2018 Application Form for
ASC Grants for New Service-Learning Course Proposals

Application Deadline: February 5, 2018

You MUST use this form to submit your proposal. Please send submission (form and supplementary materials) to Linda Hood (hood.82@osu.edu), Executive Assistant to Associate Executive Dean Steven Fink.

1. **Working Title of Course Proposal**
   EEOB 5610, Translating Evolution
2. **Applicant Information**
   - Name: Marymegan Daly
   - Title: Professor
   - Department: Evolution, Ecology, and Organismal Biology
   - Address: Museum of Biological Diversity, 1315 Kinnear Rd Columbus OH 43212
   - Phone: 614-596-3824
   - E-mail: daly.66@osu.edu

3. **Course Description**
   - Provide general description of course goals of proposed course.

     Overview: This is a hands-on study of the theory and practice of informal science education, with an emphasis on the translation of concepts and research on evolutionary biology to non-specialist audiences.

     Course Objectives and Learning Outcomes: This course is a practicum that provides hands-on training in informal education about evolution. The focus is on the programs and exhibits of the Center of Science and Industry (COSI @ http://cosi.org/). Students will spend a significant portion of their time at COSI actively engaged demonstrations about evolution and natural history, and learn how to measure outcomes. In successfully completing this course, students will learn to:

     1) **Identify** diverse platforms and methods for informal science communication

     2) **Recognize and be able to defend** the rationale for and impact of informal science education.

     3) **Explain and apply** examples of assessment for informal science education products.

     4) **Collaborate** with natural history scientists and representatives of partner organizations to identify ways in which the scientists' research can be translated for the audience of the partner organization.

     5) **Develop and demonstrate** an outreach product for a partner organization that uses research findings of the scientist.

     6) **Propose** refinements to and an assessment plan for their outreach product.

   - Provide general description of service-learning component of the course.

     Students will work with educators and scientific staff at COSI to develop an interactive that supports the new Dinosaur Gallery permanent exhibit.

- Provide general explanation of how service-learning activities will contribute to the course goals.

  The interactive designed and demo'ed at COSI is the testing ground for the lessons learned about evolutionary biology and informal science communication. Working with COSI educators is a 'real world' practicum in the methods and challenges of informal science communication. Through the development and demonstration of the interactive and its assessment plan, students will accomplish all or part of Outcomes 3, 4, 5, and 6.

- Optional: Should you happen to already have a tentative syllabus (with course number), please provide it. Please see attached. Note that no assessment is proposed in the initial (non- Service-Learning) submission; we recognize that this will need to be done for designation as a Service-Learning course.

4. Community Focus and Reciprocity

- Identify and provide a brief profile of the intended community partner(s). (If a specific partnership has not yet been confirmed at the time of the grant proposal, provide a clear explanation of the kind of community partner(s) being sought and provide some examples of appropriate candidates for community partner(s).) *Community partners must be tax-exempt nonprofits or organizations with an easily identified public service component to their mission*.

  We plan to work with COSI, a Columbus-based public-serving interactive science center. More than 700,000 visitors visit COSI annually. COSI has several ongoing partnerships with OSU through its "Life in Labs" program. Our initiative provides support for COSI's new venture into Natural History.

- Describe the community partners' participation in the development of the service project.

  We have been working with COSI to support their staff and programming efforts for their new Natural history galleries. We have held several meetings (some involving COSI director Frederick Berteley and OSU Senior Associate VP for Research Jan Weisenberger) to sketch out priorities and opportunities for collaboration. This course is the result of those discussions.

- How does the service project reflect priorities and stated goals/needs of community partners and collaborative planning by all partners?

  COSI's mission is to motivate a better understanding of science "through involvement in exhibits, demonstrations, and a variety of educational activities and experiences." The proposed collaboration will support COSI in this mission by engaging OSU students as innovators and translators of supportive, interactive exhibits. We do this by having students study communication, informal science education, and evolutionary biology so that they can develop mobile mini-exhibits that highlight the evolutionary and ecological context for the Dinosaur Gallery.

  This new course will serve COSI by developing supplemental, interactive activities for the Dinosaur Gallery and will serve students by providing them with opportunities to translate sophisticated, discipline-specific knowledge into activities that support learning in diverse audiences. This model of having OSU students engage the COSI public with discipline-specific science content has been successfully implemented in e.g., Pharmacy, Optometry, and Language Science.

  Experience in the communication of STEM concepts is foundational to successful employment in the field, but is not generally part of the coursework required of majors in the sciences. At the graduate level, outreach and communication training is similarly absent, and when present emphasizes classroom teaching. Nonetheless, museums and science centers can play a critical role in developing interest in STEM fields (Rennie & McClafferty, 1995) and are key to the success and engagement of many groups not currently well-represented in STEM (Adams et al., 2014; Whitesell, 2016). Thus, the

proposed partnership provides training to current student and pathways for retention and recruitment for current and future students.

- Describe the anticipated community benefit and impact of the service project.

  The activities and interactives developed by participants in this course will enrich the visitor experience at COSI. The Dinosaur Galleries and the new Natural History exhibits that will follow represent a major investment by COSI, part of a city-supported plan to increase the visibility of COSI among the other large, interactive science museums across the country. These exhibits are not developed in-house at COSI, and extend beyond to content expertise of their educators and staff scientists, who have generally been trained in physical science and engineering.

  The challenge for COSI in this new endeavor is in innovating the educational experiences that accompany the long-term exhibits. Interactivity in informal science environments has been identified as a core feature for supporting effective learning (Fenichel & Schweingruber, 2010). It is also essential to generating repeat visits and to customizing the experience to the educational goals of the visitors. K-12 students make up the majority of COSI's visitors, and COSI has programs for working with under-resourced school districts and with home schools. In supporting COSI to expand and customize the interactive aspects of the new Natural History galleries, our program will enrich and extend the educational experience for COSI attendees.

5. Letter of Support from Department Chair

- Letter should provide departmental support for offering the service-learning course on a continuing basis once approved.
- Please see attached.

- Letter should also address how the course plays into the department's curriculum. For example, will course be an elective that will count toward the minor? Will it request General Education status?

References Cited

Adams, J. D., Gupta, P., & Cotumaccio, A. (2014). Long-term participants: a museum program enhances girls' STEM interest, motivation, and persistence. *Afterschool Matters*, *20*, 13-20.

Fenichel, M. & Schweingruber, H. A. (2010). *Surrounded by science: Learning science in informal environments*. National Academies Press.

Rennie, L. J., & McClafferty, T. (1995). Using visits to interactive science and technology centers, museums, aquaria, and zoos to promote learning in science. *Journal of Science Teacher Education*, *6*, 175-185.

Whitesell, E. R. (2016). A day at the museum: The impact of field trips on middle school science achievement. *Journal of Research in Science Teaching*, *53*(7), 1036-1054.

Translating evolution
EEOB 5610
Spring 2019

3 credit hours **Time :TBD** **Place: TBD**

Instructor Info:

Marymegan Daly
daly.66@osu.edu
Office hours: By appointment

Katherine O'Brien
obrien.758@osu.edu
Office hours: By appointment

Overview: This is a hands-on study of the theory and practice of informal science education, with an emphasis on the translation of concepts and research on evolutionary biology to non-specialist audiences.

Course Objectives and Learning Outcomes: This course is a practicum that provides hands-on training in informal education about evolution. The focus is on the programs and exhibits of the Center of Science and Industry (COSI @ http://cosi.org/). Students will spend a significant portion of their time at COSI actively engaged demonstrations about evolution and natural history, and learn how to measure outcomes. In successfully completing this course, students will learn to:

Identify diverse platforms and methods for informal science communication

Recognize and be able to defend the rationale for and impact of informal science education.

Explain and apply examples of assessment for informal science education products.

Collaborate with natural history scientists and representatives of partner organizations to identify ways in which the scientists' research can be translated for the audience of the partner organization.

Develop and demonstrate an outreach product for a partner organization that uses research findings of the scientist.

Propose refinements to and an assessment plan for their outreach product.

Prerequisites: Students are required to have successfully completed EEOB 3310 or to have completed 10 credits in undergraduate biological sciences.

Course Materials: Course materials, reading assignments, homework, Small Group Session activities, etc. will be available on the course web site on Carmen (carmen.osu.edu). In addition, every student will be expected to have available a rigorous introductory biology textbook targeted for science majors to use as a reference book. Any recent edition of Campbell's Biology is an appropriate reference work.

Course Requirements: This course requires a large time commitment and a willingness to take responsibility for doing independent and collaborative work. Your final letter grade in this course will reflect both your participation in all required activities and the quality of your performance in those activities. Note, you must meet with Drs. Daly and O'Brien during the first week of the class to set up your individualized schedule and requirements for the semester. **You must complete CITI training.**

Final Grade:
Attendance and Participation (15%)
Assignment (25%)
COSI observations (10%)
Grant Proposal (20%)
Final Interactive (30%)

Grades will follow the standard OSU grading scheme: **A** (93-100); **A-** (90-92.9); **B+** (87-89.9); **B** (83-86.9); **B-** (80-82.9); **C+** (77-79.9); **C** (73-76.9); **C-** (70-72.9); **D+** (67-69.9); **D** (60-66.9); **E** (59.9-0).

• *Attendance (15% of your grade).* You are expected to attend all scheduled classes AND your independently scheduled COSI hours. For in-class hours, please note that you must not only attend, but be a prepared and an active participant in class.

In addition, you will also be scheduling hours to work at COSI. In general, you will be working 15 - 25 hours with or at COSI over the semester. See the scheduling handout for full instructions about how to choose your hours and use the hours tracking program.

It is UNACCEPTABLE for you to skip class or to skip your scheduled COSI hours. You will have some control over when to schedule your COSI times and you are expected to choose times that you can make. <u>If you miss more than two class meetings or two COSI shifts you may lose ALL of your attendance points.</u> All explanations for absences must be submitted to the instructors via the email function on Carmen ONLY. You MUST indicate the date(s) you missed/will miss AND provide an explanation and documentation with the submission. Absence explanations must be submitted in advance or within 24 hours after any absence (later than 24 hours after any absence will not be accepted). We make every effort to respond to absences quickly; all absences will be reviewed & responded to within 24 hours.

• *Assignments (25% of your grade).* Over the semester, there will be a variety of assignments for you to turn in. These will each be graded based on whether you turned them in on-time and made a good-faith effort to do them right. These will help us identify skills for which you need support, scaffold your progress with readings and with the development of your interactive, and allow us to assess your attainment of the learning goals. These assignments are described in detail on the Carmen site and deadlines are listed in the schedule below.

-- Five (5) Journal entries ("write-ups" in the schedule below) (10%)
-- Stats primer homework (5 %)
-- COSI Reflection Paper (5 %)
-- Comments on other's work at the gallery walk (5%)

• *COSI Observation (10% of your grade).* Part of your COSI responsibilities involve talking to the visitors at COSI. You will be observed by an instructor at COSI interacting with visitors and will be evaluated on whether (and how effectively) you implement the practices and strategies that have been discussed in class.

• *Grant Proposal and Gallery walk (20% of your grade).* Each student will submit a proposal for an interactive installation from a list of possible topics (topics not on the list can be discussed with the instructors and used with written approval) . Each student will produce a written grant proposal that describes the need, implementation and assessment/outcomes for your project. Each student will prepare a summary of his/her idea to workshop with the class; a subset of these will be developed by small groups. This assignment is described in detail on the Carmen site and deadlines are listed in the schedule below.

• *Final Interactive (30% of your grade).* As a group, you will build and demo your interactive. The final project should contain an artist statement, learning goals, a script, a list of materials, and a contributions statement that outlines what each group member contributed. Individual grades will be assigned for this project. The assignment is described in detail on the Carmen site and deadlines are listed in the schedule below.

Technology: This course requires computer use, access to a statistical package (R, MS Excel, JMP etc.), and internet access. We will post assignments, readings, web sites, grades, & other information for the class on Carmen. Periodic announcements will be sent via email using the email address linked to your Carmen account (this is almost always your OSU email address). **We expect you to check this email address once a day and to respond promptly to any email requests you receive.**

Books and Other Resources: We will provide you with PDF copies of the required readings. We will use several excerpts from a few books; these are referred to by title in the Schedule below.

- The Participatory Museum, Nina Simon (2010)
- The Grant Application Writer's Handbook, The National Science Foundation (2017)
- Surrounded by Science, Marilyn Fenichel and Heidi Schweingruber (2010)

Statement on Disabilities and Accommodation: The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on a disability (including mental health, chronic or temporary medical conditions), please let us know immediately so that we can privately discuss options. To establish reasonable accommodations, we may request that you register with Student Life Disability Services. After registration, make arrangements with us as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. **SLDS contact information:** slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

Academic Misconduct:

The Ohio State University's Code of Student Conduct (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the

University, or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying work of another student, possession of unauthorized materials during an examination. Ignorance of the University's Code of Student Conduct is never considered and "excuse" for academic misconduct. If we suspect that a student has committed academic misconduct in this course, we are obligated by University Rules to report our suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the University's Code of Student Conduct, the sanctions for the misconduct could include a failing grade in this course and/or suspension or dismissal from the University. For additional information, see the Code of Student Conduct (http://studentaffairs.osu.edu/info_for_students/csc.asp).

Grievances and Solving Problems:

According to University Policies (available from the Division of Student Affairs), if you have a problem with this class, you should seek to resolve a grievance concerning a grade or academic practice by speaking first with the professor. Then, if necessary, with the department chairperson, college dean, and provost, in that order. Specific procedures are outlined in Faculty Rule 3335-7-23, which is available from the Office of Student Life, 208 Ohio Union.

Statement on Diversity:

The Department of Evolution, Ecology, and Organismal Biology Ecology 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. Discrimination against any individual based on 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. If you experience or witness discrimination, you are encouraged to report it to the instructors so that they can address unacceptable behavior or remediate unacceptable situations.

Sexual misconduct/relationship violence:

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at http://titleix.osu.edu or by contacting the Ohio State Title IX Coordinator, Kellie Brennan, at titleix@osu.edu

Safe Ride Service:

Safe Ride (614-292-3322) is a service provided to university students, faculty, and staff who would like safe transportation across campus. Rides are scheduled on a first-come first-serve basis. Phone lines open at 7pm and rides are available until 3am. For more information and service boundaries, please visit https://dps.osu.edu/safe-ride.

Topics and Schedule
At a Glance

week	topic	Assignment due
Jan 7	Goals and structure of the course	
Jan 14	Goals of Informal Science Education	Journal #1
Jan 21	Role of Museums in Informal Science Education	Journal #2
Jan 28	Myths and Misconceptions about Evolution	Journal #3
Feb 4	Intro to COSI	
Feb 11	Assessing Success in Informal Science	Journal #4
Feb 18	Telling a story	Statistics worksheet
Feb 25	Grant writing	
Mar 4	Peer Review of grants	Grant proposal
	Spring Break	
Mar 18	Work week -COSI	Gallery walk
Mar 25	Myth of the "general public"	Journal #5
April 1	Present with COSI personnel	Draft for Interactive
April 8	Work week -COSI	
April 15	Showcase interactives	Interactive
Final		Final write-up of Interactive

Schedule In Detail (with assignments)

Week 1 Goals and Structure of this Course

- **Before you come:** Nothing to prepare.
- **In class:** Introduction to course and all course requirements
  What's on Carmen and how to work with it
  Museums as a part of science education
  Overview of human research ethics
  Start your CITI/COI Training (see handout for directions)
- **Turn in:** Nothing to turn in

Week 2 Goals of Informal Science Education

- **Before you come:** Complete your CITI/COI Training (see handout for directions)
  Read "Of course Scientists Can Communicate"
  Read Part 1 pages 1-34 of "Surrounded by Science"
- **In class** Informal Science: Discuss reading
  What are we supposed to be accomplishing with our outreach?
  What makes informal science different from science education?
- **Turn in:** **1)** Complete CITI/COI. *We will check that you did this online*.
  AND
  2) Journal entry #1 prompt: addressing personal experience with informal science ed

Week 3 Role of Museums in Informal Education

- **Before you come:** Read "The Museum Visit: an experience, not a lesson"
  Read "The Convergence of Informal Science Education and Science Communication"
  Read "Understanding and Engagement in Places of Science Experience: Science Museums, Science Centers, Zoos, and Aquariums"
- **In class** Rise of museum - the gilded age
  The shifting purpose of museums
  What is a Juicy Question and how do we engage people?
- **Turn in:** Journal entry #2 prompt: museums and memory

Week 4 **Myths and Misconceptions about Evolution**

- **Before you come:** Read: Williams 2009 "Belief versus acceptance: Why do people not believe in evolution?"
  Read: "A conceptual guide to natural history museum visitors' understanding of evolution"

- **In class** History of evolution and natural history
  Common misconceptions
  Hands-on demos to overcome misconceptions
  Exploring your favorite story

- **Turn in:** Journal #3 prompt "favorite evolution story"

Week 5 **Introduction to COSI at COSI!!!!!**

- **Before you come:**
  Read Ch 1 ("The principles of participation") in The Participatory Museum
  Visit COSI website, review their program offerings, mission statement, etc.

- **In class** COSI Onboarding
  Tour of Natural History Exhibits and of COSI
  Tour of demos on the floor
  Overview of COSI programs

- **Turn in:** Nothing to turn in. BUT start thinking of ideas for our interactive project

Week 6 **Assessing Informal Education**

- **Before you come:** Read: "Crafting Museum Experiences in Light of Research on Learning: Implications of the National Research Council's Report on Informal Science Education"
  Read Ch 10 ("Evaluating impact") in The Participatory Museum and pp 103-118 in Surrounded by Science
  optional: "Statistical Literacy"

- **In class** **qualitative and quantitative research methods**
  model survey formation
  discuss observational studies
  place of evaluators in museum experiences

- **Turn in:** Journal 4 prompt "COSI experience"

Week 7 **Telling a Story**

- **Before you come:** "The Particular Aspects of Science Museum Exhibits That Encourage Students' Engagement"
  "The importance of Storytelling in science"
  "Using narratives and storytelling to communicate science with non-expert audience"

- **In class** Basics of storytelling
  introduction into template
  - in class writing activity-
    Simplified "not dumbed down"
    Go back to our favorite evolution story and revise

- **Turn in:** **1)** Statistics worksheet
  AND
  2) Last week to meet to talk about project idea

Week 8 **Grant Writing**

- **Before you come:** Kelsky, **"**The Professor is in foolproof guide to grant writing"
  Russell & Morrison, The Grant Application Writer's Workbook

- **In class** Why we write grants
  Types of granting agency
  Format of our class grant
  Telling a compelling story
  Making Figures that inform and interest

- **Turn in:** nothing to turn in

Week 9 **Peer Review of Grants**

- **Before you come:** Finish strong draft of your grant (see week 8 content)

- **In class** Overview to grant selection process
  workshop grants in small groups

- **Turn in:** Your grant proposal

Week 10 **SPRING BREAK**

Week 11 **Workshop week**

- **Before you come:** Read the executive summaries on carmen
- **In class** Gallery walk and determine which projects will be done for interactives through review board
- **Turn in:** Gallery walk notes **and** rankings worksheet (end of week)

Week 12 **Myth of the "General Public": Understanding your audience**

- **Before you come:** 139 -159 in Surrounded by Science
- **In class** Informal Science: *What are visitors trying to get out of COSI?*
  -visitor
  -after dark
  -other
  Go through types of outreach activities
  Discussion of final demo guidelines assignment
- **Turn in:** Journal #5 prompt your informal science outing

Week 13 **Present drafts with COSI personal**

- **Before you come:** Your draft should be ready to present to our COSI guests
- **In class** Workshop: everyone provide feedback on interactives
- **Turn in:** **DRAFT of interactives**

Week 14 **Workshop Week**

- **In class** Work on interactive
- **Turn in:** nothing to prepare

Week 15 **Showcase Interactives**

- **In class** Work on interactive
- **Turn in:** Final project with write-up with instructions

THE OHIO STATE UNIVERSITY

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4 February 2018

Dr. Steve Fink, Associate Executive Dean for Curriculum and Instruction
College of Arts and Science
114 University Hall

Dear Dean Fink:

I am writing to indicate my strong support for the proposal by Drs. Meg Daly and Katherine O'Brien for an ASC Service-Learning Course Grant. This support will be used to add a service-learning element to their course EEOB 5610, "Translating Evolution." This is a newly-developed course that is in the approval queue as a dual-enrollment course for our majors and graduate students. It meets a need that our program has identified for hands-on training in communication and complements our newly developed courses in science communication and proposal writing. We think it will appeal to students who want to teach at the K-12 level or who intend careers in public-facing institutions like zoos, science centers, and natural history museums. It will also support our graduate students in developing skills relevant to non-academic careers and in practicing the kinds of broader impacts that they will be asked to develop in grant applications.

EEOB 5610 is a majors-level course that will serve students in the Evolution & Ecology, Zoology, and Biology majors, and that can also act as an elective in the Evolution and Ecology minor. We do not intend to seek GE approval for this course.

We plan to offer EEOB 5610 every other year, as part of Dr. Daly's regular teaching assignment. The planned schedule of offering aligns with our initial estimate of enrollment demand and with Dr. Daly's other teaching obligations. Our intention to offer this course is not contingent on its approval as a Service-Learning course, and attainment of status as a Service-Learning course will not change our planned schedule of offering.

I appreciate your considering this proposal. The support that this grant would provide will make a meaningful impact on our curriculum and therefore on the success of our students.

Sincerely,

John V. Freudenstein, PhD
Professor & Chair

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	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	Organic Chemistry	4	4
Physics	PHYS 1250 & 1251	General Physics	10	4
Statistics	STAT 2480	Statistics for Life Sciences	3	5

Required core courses

Requirements	Semester Course Number	Course Title	Semester Units	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*
	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	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
	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
	EEOB 5310	Advanced Evolution	3	1**, 2*, 3**, 4*, 5*, 6**, 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	1.5	1, 3
	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 3189	UG Field Experience or Work	1-3	
	EEOB 3191	UG Internship	1-3	
	EEOB 3193	UG Individual Studies	1-3	

EEOB 3194	UG Group Studies	1-3	
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 5310	Advanced Evolution	3	1**, 2*, 3**, 4*, 5*, 6**, 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**
EEOB 5610	Translating Evolution	3	1**, 4**, 6**
EEOB 5798	Tropical Behavioral Ecology & Evolution	3	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.