Term Information

Effective Term	Spring 2023
Previous Value	*Summer 2012*

Course Change Information

What change is being proposed? (If more than one, what changes are being proposed?)

Include EEOB 3320 in Origins and Evolution theme

What is the rationale for the proposed change(s)?

EEOB 3320 overviews evolutionary patterns and processes resulting in diversity of life on earth and fits well with the goals of this theme

What are the programmatic implications of the proposed change(s)?

(e.g. program requirements to be added or removed, changes to be made in available resources, effect on other programs that use the course)?

Course could be used toward the Origins & Evolution theme

Is approval of the requrest contingent upon the approval of other course or curricular program request? No

Is this a request to withdraw the course? No

General Information

Course Bulletin Listing/Subject Area	Evol, Ecology & Organismal Bio
Fiscal Unit/Academic Org	Evolution, Ecology & Org Bio - D0390
College/Academic Group	Arts and Sciences
Level/Career	Undergraduate
Course Number/Catalog	3320
Course Title	Organismal Diversity
Transcript Abbreviation	Org Diversity
Course Description	A survey of organismal diversity and the evolutionary relationships between and within major groups of organisms. Class is laboratory based.
Semester Credit Hours/Units	Fixed: 3

Offering Information

Length Of Course	14 Week, 12 Week, 8 Week, 7 Week, 6 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	No
Grading Basis	Letter Grade
Repeatable	No
Course Components	Laboratory, Lecture, Recitation
Grade Roster Component	Laboratory
Credit Available by Exam	No
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Columbus, Lima, Mansfield, Marion, Newark, Wooster
Previous Value	*Columbus, Lima, Mansfield, Marion, Newark*

Prerequisites and Exclusions

Prerequisites/Corequisites	Prereq: 3310.
Exclusions	
Previous Value	Not open to students with credit for 405.01 and 405.02.
Electronically Enforced	No

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code	26.1303
Subsidy Level	Baccalaureate Course
Intended Rank	Sophomore, Junior, Senior

Requirement/Elective Designation

Origins and Evolution
The course is an elective (for this or other units) or is a service course for other units

Previous Value

The course is an elective (for this or other units) or is a service course for other units

Course Details

Course goals or learning objectives/outcomes

- recognize, characterize, and provide scientific explanations for the diversity of eukaryotic organisms
- participate in the process of discovery through individual and cooperative observations and comparisons
- become aware of issues related to organismal diversity and be able to discuss those issues
- understand science as a process as it relates to organismal diversity

Previous Value

Content Topic List

- How evolutionary relationships are inferred
- Testing evolutionary hypotheses
- Evolution of life on earth
- Biodiversity: definition, importance, historical, current
- The supergroups of eukaryotic organisms
- Experience with some important single-celled eukaryotes
- Evolutionary relationships within green plants
- Hands-on experience with green plants
- Evolutionary relationships within fungi
- Hands-on experience with fungi
- Evolutionary relationships within animals
- Hands-on experience with animals

Sought Concurrence No

Attachments

- EEOB 3320 ELO Questionnaire.docx

  (Cover Letter. Owner: Hamilton,Ian M)

- EEOB Curriculum Maps April 2022.xlsx: Curriculum Maps

  (Other Supporting Documentation. Owner: Hamilton,Ian M)

- EEOB3320SyllabusSpring2022 updated for Origins and Evolution.docx

  (Syllabus. Owner: Hamilton,Ian M)

Comments

- Apologies. The correct syllabus is uploaded now *(by Hamilton,Ian M on 09/02/2022 08:41 AM)*
- It looks like the syllabus for 2250 (Dynamics of Dinosaurs) was uploaded instead of the syllabus for 3320. Please upload the correct syllabus and delete the 2250 syllabus. Thanks! *(by Steele,Rachel Lea on 09/01/2022 11:22 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Hamilton,Ian M	06/14/2022 01:20 PM	Submitted for Approval
Approved	Hamilton,Ian M	06/14/2022 01:20 PM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	08/26/2022 10:20 AM	College Approval
Revision Requested	Steele,Rachel Lea	09/01/2022 11:22 PM	ASCCAO Approval
Submitted	Hamilton,Ian M	09/02/2022 08:41 AM	Submitted for Approval
Approved	Hamilton,Ian M	09/02/2022 08:41 AM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	09/08/2022 04:04 PM	College Approval
Pending Approval	Cody,Emily Kathryn Jenkins,Mary Ellen Bigler Hanlin,Deborah Kay Hilty,Michael Vankeerbergen,Bernadette Chantal Steele,Rachel Lea	09/08/2022 04:04 PM	ASCCAO Approval

Organismal Diversity
EEOB 3320
Spring 2022

3 credits
MWF 11:10 am – 1:10 pm
Jennings 124

Instructors

Norman Johnson
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Contact preference: email or Carmen

Barb Shardy
Email: shardy.1@osu.edu

Course Description

This course is a survey of the living organisms with whom we share the planet. While this may sound overwhelming – currently there are more than 1.5 million species of microorganisms, fungi, plants and animals that are known - our energy and time will be focused on the "major" eukaryotic groups.

In general, we'll be covering these groups more or less in chronological order, that is by their relative ages. Of course, evolution does not proceed in a straight line, so we'll occasionally have to "double-back" as groups split off in their phylogenetic history.

Course Learning Objectives

Students shall…

- recognize, characterize, and provide scientific explanations for the diversity of eukaryotic organisms
- participate in the process of discovery through individual and cooperative observations and comparisons
- become aware of issues related to organismal diversity and be able to discuss those issues
- understand science as a process as it relates to organismal diversity

General Education Expected Learning Outcomes

As part of the Origins and Evolution Category of the General Education curriculum, this course is designed to prepare students to be able to do the following:

1. Successful students will analyze the origins and evolution of natural systems, life, humanity, or human culture at a more advanced and in-depth level than in the Foundations component.
2. Successful students will integrate approaches to the origins and evolution of natural systems, life, humanity, or human culture by making connections to their own experiences and by making connections to work they have done in previous classes and/or anticipate doing in the future.
3. Successful students will appreciate the time depth of the origins and evolution of natural systems, life, humanity, or human culture, and the factors that have shaped them over time.
4. Successful students will understand the origins and evolution of natural systems, life, humanity, or human culture, and the factors that have shaped them over time.

More specifically, the Expected Learning Outcomes for the Origins and Evolution theme are:

1.1 Apply their understanding of scientific methods to quantitative calculations.

1.2 Engage in critical and logical thinking about the origins and evolution of the universe, physical systems, life on earth, humanity, or human culture.

2.1 Identify, describe, and synthesize approaches to or experiences of origins and evolution questions in different academic and non-academic contexts.

2.2 Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts.

3.1 Illustrate the time depth of the universe, physical systems, life on earth, humanity, or human culture by providing examples or models.

3.2 Explain scientific methods used to reconstruct the history of the universe, physical systems, life on earth, humanity, or human culture and specify their domains of validity.

3.3 Engage with current controversies and problems related to origins and evolution questions.

4.1 Describe how the universe, physical systems, life on earth, humanity, or human culture have evolved over time.

4.2 Summarize current theories of the origin and evolution of the universe, physical systems, life on earth, humanity, or human culture.

EEOB 3320 addresses the origins and evolution of life on earth. This course provides an introductory survey of the wondrous and amazing diversity of life with which we share the planet. Currently there are more than 1.5 million species of microorganisms, fungi, plants, and animals that have been identified and this course will focus on the major eukaryotic groups. Many of these organisms will be unfamiliar, and in order to make some sense of it all, the evolutionary history and organization of different taxa will be approached from a phylogenetic perspective. The evolutionary history of life has

not proceeded in a straight line but is characterized by a branching pattern with some groups of organisms increasing in diversity and some becoming extinct. This is a hands-on course, taught using a studio format, providing a first-hand acquaintance with the richness of life using live and preserved specimens.

Course Format

EEOB 3320 is designed as a studio course. This means that the class will not have the typical distinction between lecture and lab. In fact, we hope to minimize the amount of time engaged in lecturing to (or at) you. Rather, you will be working together on projects. Studio classes are also designed to take place in larger blocks of time, relieving time pressure to accomplish the work. We will meet three times per week in 2-hour blocks.

The idea is to give you control of your own learning and to make this an active process. In other words, you will be "doing" things. Studio classrooms are centered around active and group learning. They promote holistic skills, including thinking, inquiry, creativity, and reflection.

Most of the work you will do this semester will be done in groups. All members of a group are responsible for seeing that assignments are completed. For some work a single group report will be assessed. For others, each person will be assessed individually.

In keeping with the spirit of a studio class, we will deal with each group of organisms not by only talking about them and looking at pretty pictures, but by handling specimens, preserved when necessary and alive where possible. For each group we will have the same basic set of questions:

How do these organisms:

- move
- obtain and use nutrition
- support themselves
- defend themselves
- reproduce
- maintain homeostasis
- sense their environment

The answers to these questions involve observation, comparison, and – on occasion – dissection. The answers, ultimately, extend deeply into physiology and molecular biology, but for our purposes we will be approaching the questions from a macroscopic viewpoint.

You should keep a dedicated record for EEOB 3320 of what transpired in class, what the answers to those core questions are, and how you arrived at those answers. This may be either a physical notebook or an electronic analog. You may use this record during the practical quizzes, so this should be an incentive to keep detailed and organized notes. You may take photos to document specimens and dissections. While photos have an important place, drawings and sketches are particularly helpful. The act of drawing forces you to focus your attention on structures and their physical relationship to one another, thus helping you to develop an understanding of how the organisms are put together. It also engages a different dimension of learning that you may find to be very helpful.

Class Attendance: Group work (and assessment) implies that it is critical that you attend class and participate. Missing class not only affects your learning and grade in the course, but that of the other members of your group.

Required course materials: The only thing that you may need to purchase is access to the PackBack platform (more details on this below). Readings will be posted on the course Carmen site.

Assessment and Grading

The grading in this section of the course will be based on five general items:

1. Practical quizzes: In a practical generally you will be presented with specimens and answer specific questions about those specimens. You will be allowed to use your lab notebooks to help answer these questions.
2. For each week during the course, we will have "exercises" that will vary in their details. They might be traditional short quizzes, one-minute essays, etc. The point here is to provide you with ongoing feedback concerning your understanding and mastery of the material.
3. Blog post. Each group (4 students at a table) will select one of the topics that are listed below on the class schedule. If you desire, you may choose to suggest another topic. The point is that each topic relates to the group(s) of organisms being discussed that week and is of current interest. For the blog post, your group will prepare an essay (~800 words) on that topic that is aimed at the general public. The blog will be posted at the site that I have set up for this course: https://u.osu.edu/worldunseen/
   a) The blog post will be assessed on the basis of its accuracy, accessibility to the target audience, and its level of interest (as well as grammar, spelling, and other mechanics).
   b) Since this will be graded for the group as a whole, the group will prepare a description of the roles played by each member in the preparation of the post, and all the group members will sign confirming its accuracy. Significant deviations from a fair sharing of the workload will be reflected in the individual grades assigned!

4. Presentation. In conjunction with the blog post, each group will prepare a 15-minute presentation to be given to the entire class. In contrast to the blog, this presentation should be aimed at least at the level of an upperclass science (biology!) major. Assessment will use the same criteria as the blog post.

8 In-class activities @ 10 points each	80 points
5 practical quizzes @ 40 points each	200 points
12 Packback response sets @ 10 points each	120 points
Final:	
1 group blog post	50 points
1 group presentation	50 points
Total	500 points

Letter Grade Conversion Scale:

A: 93.0 – 100%	B+: 87.0 – 89.9%	C+: 77.0 – 77.9%	D+: 67.0 – 69.9%
A-: 90.0 – 92.9%	B: 83.0 – 86.9%	C: 73.0 – 76.9%	D: 60.0 – 66.9%
	B-: 80.0 – 82.9%	C-: 70.0 – 72.9%	E: < 59.9%

Posting of Grades: All grades will be posted on Carmen. You will have 10 class days from the day of posting to challenge or inquire about any posted grade. After that, the posted grades are final.

Packback

Participation is a requirement for this course, and the Packback Questions platform will be used for online discussion about class topics. Packback Questions is an online community where you can be fearlessly curious and ask open-ended questions to build on top of what we are covering in class and relate topics to real-world applications.

There will be a weekly Sunday at 11:59PM EST deadline for submissions. In order to receive full credit, you should submit the following per each deadline period:

1 open-ended Question every week, worth 5pts of each assignment grade
1 Response every week, worth 5pts of each assignment grade

How to register on Packback:

An email invitation will be sent to you from help@packback.co prompting you to finish registration. If you don't receive an email (be sure to check your spam), you may register by following the instructions below:

1. Create an account by navigating to https://questions.packback.co and clicking "Sign up for an Account." Note: If you already have an account on Packback you can log in with your credentials.
2. Then enter our class community's lookup key into the "Looking to join a community you don't see here?" section in Packback at the bottom of the homepage. Community Lookup Key: **e48d1f6b-9e06-40ed-8254-b5c1fdabc0e8**
3. Follow the instructions on your screen to finish your registration.

Packback may require a paid subscription. Refer to www.packback.co/product/pricing for more information.

How to Get Help from the Packback Team:
If you have any questions or concerns about Packback throughout the semester, please read their FAQ at help.packback.co. If you need more help, contact their customer support team directly at help@packback.co.

For a brief introduction to Packback Questions and why we are using it in class, watch this video: https://www.youtube.com/watch?v=OV7QmikrD68

Academic Integrity Policy

See Descriptions of Major Course Assignments for specific guidelines about collaboration and academic integrity in the context of this online class.

Ohio State's Academic Integrity Policy

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct http://studentlife.osu.edu/csc/.

Copyright for Instructional Materials

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Statement on Title IX

All students and employees at Ohio State have the right to work and learn in an environment free from harassment and discrimination based on sex or gender, and the university can arrange interim measures, provide support resources, and explain investigation options, including referral to confidential resources.

If you or someone you know has been harassed or discriminated against based on your sex or gender, including sexual harassment, sexual assault, relationship violence, stalking, or sexual exploitation, you may find information about your rights and options on Ohio State's Title IX website (titleix.osu.edu) or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu. Title IX is part of the Office of Institutional Equity (OIE) at Ohio State, which responds to all bias-motivated incidents of harassment and discrimination, such as race, religion, national origin and disability. For more information, visit the OIE website (equity.osu.edu) or email equity@osu.edu.

Commitment to a Diverse and Inclusive Learning Environment

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are

committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

Your Mental Health

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. No matter where you are engaged in distance learning, The Ohio State University's Student Life Counseling and Consultation Service (CCS) is here to support you. If you find yourself feeling isolated, anxious or overwhelmed, on-demand mental health resources (go.osu.edu/ccsondemand) are available. You can reach an on-call counselor when CCS is closed at 614- 292-5766**. 24-hour emergency help** is available through the National Suicide Prevention Lifeline website (suicidepreventionlifeline.org) or by calling 1-800-273-8255(TALK). The Ohio State Wellness app (go.osu.edu/wellnessapp) is also a great resource.

Accessibility Accommodations for Students with Disabilities

The university strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability including mental health, chronic or temporary medical conditions, please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services (SLDS). After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion.

Disability Services Contact Information

Phone: 614-292-3307

Website: slds.osu.edu

Email: slds@osu.edu

In person: Baker Hall 098, 113 W. 12th Avenue

Accessibility of Course Technology

This online course requires use of CarmenCanvas (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations with your instructor.

- CarmenCanvas accessibility (go.osu.edu/canvas-accessibility)
- Streaming audio and video
- CarmenZoom accessibility (go.osu.edu/zoom-accessibility)

- Collaborative course tools

Class Schedule

Date	Topic	Projects & Assignments
10 January	Course introduction; plate slime molds	
12 January	Phylogenies; exploration of aquatic diversity	Readings: Strange Relations; The New Tree of Eukaryotes
14 January	Multicellularity; examine slime molds; sponge slurry	
17 January	Martin Luther King Day: NO CLASSES	
19 January	Ediacaran fauna and geological perspective	Reading: Wilson (1992)
21 January	Dissecting molecular data	Reading: Instructions on Carmen
24 January	What does it mean to be an animal? Choanozoa, Porifera	Reading: Microbes Team Up
26 January	Cnidaria & Ctenophora	Reading: Ctenophora Genome
28 January	Practical Quiz 1: Eukaryote diversity through Cnidaria	
31 January	Cambrian explosion: protostome/deuterostome and origin of complex body plans	
02 February	Bilaterian diversity; flatworms	
04 February	Echinoderms	
07 February	Chordates and protochordates	
09 February	Hagfish and lampreys; sow ferns	
11 February	Practical Quiz 2: Bilaterian diversity through early deuterostomes (Cambrian explosion to hagfish & lampreys)	
14 February	Chondrichthyes, Osteichthyes	
16 February	Ecdysozoa; Tardigrades, nematodes	
18 February	Arthropods	
21 February	Arthropods; set up Berlese funnels	
23 February	Annelids	
25 February	Berlese funnel wrap-up day	
28 February	Molluscs	
02 March	Lophophores	
04 March	Practical Quiz 3: Lophotrochozoa	
07 March	Fungi; what's life like on land?	
09 March	Land plants; mosses	
11 March	Mosses and liverworts, lichens, vascular adaptations	
14 March 16 March 18 March	SPRING BREAK NO CLASSES	
21 March	Ferns	
23 March	Terrestrial adaptations; gymnosperms	
25 March	Practical Quiz 4: Non-vascular plants	

28 March	Tetrapod diversification; amniotes	
30 March	Racing extinction	
01 April	Chadwick	
04 April	Chadwick rain day (no class if April 1 trip works out)	
06 April	Seeds, fruit	
08 April	Dicots, monocots	
11 April	Greenhouse	Blog posts due
13 April	Practical Quiz 5: seed plants and tetrapods	
15 April	Final Presentations (3)	
18 April	Final Presentations (3)	
20 April	Final Presentations (3)	
22 April	Final Presentations (3)	
25 April	Flex Day	

EEOB 3320 Organismal Diversity

Submitted for approval for the new theme Origins and Evolution

Background: This course provides an introductory survey of the wondrous and amazing diversity of life with which we share the planet. Currently there are more than 1.5 million species of microorganisms, fungi, plants, and animals that have been identified and this course will focus on the major eukaryotic groups. Many of these organisms will be unfamiliar, and in order to make some sense of it all, the evolutionary history and organization of different taxa will be approached from a phylogenetic perspective. The evolutionary history of life has not proceeded in a straight line but is characterized by a branching pattern with some groups of organisms increasing in diversity and some becoming extinct. This is a hands-on course, taught using a studio format, providing a first-hand acquaintance with the richness of life using live and preserved specimens.

EEOB 3320 Organismal Diversity explores fundamentals of evolution, physiology and anatomy through a comparative lens using the diversification of organisms through time. This course examines complex, "big picture" biological concepts such as tracking evolutionary innovations exhibited by living organisms through time (e.g. when did animals evolve tissues? When did organisms move to land? Who did this first and how did that facilitate the diversification of other organisms?). Using a comparative, inquiry-based approach with dissections of many different lineages of organisms provides a unique opportunity to "track" changes that occurred through evolutionary history.

The 3-credit hour course is comprised of class meetings focused on dissections of different organismal lineages, class discussions and small group work. An example of a class period would be to first introduce a group of organisms, which includes only basic information on how to conduct the dissection. Students are not given a lab guide for dissections which allows them to experience scientific discovery (including the challenges and the excitement) through the course of the semester. Students are organized in small groups in which each student will dissect a different representative of that group of organisms, and then students will compare and contrast the organisms within their lab groups. The questions they must answer are "what makes these organisms different? What unites them? What big evolutionary innovations may have occurred during the evolution of this lineage?" These will then be part of a large in-class discussion in which groups share their conclusions during a concluding wrap up.

***Expected learning outcomes specific to the course*:** Successful students will: (1) recognize, characterize, and provide scientific explanations for the diversity of eukaryotic organisms, (2) participate in the process of discovery through individual and cooperative observations and comparisons, (3) become aware of issues related to organismal diversity and be able to discuss those issues and (4) understand science as a process as it relates to organismal diversity.

(I) How EEOB 3320 meets ELOs shared by all themes

ELO 1.1 Engage in critical and logical thinking.	Lectures, scientific article readings, and lab exercises will help engage students in the application of the scientific method to organismal diversity. Students investigate the body size limitations on propulsion (swimming) in animals by means of cilia. This is accomplished by measuring rotifer body size and absolute speeds by using the microscope, micrometer slides and a timing device. They then calculate relative swimming speeds (body lengths per unit time). The data are graphed and a point in the curve is determined corresponding to a sharp downward slope (indicative of the inefficiency of cilia as a mechanism of propulsion beyond a certain body size). Phylogenetic, or evolutionary trees will provide the context for understanding how life on the planet has developed and diversified. These trees are hypotheses that are themselves built upon layers of hypotheses of homology among the characteristics of organisms. These characters, in turn, today are largely derived from the analysis of molecular sequences of biomolecules, particularly DNA, RNA, and proteins. Students in the class learn the theoretical principles underlying the development of phylogenetic hypotheses and learn how to apply those principles with independent quantitative analyses of data, for example, using maximum likelihood algorithms. These are real data, derived from publicly available databases and the software tool used for the analyses is widely used in current research.
ELO 2.1 Identify, describe, and synthesize approaches or experiences.	Life on the planet is incredibly diverse, yet organisms face many of the same challenges to live, thrive, and reproduce. These include problems of energy acquisition, dispersal, reproduction, and the maintenance of homeostatic internal environments. Students explore how the different groups of organisms have, through evolutionary time, devised independent solutions to those issues. They do this through the observation, study, and dissection of specimens, developing their own hypotheses of the relationship between form and function, and testing these hypotheses with the materials being studied.
ELO 2.2 Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts.	As a laboratory studio format course, students are provided minimal guidance and encouraged to explore the diversity of living and preserved specimens in a small group context. Students are provided with initial guidance on visible cellular structures in unicellular organisms and the basic body plans of multicellular organisms. They are then required to find these structures in different taxa of organisms and link them to basic biological functions such as feeding, locomotion, reproduction, gas exchange, and waste excretion. They are required to draw, photograph, and document their observations to prepare for practical laboratory quizzes, building upon the information they obtain from each group of organisms, reflecting on and comparing body plans in different groups. In this way, students gather information from observations

	on previous groups of organisms and logically apply their findings to the body plans of organisms that they have not examined before.

(I) How EEOB 2250 meets ELOs of the Origins and Evolution Theme.

ELO 1.1 Apply their understanding of scientific methods to quantitative calculations.	Lectures, scientific article readings, and lab exercises will help engage students in the application of the scientific method to organismal diversity. Students investigate the body size limitations on propulsion (swimming) in animals by means of cilia. This is accomplished by measuring rotifer body size and absolute speeds by using the microscope, micrometer slides and a timing device. They then calculate relative swimming speeds (body lengths per unit time). The data are graphed and a point in the curve is determined corresponding to a sharp downward slope (indicative of the inefficiency of cilia as a mechanism of propulsion beyond a certain body size). Phylogenetic, or evolutionary trees will provide the context for understanding how life on the planet has developed and diversified. These trees are hypotheses that are themselves built upon layers of hypotheses of homology among the characteristics of organisms. These characters, in turn, today are largely derived from the analysis of molecular sequences of biomolecules, particularly DNA, RNA, and proteins. Students in the class learn the theoretical principles underlying the development of phylogenetic hypotheses and learn how to apply those principles with independent quantitative analyses of data, for example, using maximum likelihood algorithms. These are real data, derived from publicly available databases and the software tool used for the analyses is widely used in current research.
ELO 1.2 Engage in critical and logical thinking about the origins and evolution of the universe, physical systems, life on earth, humanity, or human culture.	Life on the planet is incredibly diverse, yet organisms face many of the same challenges to live, thrive, and reproduce. These include problems of energy acquisition, dispersal, reproduction, and the maintenance of homeostatic internal environments. Students explore how the different groups of organisms have, through evolutionary time, devised independent solutions to those issues. They do this through the observation, study, and dissection of specimens, developing their own hypotheses of the relationship between form and function, and testing these hypotheses with the materials being studied.
ELO 2.1 Identify, describe, and synthesize approaches to or experiences of origins and evolution questions in different academic and non-academic contexts.	Through close and guided examination of specimens representing the breadth of multicellular life, students learn to understand that non-academic concepts such as worms, algae, and fish in fact are composed of groups of sometimes quite unrelated organisms. By studying diversity in structure in a phylogenetic, evolutionary

	context they learn how biologists developed hypotheses of how organisms are interrelated and how they have diversified in terms of their body form and ecology over time. Students learn to communicate this through the preparation of a written presentation (a blog post) aimed at the general public, and to a more specialist group (their classmates) through an oral presentation on a topic of their choice related to organismal diversity. Such subjects have included the conservation of coral reefs or large cats, the study of intelligence of octopuses, and the medical importance of flatworms.
ELO 2.2 Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts.	As a laboratory studio format course, students are provided minimal guidance and encouraged to explore the diversity of living and preserved specimens in a small group context. Students are provided with initial guidance on visible cellular structures in unicellular organisms and the basic body plans of multicellular organisms. They are then required to find these structures in different taxa of organisms and link them to basic biological functions such as feeding, locomotion, reproduction, gas exchange, and waste excretion. They are required to draw, photograph, and document their observations to prepare for practical laboratory quizzes, building upon the information they obtain from each group of organisms, reflecting on and comparing body plans in different groups. In this way, students gather information from observations on previous groups of organisms and logically apply their findings to the body plans of organisms that they have not examined before.
ELO 3.1 Illustrate the time depth of the universe, physical systems, life on earth, humanity, or human culture by providing examples or models.	A combination of phylogenetic trees, dated using molecular clocks, and the fossil record, dated using radioisotopes, is used to identify the time of origin of each major group of organisms discussed in the class. Students learn about the theoretical basis of a molecular clock-based timeline of life's history, and the comparisons of such a timeline to a history based on the fossil evidence. The topologies of phylogenetic trees provide estimates of the relative time of divergence for those groups with poor or non-existent fossil records. As each group is introduced, it is placed in this chronological context, and the shifting community structure through time is discussed. For example, the origin of ferns is roughly dated to the late Devonian. The forests that gave rise to the extensive coal beds in the eastern United States were fundamentally different than those of today: instead of conifers and flowering plants, these forests were composed primarily of lycophytes, ferns, and seed ferns.
ELO 3.2 Explain scientific methods used to reconstruct the history of the universe, physical systems, life on earth, humanity,	The history of the evolution of living organisms is encoded in the characteristics that they possess: these include DNA sequences, protein sequences, expression patterns, genome structure, endosymbiotic relationships,

or human culture and specify their domains of validity.	physiological processes, anatomy, behavior, and ecology. Decoding this phylogenetic signal and summarizing it in the form of an evolutionary tree is a complex process that builds upon models of character evolution, hypotheses of homology, and different optimization techniques for tree-building. Students learn the basics of phylogenetic reconstruction, conduct an analysis of relationships among exemplars of the earliest groups of animals, and learn to interpret the results of the hypotheses that form the overall context for the survey of the diversity of multicellular organisms.
ELO 3.3 Engage with current controversies and problems related to origins and evolution questions.	EEOB 3320 provides an excellent opportunity to demonstrate the history of evolution and that it is still occurring today. The theory that evolution by natural selection has been responsible for generating the diversity of life on Earth is now so well supported by all available observations that there really is no other scientific theory that stands as a viable alternative. Nevertheless, for religious, philosophical, or cultural reasons, some members of American society have difficulty accepting evolution as the best, indeed only explanation for the history of life. This course focuses on macroevolution, examining the major morphological changes that have occurred over geological time in the evolution of major taxa, as evidence of evolution. Some of these examples are provided by the examination of fossils in lab. Utilizing evidence from multiple sources, students learn about competing phylogenetic hypotheses, and how/why phylogenies come to be revised as new relevant evidence of evolutionary relationships become available. Students also examine new phylogenies emphasizing gene sequence data that are published almost monthly and discuss these newly proposed relationships in the light of their own observations and traditional phylogenetic relationships. While much of the class is devoted to understanding the origins of the major groups, the loss of groups – extinction – is equally important. Students engage with current issues concerning the causes and consequences of extinction through independent projects that focus on threats to a group (for example, marine mammals or big cats), the genetic consequences of reduced population sizes, and efforts in conservation.
ELO 4.1 Describe how the universe, physical systems, life on earth, humanity, or human culture have evolved over time.	EEOB 3320 focuses on the empirically, well-established timeline of evolution from unicellular eukaryotes (protists, algae), through the advent of multicellularity, the development of a diverse pre-Cambrian fauna, the colonization of terrestrial environments by fungi, plants, and animals, the effects of major extinctions on organism diversity, through to current extant groups of organisms. Major biotic (e.g., evolution of aerobic metabolism, mobility and predation; flight) and abiotic events (e.g.,

	increase in atmospheric oxygen, changes in climate) are also discussed in the context of ecological interactions affecting evolution. The evolutionary and ecological history of organisms is emphasized throughout labs and readings and explored further by students through in-class questions and homework assignments.
ELO 4.2 Summarize current theories of the origin and evolution of the universe, physical systems, life on earth, humanity, or human culture.	The theory of evolution by natural selection is one of the great achievements of the scientific revolution and of human culture. Evolution is responsible for revolutionizing biology, proving a unifying conceptual framework, and for fundamentally changing how we view ourselves as a species and our place in the cosmos. Our understanding of evolution has itself matured as more has been learned since Darwin of mechanisms of inheritance, how changes in development produce changes in phenotype and how genes shape development, and how a diversity of selection mechanisms operating at different levels of the biological hierarchy can supplement "simple" natural selection. As our understanding of evolution in general has matured, so have our interpretations of the phylogenetic relationships among organisms. For example, as advanced molecular sequencing has developed, substantial reorganization of evolutionary relationships among taxa have occurred. Phylogenies that were painstakingly built upon morphological observations have been shattered and rearranged in manners that were once inconceivable. Students in EEOB 3320 learn about modern evolutionary thought, historical phylogenies, how data are analyzed to develop phylogenetic hypotheses, and the basic morphological observations and hypotheses that they make in the studio enable them to interpret and understand the consequences of evolution.

Course Listing and Curriculum Map for the Zoology BA Major

Required supportive courses (do not count towards hours in the major)

Requirements	Semester Course Number	Course Title	Semester Units	Notes	Relevant Program Goals
Biology	BIOL 1113	Introductory Biology	4		1, 2, 3
Biology	BIOL 1114	Introductory Biology	4		1, 2, 3
Math	MATH 1148	College Algebra	5	MATH 1156 also accepted	5
General Chemistry	CHEM 1210, 1220	General Chemistry	10	2 semesters of general chemistry required for program	4
Organic Chemistry	CHEM 2310	Organic Chemistry	4	1 semester organic chemistry required for majors	4
Physics	PHYS 1106 & 1007 OR 1250 & 1251 OR 1200 & 1201	General Physics	10		4
Statistics	STAT 1450	Intro Stats	3		5

Required core courses

Semester Course Number	Course Title	Semester Units	Notes	Relevant Program Goals
EEOB 3310 or 3310H	Evolution	4		1*, 3*, 5*, 6*, 7*
EEOB 3410 or 3410H	Ecology	4		2*, 3*, 5*
MOLGEN 4500	General Genetics	3		1*, 2*, 3*

Elective courses in Biodiversity (choose two)

Semester Course Number	Course Title	Semester Units	Notes	Relevant Program Goals
EEOB 2220	Ohio Birds	2	7-week course	1, 2, 3, 4, 6, 7
EEOB 3320	Organismal Diversity	2		1*, 2*, 3*, 4*, 7*
EEOB 4210	Evolution & Ecology: Vertebrates	2		1*, 2*, 3*, 4*
EEOB 4220	Evolution & Ecology: Mammals	3		1*, 2*, 3*, 4*
EEOB 4230	Evolution & Ecology: Invertebrates	2		1*, 2*, 3*, 4*
EEOB 4410	Conservation Biology	3		2*, 5*, 7*
EEOB 4420H	Tropical Field Studies	2		2*, 5*

Elective courses in Organismal Biology (choose at two)

Semester Course Number	Course Title	Semester Units	Notes	Relevant Program Goals
EEOB 2510	Human Anatomy	3		3, 4
EEOB 3510	Cellular & Developmental Biology	3		1, 3*, 7
EEOB 4510	Comparative Vertebrate Anatomy	3		1*, 3*, 6*
EEOB 4520	Comparative Physiology	3		2*, 3*, 5*
EEOB 4550	Neurobiology of Behavior	3		3**, 5*, 6*
EEOB 4560	Endocrinology	2		1*, 3**, 4*

All elective courses in EEOB that could count toward major (up to 10 semester units)

EEOB 2210	Ohio Plants	2	7-week course	1, 2, 3, 4, 6, 7
EEOB 2220	Ohio Birds	2	7-week course	1, 2, 3, 4, 6, 7
EEOB 2250	Dynamics of Dinosaurs	3	7-week course	1*,3*,6
EEOB 2410	Biological Invasions	3		1, 2, 3, 4, 6, 7
EEOB 2510	Human Anatomy	3		3, 4
EEOB 2520	Human Physiology	3		1, 3, 6, 7
EEOB 2911	The Climate Crisis: Mechanisms, Impact, and Mitigation	4	Cross-listed with EarthSc and Hist	2,6,7*
EEOB 3189	UG Field Experience or Work	1-3		
EEOB 3191	UG Internship	1-3		
EEOB 3193	UG Individual Studies	1-3		
EEOB 3270	Infectious disease ecology, evolution, and tra	3		1*,2*,3,4**,5**,6**,7*
EEOB 3320	Organismal Diversity	3		1*, 2*, 3*, 4*, 7*
EEOB 3420	Behavioral Ecology	4		2*, 3*
EEOB 3510	Cellular & Developmental Biology	3		1, 3*, 7
EEOB 3520	Micro Anatomy	1.5		3**, 4*, 5*, 6*, 7**
EEOB 3797	UG Foreign Study	1-12		
EEOB 3798	UG Study Tour	1-12		
EEOB 4210	Evolution & Ecology: Vertebrates	2		1*, 2*, 3*, 4*
EEOB 4220	Evolution & Ecology: Mammals	3		1*, 2*, 3*, 4*
EEOB 4230	Evolution & Ecology: Invertebrates	2		1*, 2*, 3*, 4*
EEOB 4240	Evolution & Ecology: Plants & People	2		1*, 2*, 3*, 4*, 7*
EEOB 4410	Conservation Biology	3		2*, 5*, 7*
EEOB 4420H	Tropical Field Studies	2		2*, 5*
EEOB 4430	Ecological Methods I	2		2*, 3*, 5
EEOB 4510	Comparative Vertebrate Anatomy	3		1*, 3*, 6*
EEOB 4520	Comparative Physiology	3		2*, 3*, 5*
EEOB 4520H	Comparative Physiology - Honors	3		2*, 3*, 5*
EEOB 4550	Neurobiology of Behavior	3		3**, 5*, 6*
EEOB 4560	Endocrinology	2		1*, 3**, 4*
EEOB 4910	Plant Biology for Teachers (Stone Lab)	2		1*, 2*, 3*
EEOB 4920	Ornithology for Teachers (Stone Lab)	2		1*, 2*, 3*
EEOB 4930	Stream Ecology for Teachers (Stone Lab)	2		2*, 3*
EEOB 4950	Field Ecology (Stone Lab)	2		2*, 3*
EEOB 4998	UG Research	1-3		
EEOB 4998H	UG Research - Honors	1-3		
EEOB 4999	UG Thesis Research	1-5		
EEOB 4999H	UG Thesis Research - Honors	1-5		
EEOB 5189	Field Work	1-4		
EEOB 5194	Bioacoustic Ecology	2		1*,2*,3,4**,5**,6,7**
EEOB 5194	Host-Microbial Symbioses	3		1**, 2**, 3*, 4**, 5**
EEOB 5310	Advanced Evolution	3		1**, 2*, 3**, 4*, 5*, 6**, 7**
EEOB 5320	Society & Evolution	3		1**, 6**, 7**
EEOB 5330	Population Genetics & Phylogeography	3		1**, 4**, 5**
EEOB 5340	Evolution & Taxonomy of Vascular Plants	3		1**, 3**, 6**
EEOB 5350	Evolutionary Ecology	3		1**, 2**, 3*, 5**
EEOB 5410	Ocean Ecology	1.5		2**, 3*, 5*
EEOB 5420	Ecology of Inland Waters	1.5		2**, 3*, 5*
EEOB 5430	Fish Ecology	1.5		2**, 3*, 5*
EEOB 5440	Plankton Ecology	3		2**,3**,4**,5**,6**,7**
EEOB 5450	Population Ecology	3		2**, 5**
EEOB 5460	Physiological Ecology	3		2**, 5**
EEOB 5470	Community & Ecosystem Ecology	3		2**, 3**, 4**, 5**
EEOB 5480	Advanced Plant Ecology	3		1**,2**,3**,5*,6**,7**
EEOB 5490	Insect Behavior: Mechanisms and Function	3	Cross-listed with ENTO 5490	1**,2**,3**,4**,6**,7**
EEOB 5505	Wicked Science	3	Cross-listed with ANTHROP 5505	4*,5,6**
EEOB 5510	Interdisciplinary Team Science	3	Cross-listed with ANTHROP 5510	4*,5,6**
EEOB 5610S	Translating Evolution	3	SL Course in sci comm	1**, 4**, 6**
EEOB 5798	Tropical Behavioral Ecology & Evolution	3	Field course at Smithsonian Tropical Research Institute, Panama	1**, 2**, 3**, 4**, 6**
EEOB 5910	Field Herpetology (Stone Lab)	2	Summer course at Stone Lab	1*, 2*, 3*
EEOB 5920	Field Biology of Aquatic & Wetland Plants (Stone Lab)	3	Summer course at Stone Lab	1*, 2*, 3*
EEOB 5930	Ichthyology (Stone Lab)	3	Summer course at Stone Lab	1*, 2*, 3*
EEOB 5940	Field Zoology (Stone Lab)	3	Summer course at Stone Lab	1*, 2*, 3*
EEOB 5950	Algae Identification Workshop (Stone Lab)	0.5	Summer course at Stone Lab	3*
EEOB 5960	Plankton Identification Workshop (Stone Lab)	0.5	Summer course at Stone Lab	3*
EEOB 5970	Larval Fish Identification Workshop (Stone Lab)	0.5	Summer course at Stone Lab	3*

Program Learning Goals

1. Students are able to describe the processes that underlie evolution and their manifestation in the natural world.
2. Students are able to explain ecological concepts, methods of study, and the interactions among organisms and between organisms and their environment.
3. Students are able to understand organismal diversity and functioning at all levels, from the molecular and cellular to the whole organism, and will understand the interplay between organismal functioning and ecological and evolutionary processes.
4. Students participate in the process of discovery by conducting experimental and observational studies, synthesizing results with the primary literature, and communicating their questions, hypotheses, observations, and experiences to others.
5. Students demonstrate proficiency in mathematics, statistics, computer modeling, and the use of computers, as these topics relate to biology.
6. Students know the theoretical framework of evolution, ecology and organismal biology and understand science as a process, including the history of science as it relates to these three disciplines within biology.
7. Students are aware of current issues in biology, especially those that have significant ethical and societal implications, and will be able to communicate scientific concepts and processes.

Notes

Program goal numbers that have no asterisk indicate a beginner level; * = intermediate level; ** = advanced level.
Honors versions of courses may be substituted in all cases.
No more than three units of S/U credit can count toward the major.

Course Listing and Curriculum Map for the Zoology BS Major

Required supportive courses (do not count towards hours in the major)

Requirements	Semester Course Number	Course Title	Semester Units	Notes	Relevant Program Goals
Biology	BIOL 1113	Introductory Biology	4		1, 2, 3
Biology	BIOL 1114	Introductory Biology	4		1, 2, 3
Math	MATH 1151	Calculus 1	5	MATH 1156 also accepted	5
General Chemistry	CHEM 1210, 1220	General Chemistry	10	2 semesters of general chemistry required for program	4
Organic Chemistry	CHEM 2310 or CHEM 2510 & 2520	Organic Chemistry	4	1 semester organic chemistry required for majors; pre-professional track advised to take 2 semesters	4
Physics	PHYS 1106 & 1007 OR 1250 & 1251 OR 1200 & 1201	General Physics	10		4
Statistics	STAT 2480	Statistics for Life Sciences	3	STAT 2450 also accepted	5

Required core courses

Semester Course Number	Course Title	Semester Units	Notes	Relevant Program Goals
EEOB 3310 or 3310H	Evolution	4		1*, 3*, 5*, 6*, 7*
EEOB 3410 or 3410H	Ecology	4		2*, 3*, 5*
MOLGEN 4500	General Genetics	3		1*, 2*, 3*

Elective courses in Biodiversity (choose two)

Semester Course Number	Course Title	Semester Units	Notes	Relevant Program Goals
EEOB 2220	Ohio Birds	2	7-week course	1, 2, 3, 4, 6, 7
EEOB 3320	Organismal Diversity	2		1*, 2*, 3*, 4*, 7*
EEOB 4210	Evolution & Ecology: Vertebrates	2		1*, 2*, 3*, 4*
EEOB 4220	Evolution & Ecology: Mammals	3		1*, 2*, 3*, 4*
EEOB 4230	Evolution & Ecology: Invertebrates	2		1*, 2*, 3*, 4*
EEOB 4410	Conservation Biology	3		2*, 5*, 7*
EEOB 4420H	Tropical Field Studies	2		2*, 5*

Elective courses in Organismal Biology (choose at two)

Semester Course Number	Course Title	Semester Units	Notes	Relevant Program Goals
EEOB 2510	Human Anatomy	3		3, 4
EEOB 3510	Cellular & Developmental Biology	3		1, 3*, 7
EEOB 4510	Comparative Vertebrate Anatomy	3		1*, 3*, 6*
EEOB 4520	Comparative Physiology	3		2*, 3*, 5*
EEOB 4550	Neurobiology of Behavior	3		3**, 5*, 6*
EEOB 4560	Endocrinology	2		1*, 3**, 4*

All elective courses in EEOB that could count toward major (up to 10 semester units)

EEOB 2210	Ohio Plants	2	7-week course	1, 2, 3, 4, 6, 7
EEOB 2220	Ohio Birds	2	7-week course	1, 2, 3, 4, 6, 7
EEOB 2250	Dynamics of Dinosaurs	3	7-week course	1*,3*,6
EEOB 2410	Biological Invasions	3		1, 2, 3, 4, 6, 7
EEOB 2510	Human Anatomy	3		3, 4
EEOB 2911	The Climate Crisis: Mechanisms, Impact, and Mitigation	4	Cross-listed with EarthSc and Hist	2,6,7*
EEOB 2520	Human Physiology	3		1, 3, 6, 7
EEOB 3189	UG Field Experience or Work	1-3		
EEOB 3191	UG Internship	1-3		
EEOB 3193	UG Individual Studies	1-3		
EEOB 3270	Infectious disease ecology, evolution, and tra	3		1*,2*,3,4**,5**,6**,7*
EEOB 3320	Organismal Diversity	3		1*, 2*, 3*, 4*, 7*
EEOB 3420	Behavioral Ecology	4		2*, 3*
EEOB 3510	Cellular & Developmental Biology	3		1, 3*, 7
EEOB 3520	Micro Anatomy	1.5		3**, 4*, 5*, 6*, 7**
EEOB 3797	UG Foreign Study	1-12		
EEOB 3798	UG Study Tour	1-12		
EEOB 4210	Evolution & Ecology: Vertebrates	2		1*, 2*, 3*, 4*
EEOB 4220	Evolution & Ecology: Mammals	3		1*, 2*, 3*, 4*
EEOB 4230	Evolution & Ecology: Invertebrates	2		1*, 2*, 3*, 4*
EEOB 4240	Evolution & Ecology: Plants & People	2		1*, 2*, 3*, 4*, 7*
EEOB 4410	Conservation Biology	3		2*, 5*, 7*
EEOB 4420H	Tropical Field Studies	2		2*, 5*
EEOB 4430	Ecological Methods I	2		2*, 3*, 5
EEOB 4510	Comparative Vertebrate Anatomy	3		1*, 3*, 6*
EEOB 4520	Comparative Physiology	3		2*, 3*, 5*
EEOB 4520H	Comparative Physiology - Honors	3		2*, 3*, 5*
EEOB 4550	Neurobiology of Behavior	3		3**, 5*, 6*
EEOB 4560	Endocrinology	2		1*, 3**, 4*
EEOB 4910	Plant Biology for Teachers (Stone Lab)	2		1*, 2*, 3*
EEOB 4920	Ornithology for Teachers (Stone Lab)	2		1*, 2*, 3*
EEOB 4930	Stream Ecology for Teachers (Stone Lab)	2		2*, 3*
EEOB 4950	Field Ecology (Stone Lab)	2		2*, 3*
EEOB 4998	UG Research	1-3		
EEOB 4998H	UG Research - Honors	1-3		
EEOB 4999	UG Thesis Research	1-5		
EEOB 4999H	UG Thesis Research - Honors	1-5		
EEOB 5189	Field Work	1-4		
EEOB 5194	Bioacoustic Ecology	2		1*,2*,3,4**,5**,6,7**
EEOB 5194	Host-Microbial Symbioses	3		1**, 2**, 3*, 4**, 5**
EEOB 5310	Advanced Evolution	3		1**, 2*, 3**, 4*, 5*, 6**, 7**
EEOB 5320	Society & Evolution	3		1**, 6**, 7**
EEOB 5330	Population Genetics & Phylogeography	3		1**, 4**, 5**
EEOB 5340	Evolution & Taxonomy of Vascular Plants	3		1**, 3**, 6**
EEOB 5350	Evolutionary Ecology	3		1**, 2**, 3*, 5**
EEOB 5410	Ocean Ecology	1.5		2**, 3*, 5*
EEOB 5420	Ecology of Inland Waters	1.5		2**, 3*, 5*
EEOB 5430	Fish Ecology	1.5		2**, 3*, 5*
EEOB 5440	Plankton Ecology	3		2**,3**,4**,5**,6**,7**
EEOB 5450	Population Ecology	3		2**, 5**
EEOB 5460	Physiological Ecology	3		2**, 5**
EEOB 5470	Community & Ecosystem Ecology	3		2**, 3**, 4**, 5**
EEOB 5480	Advanced Plant Ecology	3		1**,2**,3**,5*,6**,7**
EEOB 5490	Insect Behavior: Mechanisms and Function	3	Cross-listed with ENTO 5490	**,2**,3**,4**,6**,7**
EEOB 5505	Wicked Science	3	Cross-listed with ANTHROP 5505	4*,5,6**
EEOB 5510	Interdisciplinary Team Science	3	Cross-listed with ANTHROP 5510	4*,5,6**
EEOB 5610S	Translating Evolution	3	SL Course in sci comm	1**, 4**, 6**
EEOB 5798	Tropical Behavioral Ecology & Evolution	3	Field course at Smithsonian Tropical Research Institute, Panama	1**, 2**, 3**, 4**, 6**
EEOB 5910	Field Herpetology (Stone Lab)	2	Summer course at Stone Lab	1*, 2*, 3*
EEOB 5920	Field Biology of Aquatic & Wetland Plants (Stone Lab)	3	Summer course at Stone Lab	1*, 2*, 3*
EEOB 5930	Ichthyology (Stone Lab)	3	Summer course at Stone Lab	1*, 2*, 3*
EEOB 5940	Field Zoology (Stone Lab)	3	Summer course at Stone Lab	1*, 2*, 3*
EEOB 5950	Algae Identification Workshop (Stone Lab)	0.5	Summer course at Stone Lab	3*
EEOB 5960	Plankton Identification Workshop (Stone Lab)	0.5	Summer course at Stone Lab	3*
EEOB 5970	Larval Fish Identification Workshop (Stone Lab)	0.5	Summer course at Stone Lab	3*

Program Learning Goals

1. Students are able to describe the processes that underlie evolution and their manifestation in the natural world.
2. Students are able to explain ecological concepts, methods of study, and the interactions among organisms and between organisms and their environment.
3. Students are able to understand organismal diversity and functioning at all levels, from the molecular and cellular to the whole organism, and will understand the interplay between organismal functioning and ecological and evolutionary processes.
4. Students participate in the process of discovery by conducting experimental and observational studies, synthesizing results with the primary literature, and communicating their questions, hypotheses, observations, and experiences to others.
5. Students demonstrate proficiency in mathematics, statistics, computer modeling, and the use of computers, as these topics relate to biology.
6. Students know the theoretical framework of evolution, ecology and organismal biology and understand science as a process, including the history of science as it relates to these three disciplines within biology.
7. Students are aware of current issues in biology, especially those that have significant ethical and societal implications, and will be able to communicate scientific concepts and processes.

Notes

Program goal numbers that have no asterisk indicate a beginner level; * = intermediate level; ** = advanced level.
Honors versions of courses may be substituted in all cases.
No more than three units of S/U credit can count toward the major.

Course Listing and Curriculum Map for the Evolution and Ecology Major

Required supportive courses (do not count towards hours in the major)

Requirements	Semester Course Number	Course Title	Semester Units	Notes	Relevant Program Goals
Biology	BIOL 1113	Introductory Biology	4		1, 2, 3
Biology	BIOL 1114	Introductory Biology	4		1, 2, 3
Math	MATH 1151	Calculus 1	5		5
General Chemistry	CHEM 1210, 1220	General Chemistry	10		4
Organic Chemistry	CHEM 2310 or CHEM 2510 1250 & 1251 OR 1200	Organic Chemistry	4		4
Physics	& 1201	General Physics	10		4
Statistics	STAT 2480	Statistics for Life Sciences	3		5

Required core courses

Requirements	Semester Course Number	Course Title	Semester Units	Notes	Relevant Program Goals
	EEOB 3310 or 3310H	Evolution	4		1*, 3*, 5*, 6*, 7*
	EEOB 3410 or 3410H	Ecology	4		2*, 3*, 5*
	BIOL 3401	Integrated Biology	4		1*, 2*, 3*
	MATH or STAT	Advanced quantitative analysis course			5*

Elective courses in Biodiversity (choose at least two)

Requirements	Semester Course Number	Course Title	Semester Units	Notes	Relevant Program Goals
	EEOB 2210	Ohio Plants	2		1, 2, 3, 4, 6, 7
	EEOB 2220	Ohio Birds	2		1, 2, 3, 4, 6, 7
	EEOB 3320	Organismal Diversity	2		1*, 2*, 3*, 4*, 7*
	EEOB 4210	Evolution & Ecology: Vertebrates	2		1*, 2*, 3*, 4*
	EEOB 4220	Evolution & Ecology: Mammals	3		1*, 2*, 3*, 4*
	EEOB 4230	Evolution & Ecology: Invertebrates	2		1*, 2*, 3*, 4*
	EEOB 4240	Evolution & Ecology: Plants & People	2		1*, 2*, 3*, 4*, 7*

Elective courses in Evolution and Ecology (choose at least two)

Requirements	Semester Course Number	Course Title	Semester Units	Relevant Program Goals	Relevant Program Goals
	EEOB 3420	Behavioral Ecology	4		2*, 3*
	EEOB 4410	Conservation Biology	3		2*, 5*, 7*
	EEOB 4420	Tropical Field Studies	2		2*, 5*
	EEOB 4430	Ecological Methods I	1		2*, 3*, 5
					1**, 2*, 3**, 4*, 5*, 6**, 7**
	EEOB 5310	Advanced Evolution	3		7**
	EEOB 5320	Creation & Evolution	3		1**, 6**, 7**
	EEOB 5410	Ocean Ecology	1.5		2**, 3*, 5*
	EEOB 5420	Ecology of Inland Waters	1.5		2**, 3*, 5*
	EEOB 5430	Fish Ecology	1.5		2**, 3*, 5*
	EEOB 5450	Population Ecology	3		2**, 5*
	EEOB 5460	Physiological Ecology	3		2**, 5*
	EEOB 5470	Community Ecosystem Ecology	3		2**, 3**, 4**, 5**

All elective courses in EEOB that could count toward major

	EEOB 2210	Ohio Plants	2		1, 2, 3, 4, 6, 7
	EEOB 2220	Ohio Birds	2		1, 2, 3, 4, 6, 7
	EEOB 2250	Dynamics of Dinosaurs	3		1*,3*,6
	EEOB 2410	Biological Invasions	3		1, 2, 3, 4, 6, 7
	EEOB 2510	Human Anatomy	3		3, 4
	EEOB 2520	Human Physiology	3		1, 3, 6, 7
	EEOB 2911	The Climate Crisis: Mechanisms, Impact, and Mitigation	4	Cross-listed with EarthSc and History	2,6,7*
	EEOB 3189	UG Field Experience or Work	1-3		
	EEOB 3191	UG Internship	1-3		
	EEOB 3193	UG Individual Studies	1-3		
	EEOB 3270	Infectious disease ecology, evolution, and transmission	3		1*,2*,3,4**,5**,6**,7*
	EEOB 3320	Organismal Diversity	3		1*, 2*, 3*, 4*, 7*
	EEOB 3420	Behavioral Ecology	4		2*, 3*
	EEOB 3510	Cellular & Developmental Biology	3		1, 3*, 7
	EEOB 3520	Micro Anatomy	1-5		3**, 4*, 5*, 6*, 7**
	EEOB 3797	UG Foreign Study	1-12		
	EEOB 3798	UG Study Tour	1-12		
	EEOB 4210	Evolution & Ecology: Vertebrates	2		1*, 2*, 3*, 4*
	EEOB 4220	Evolution & Ecology: Mammals	3		1*, 2*, 3*, 4*
	EEOB 4320	Evolution & Ecology: Invertebrates	2		1*, 2*, 3*, 4*
	EEOB 4240	Evolution & Ecology: Plants & People	2		1*, 2*, 3*, 4*, 7*
	EEOB 4410	Conservation Biology	3		2*, 5*, 7*
	EEOB 4420H	Tropical Field Studies	2		2*, 5*
	EEOB 4430	Ecological Methods I	2		2*, 3*, 5
	EEOB 4510	Comparative Vertebrate Anatomy	3		1*, 3*, 6*
	EEOB 4520	Comparative Physiology	3		2*, 3*, 5*
	EEOB 4520H	Comparative Physiology - Honors	3		2*, 3*, 5*
	EEOB 4550	Neurobiology of Behavior	3		3**, 5*, 6*
	EEOB 4560	Endocrinology	2		1*, 3**, 4*
	EEOB 4910	Plant Biology for Teachers (Stone Lab)	2		1*, 2*, 3*
	EEOB 4920	Ornithology for Teachers (Stone Lab)	2		1*, 2*, 3*
	EEOB 4930	Stream Ecology for Teachers (Stone Lab)	2		2*, 3*
	EEOB 4950	Field Ecology (Stone Lab)	2		2*, 3*
	EEOB 4998	UG Research	1-3		
	EEOB 4998H	UG Research - Honors	1-3		
	EEOB 4999	UG Thesis Research	1-5		
	EEOB 4999H	UG Thesis Research - Honors	1-5		
	EEOB 5189	Field Work	1-4		
	EEOB 5194	Bioacoustic Ecology	2		1*,2*,3,4**,5**,6,7**
	EEOB 5194	Host-Microbial Symbioses	3		1**, 2**, 3*, 4**, 5**
					1**, 2*, 3**, 4*, 5*, 6**, 7**
	EEOB 5310	Advanced Evolution	3		7**
	EEOB 5320	Society & Evolution	3		1**, 6**, 7**
	EEOB 5330	Population Genetics & Phylogeography	3		1**, 4**, 5**
	EEOB 5340	Evolution & Taxonomy of Vascular Plants	3		1**, 3**, 6**
	EEOB 5350	Evolutionary Ecology	3		1**, 2**, 3*, 5**
	EEOB 5410	Ocean Ecology	1.5		2**, 3*, 5*
	EEOB 5420	Ecology of Inland Waters	1.5		2**, 3*, 5*
	EEOB 5430	Fish Ecology	1.5		2**, 3*, 5*
	EEOB 5440	Plankton Ecology	3		2**,3**,4**,5**,6**,7**
	EEOB 5450	Population Ecology	3		2**, 5**
	EEOB 5460	Physiological Ecology	3		2**, 5**
	EEOB 5470	Community & Ecosystem Ecology	3		2**, 3**, 4**, 5**
	EEOB 5480	Advanced Plant Ecology	3		1**,2**,3**,5*,6**,7**
	EEOB 5490	Insect Behavior: Mechanisms and Function	3	Cross-listed with ENTO 5490	1**,2**,3**,4**,6**,7***
	EEOB 5505	Wicked Science	3	Cross-listed with ANTHROP 5505	4*,5,6**
	EEOB 5510	Interdisciplinary Team Science	3	Cross-listed with ANTHROP 5510	4*,5,6**
	EEOB 56105	Translating Evolution	3	SL Course in sci comm	1**, 4**, 6**
				Field course at Smithsonian Tropical	
	EEOB 5798	Tropical Behavioral Ecology & Evolution	3	Research Institute, Panama	1**, 2**, 3**, 4**, 6**
	EEOB 5910	Field Herpetology (Stone Lab)	2		1*, 2*, 3*
	EEOB 5920	Field Biology of Aquatic & Wetland Plants (Stone Lab)	3		1*, 2*, 3*
	EEOB 5930	Ichthyology (Stone Lab)	3		1*, 2*, 3*
	EEOB 5940	Field Zoology (Stone Lab)	3		1*, 2*, 3*
	EEOB 5950	Algae Identification Workshop (Stone Lab)	0.5		3*
	EEOB 5960	Plankton Identification Workshop (Stone Lab)	0.5		3*
	EEOB 5970	Larval Fish Identification Workshop (Stone Lab)	0.5		3*

Program Learning Goals

1. Students are able to describe the processes that underlie evolution and their manifestation in the natural world.
2. Students are able to explain ecological concepts, methods of study, and the interactions among organisms and between organisms and their environment.
3. Students are able to understand organismal diversity and functioning at all levels, from the molecular and cellular to the whole organism, and will understand the interplay between organismal functioning and ecological and evolutionary processes.
4. Students participate in the process of discovery by conducting experimental and observational studies, synthesizing results with the primary literature, and communicating their questions, hypotheses, observations, and experiences to others.
5. Students demonstrate proficiency in mathematics, statistics, computer modeling, and the use of computers, as these topics relate to biology.
6. Students know the theoretical framework of evolution, ecology and organismal biology and understand science as a process, including the history of science as it relates to these three disciplines within biology.
7. Students are aware of current issues in biology, especially those that have significant ethical and societal implications, and will be able to communicate scientific concepts and processes.

Notes

Program goal numbers that have no asterisk indicate a beginner level; * = intermediate level; ** = advanced level.
Honors versions of courses may be substituted in all cases.
No more than three units of S/U credit can count toward the major.