 2:00 PM - 3:20 PM CDL 110

Instructor:

Dr. Kimberly Russell

kimberly.russell@rutgers.edu

Office hours by appointment:

<https://krussell-rutgersuniversity.youcanbook.me>

Grader:

Lindsey Hauff, Ph.D. student (lrh85@scarletmail.rutgers.edu)

Webpage: The course website is on **Canvas** and all material associated with the class can be found there. MAKE SURE YOU ARE CHECKING THE E-MAIL LISTED ON CANVAS, so you get all information and updates sent to your correct e-mail that you check regularly. Most communication will be through the Announcement tab, so get used to checking that often.

Course content: For future biologists, scientists or simply informed citizens, a fundamental understanding of evolutionary biology is absolutely essential. As Dobzhansky famously quipped “Nothing in biology makes sense except in light of evolution.” Despite this, most students make it through high school and university without truly grasping the meaning behind his statement. Why is evolution so important? How does it alter our perception of our world and ourselves? This course will attempt to answer these questions while giving students a detailed understanding of the mechanisms of evolution and the scientific methods employed in evolutionary analysis. Topics that will be covered include the development of evolutionary theory, the history of the evolution of life on Earth, the genetic basis of variation and heredity, natural selection, evolution and development, and speciation.

Learning goals:

- Demonstrate understanding and apply basic principles and concepts in evolutionary biology: how organisms have changed and continue to change in response to the environment and other organisms, different mechanisms of evolution including natural selection, and the relationship between microevolution and macroevolution (*Departmental Learning Goal 2*)
- Explain and be able to assess the relationship among assumptions, method, evidence, arguments and theory in evolutionary biology.
- Understand and be able to exemplify how evolution is an ongoing process that affects our everyday life.
- Effectively communicate evolutionary concepts (*Departmental learning Goal 6*)

Prerequisites: Two semesters of General Biology (01:119:115/116) or equivalent. It will be very difficult to keep up with the pace of this course without already having a basic introduction to ecological and evolutionary concepts.

Course textbook: *Evolution – Making Sense of Life*, by Carl Zimmer and Douglas Emlen, 2020, 3rd ed. Macmillan. Available as paperback, ebook and iPad app on Amazon, Barnes & Noble, iTunes, and at the campus bookstore. Students can also rent from Amazon. Any edition of the book is acceptable, but edition 3 has some new content and some chapters are in a different order.

Discussions. All students are expected to contribute to the weekly Discussion by asking or answering a question from a fellow student about course material by Tuesday at 11:59pm weekly (2 post minimum).

These questions should be directly related to the lecture material or at least inspired by it. I will review these questions and address common misconceptions in lectures.

In Class Activities (ICAs). These activities will be completed in class and are unannounced. For students who must miss class for health reasons (e.g., COVID), contact Dr. Russell after reporting to the online student absence system (<https://sims.rutgers.edu/ssra/>). Once notification is received, you will be able to complete any missed ICAs remotely. If you miss more than one in-class assignment due to illness, proper documentation is required to avoid penalty. All students can miss 1 ICA without penalty.

Note that attendance at every lecture is expected and attendance will be taken each class. This is **NOT** an asynchronous online course.

Evaluation and Grading: There will be three exams and one project in the class. The third exam will be given during the final exam period. While the third exam is not explicitly cumulative, the topics covered later in the course build on those discussed earlier. All exams will be given in person.

Two problem sets will be available as a quizzes in Canvas.

<u>Course component</u>	<u>Grade points</u>
Exam 1	100
Exam 2	100
Exam 3	100
Evolution in “Action!” Project	60
Video project peer review	10
Tree-thinking Problem Set	20
Population Genetics Problem Set	20
Participation & Engagement	
Questions (5 pts per week)	50
<u>In class assignments (10, worth 10 pts each)</u>	<u>90</u>
Total points	550

Exams. Exams will be given in class and are a mixture of multiple choice and matching (~50%) and short answer/essay (~50%). Make-up exams will be possible only with a doctor’s or a dean’s note or with prior approval. If you have a serious reason for missing an exam, you must notify us BEFORE the scheduled exam period and accommodations will made at the Instructor’s discretion.

Evolution in “Action!”. General overview: This is a group project. Groups will select one primary source research paper, published in the last two years from one of the following a scientific journals: *Biological Journal of Linnean Society*, *Evolution*, *Genome Biology and Evolution*, *Journal of Evolutionary Biology*, *Molecular Biology and Evolution*, *Plant Systematics and Evolution*, *Systematic Biology*, *Virus Evolution* (articles must be approved, as no duplicates are allowed). The assignment is to create a 4 to 6 minute video explaining the article in a way that would be understandable to a wider audience. The intent is to be creative, entertaining as well as informative. Groups can go with a news anchor/news program style or a music video style or something else (with approval). This CANNOT be just a voiceover slide presentation. Also, the presentation must be integrated (not just each group member recording on their own without input from the others). All Rutgers students have access to Adobe video editing software. To get ideas, google “Dance your PhD” or see https://youtu.be/9k_oKK4Teco?si=P6-mSgdyfTdI3bPF or <https://youtu.be/g8Y9ZK6-V3c?si=KCsjxbDu1EmaKcu3>. These examples are not exactly the same, as they are covering a topic, not a specific paper, but you get the idea! For students not comfortable being filmed, there are other ways to be involved. Note that there will be an anonymous peer review of each group member and grades will be given individually if warranted. There will also be a class peer review of the videos with an awards ceremony! Detailed prompt to follow in a separate document.

Rutgers Academic Integrity Policy: You are personally responsible for adhering to the entire policy (<http://academicintegrity.rutgers.edu/>). This means, for example - DO NOT CHEAT, DO NOT COLLABORATE TOO MUCH ON PROJECTS THAT ARE INDIVIDUAL PROJECTS, DO NOT COPY TEXT FROM THE INTERNET (= write everything in your own words), DO NOT USE AI, AND CITE SOURCES OF INFORMATION. Do not use any images from the internet or other sources unless you have specific permission, they have appropriate licensing (Creative Commons, etc.) or they are in the public domain (see handout on the course website). Sources for facts and images are always needed. We report all instances of improper Academic Conduct to the Student Conduct Office.

Advice for efficient learning: Read each chapter before attending class. Use a pencil and paper to take detailed notes while watching – only write down key words (transcribing does not help you learn!). Note any questions you have in the margins to ask either after class or to post in the discussion later. Vocabulary is important, but concepts are more significant than details – note what concepts the case studies are meant to demonstrate (vs. getting hung up on the details). If you are struggling, make an appointment with Dr. Russell, form a study group, ask us questions – look for help before exams rather than afterwards. Studies have shown that repeated recall of information leads to better understanding and memory – test yourself frequently! Still struggling? Check out this useful website for study advice:

<https://www.learningscientists.org/downloadable-materials>

NOTICE FOR STUDENTS WITH DISABILITIES

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: <https://ods.rutgers.edu/students/documentation-guidelines>. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodations. To begin this process, please complete the Registration form on the ODS web site at: <https://ods.rutgers.edu/students/registration-form>.

STATEMENT OF DIVERSITY AND INCLUSION

It is our intention that students of all backgrounds will be well served by this course. We will work to create an environment of **inclusion** which respects and affirms the inherent dignity, value, and uniqueness of all individuals, communities and perspectives. We are lucky to have a diverse university. Diverse voices and life experiences enhance the learning process and we welcome students to share their personal experiences. We will not tolerate disrespectful language or behavior against any individual or group. If you feel as though you have been disrespected or treated unfairly by the instructors or any other individual please let us know. You may speak with the instructors in person, over email or report anonymously using the feedback note box. You may also report bias to the Rutgers Diversity and Inclusion initiative using this link: <http://inclusion.rutgers.edu/report-bias-incident/>.

****The faculty and staff at Rutgers are committed to your success. Students who are successful tend to seek out resources that enable them to excel academically, maintain their health and wellness, prepare for future careers, navigate college life and finances, and connect with the RU community. Resources that can help you succeed and connect with the Rutgers community can be found at success.rutgers.edu.**

Not written in stone: This is the planned course outline, but changes may be necessary as the semester progresses. All schedule or assignment changes will be announced in class AND on Canvas.

Note that it is your responsibility to keep track of deadlines and exam dates. We suggest you keep a personal calendar, separate from Canvas.

LECTURE TOPICS AND SCHEDULE SPRING 2025

Week 1

W1/22 Introduction to evolution & how we study it (chapter 1)
F 1/24 The history of evolutionary thought to Darwin (chapter 2)

Week 2

W1/29 Diversity of Life, Part 1 (chapter 3 in part)
F 1/31 Diversity of Life, Part 2

Week 3

W2/5 Tree of life Part 1 (chapter 4)
F 2/7 Tree of life Part 2 (chapter 4)

Deadline: Tree-Thinking Problem Set due by 11:59pm on 2/11

Week 4

W2/12 Genetic variation (chapter 5)
F 2/14 Drift and selection Part 1 (chapter 6)

Week 5

W2/19 Drift and selection Part 2 (chapter 6)
F 2/21 Project Workshop & Exam Review

Deadline: Population Genetics Problem Set due by 11:59pm on 2/21

Week 6

W2/26 **Exam 1 (chapters 1-6)**
F 2/28 Genotypes and phenotypes (chapter 7)

Week 7

W3/5 Empirical Natural Selection (chapter 10)
F 3/7 Gene Histories (chapter 8)

Week 8

W3/12 Gene Histories, cont'd
F 3/14 Genes to traits (chapter 9)

SPRING BREAK

Week 9

W3/26 Sex: Causes and Consequences (chapter 11)
F 3/28 Life Histories and Parental Care (chapter 12)

Week 10

W4/2 Project Workshop & Exam Review
F 4/4 **Exam 2 (chapters 7-12)**

Week 11

W4/9 Chapter 13: The Origin of Species Part 1
F 4/11 Chapter 13: The Origin of Species Part 2

Week 12

W4/16 Macroevolution (chapter 14)
F 4/18 Coevolution (chapter 15)

DEADLINE: Video Projects uploaded to Canvas Assignments by 11:59PM on 4/21.

Week 13

W4/23 Brains and Behavior (chapter 16)
F 4/25 Human Evolution (chapter 17)

Week 14

W4/30 Evolutionary Medicine (chapter 18)
F 5/2 **Video Peer Review & Awards**

5/13 8 to 11am Exam 3 (chapter 13-18)