# BIOL205 Foundations of Biology: Ecology and Evolution – Honors

**Instructor:** Phil Barden
**E-mail:** barden@njit.edu (bardenlab.org)
**Office:** Online and CKB 428B
**Office Hours:** Mon/Thu 1:30-2:30pm; by appointment

**Course Website:** http://canvas.njit.edu
**Course Schedule:** Mon/Thu 2:30-3:50pm
**Course Location:** CKB 219

---

**Course description:** There are about 1.2 million described species living on Earth – a small proportion of the estimated 5-10 million total species that exist today. Each of species is a unique assemblage of genes, morphology, ecology, and behavior. Remarkably, all organisms alive today as well as the billions that are now extinct arose from the same fundamental mechanism: evolution. At the same time, these species and their interactions with each other and the environment have irreversibly shaped our planet and ourselves. Ecology and evolution are fundamental in our understanding of biology, as they underlie mechanisms responsible for all life. The material we cover will build upon concepts you likely are somewhat familiar with and expand your expertise in ecology and evolution, topics include: the history of life; selection, genetic mechanisms of evolution and variation; adaptation; community ecology; ecosystems; coevolution; phylogenetics; speciation; biogeography; paleontology.

**Course objectives**
After completing this course, students will be able to:
1. Recall key moments in the history of life on Earth.
2. Describe different processes of selection and how they ultimately shape genotypes and phenotypes.
3. Describe the genetic basis for variation, inheritance, and development as these mechanisms relate to evolution.
4. Interpret and evaluate information presented in the form of phylogenetic trees while recalling the theory behind their construction.
5. Describe how new species arise and diversify.
6. Explain how organisms impact each other in a community setting.
7. Understand how nutrients cycle and energy flows at an ecosystem level.
8. Describe the relationship between distributional patterns of organisms and their evolutionary histories.
9. Describe how fossils contribute to modern understanding of evolutionary biology.
10. Apply concepts learned throughout the course to other fields of biology.
11. Relate the topics we cover in class to humans, medicine, and society.

**Prerequisites:** Concepts in Biology (BIOL 200)

**Required Materials:** We may occasionally consult a free textbook called Open Stax Biology 2e: https://openstax.org/details/biology-2e.

**Grading Policy:** Grades will be determined by performance on exams, assignments, participation, and final project. There will be two in-class exams, worth a total 30% of your final grade as well as a cumulative final exam worth 20% of your final grade. Assignments and participation will comprise 30% of your grade while a group & final project will make up 20%.

| Grading Scale | |
|---|---|
| A | 90 – 100 |
| B+ | 85 – 90 |
| B | 80 – 85 |
| C+ | 75 – 80 |
| C | 65 – 75 |
| D | 50 – 65 |
| F | 0 – 50 |

| Assignment | Percentage |
|---|---|
| In-Class Exams (2) | 30% |
| Final Exam | 20% |
| Group & Final Project | 20% |
| Assignments & Participation | 30% |

**Group & Final Project:** Over the course of the semester you will work toward completing a group & final project which will culminate in a final presentation. In the lead up to the final presentation, the project will include work that will be turned in as a group, as well as individual assignments. A description and timeframe for the project will be posted to Canvas.

**Assignments & Participation:** Because we will spend a lot of time discussing and contemplating sometimes complex topics, this course will work best when everyone comes curious and prepared. Each week you will be assigned a reading from primary literature, book chapters, or websites. These readings are not optional and usually directly relate to assignments listed in the syllabus. Assignments listed in the syllabus schedule are due through Canvas on the date listed by 12:00pm, two and a half hours before class begins.

**Make up exams** will be possible with approval from the Dean of Students. If you have a serious reason for missing an exam that you are aware of head of time, you must talk to me before the scheduled exam period to notify me that you cannot take the exam. You are then responsible for arranging with me to make up the test within two days**.**

**Academic integrity** is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy here.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu

**Canvas:** We will be using Canvas for our class website (http://canvas.njit.edu).

| Date | Topic | Assignment |
|---|---|---|
| Thurs, Jan 18 | *Course Overview* | Reading: Syllabus |
| Mon, Jan 22 | *Biodiversity & You* | Assignment: Identify your focal organism |
| Thurs, Jan 25 | *Perceptions of Evolution & the History of Life* | Reading: Gould, S.J., 1994. The evolution of life on the earth. Scientific American, 271(4), pp.84-91.<br>Assignment: Depicting evolution" |
| Mon, Jan 29 | *Mechanisms of Evolution: Selection* | Reading: Darwin in the Pumpkin Patch or Bay Area Travels with Charlie PDF<br>Assignment: Reading assignment 1 |
| Thurs, Feb 1 | *Mechanisms of Evolution: Genes, Variation, and Drift* | Optional Reading: OpenStax Biology 2e: Chapter15.1 The Genetic Code: 369-373. |
| Mon, Feb 5 | *Adaptation, Life History, & Environment* | Reading: TBD Guppy Paper: Reznick et al. 1990 or Reznick & Endler 1982<br>Assignment: Reading assignment 2 |
| Thurs, Feb 8 | *Adaptation, Life History, & Environment* |  |
| Mon, Feb 12 | *Homology & Phylogenetics* | Reading: McLennan, D.A., 2010. How to read a phylogenetic tree. Evolution: Education and Outreach, 3(4), pp.506-519. |
| Thurs, Feb 15 | *Homology & Phylogenetics* | |
| Mon, Feb 19 | *Sexual Selection* | Reading: Diversity in the Weapons of Sexual Selection: Horn Evolution in Dung Beetles PDF<br>Assignment: Reading assignment 3 |
| **Thurs, Feb 22** | | ***Exam 1*** |
| Mon, Feb 26 | *Ecosystems & Niches* | Reading: Lycaenid butterfly paper<br>Assignment: Reading assignment 4 |
| Thurs, Feb 29 | *Ecosystems, Niches, & Cycles* | |
| Mon, Mar 4 | *Coevolution, Evolutionary Medicine* | Reading: Newt Paper<br>Assignment: Reading assignment 5 |
| Thurs, Mar 7 | *Coevolution, Evolutionary Medicine* | |
| **Mon, Mar 11**<br>**Thurs, Mar 14** | | ***Spring Break*** |
| Mon, Mar 18 | *Speciation* | Reading: Adaptive radiation paper<br>Assignment: Reading assignment 6 |
| Thurs, Mar 21 | *Speciation II* | |

| | | |
|---|---|---|
| Mon, Mar 25 | *Biogeography* | Reading: Vicariance paper<br>Assignment: Reading assignment 7 |
| Thurs, Mar 28 | *Extinction* | |
| **Mon, Apr 1** | ***Exam 2*** | |
| Thurs, Apr 4 | *Student Presentation Group Work* | |
| Mon, Apr 8 | *Evodevo* | Reading: Regulatory gene network paper<br>Assignment: Reading assignment 8 |
| Thurs, Apr 11 | *Evodevo II* | |
| Mon, Apr 15 | *Human Evolution & Ecology* | Reading: Four Legs Good, Two Legs Fortuitous: Brains, Brawn, and the Evolution of Human Bipedalism PDF<br>Assignment: Reading assignment 9 |
| Thurs, Apr 18 | *Human Evolution & Ecology* | |
| Mon, Apr 22 | *Conservation & the Future of Life on Earth* | |
| Thurs, Apr 25 | Student Presentations | |
| Mon, Apr 29 | Student Presentations | |
| **Final** | **The final exam will be during final exam week.** | |

*Course schedule is tentative and subject to change.
*The final exam schedule will be posted here: http://www.njit.edu/registrar/exams/