Term Information

Effective Term	Autumn 2024

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	2260
Course Title	Discovering Biodiversity using Integrative Research
Transcript Abbreviation	Biodiv Research
Course Description	This course-based undergraduate research experience (CURE) will build science literacy and critical thinking skills by focusing on captivating ecological relationships and the conservation of biodiversity. Students will develop proficiencies and content knowledge about the origins and evolution of local and global natural systems.
Semester Credit Hours/Units	Fixed: 4

Offering Information

Length Of Course	14 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	Yes
Is any section of the course offered	Less than 50% at a distance
Grading Basis	Letter Grade
Repeatable	No
Course Components	Laboratory, Lecture, Field Experience
Grade Roster Component	Lecture
Credit Available by Exam	No
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Columbus, Lima, Mansfield, Marion, Newark, Wooster

Prerequisites and Exclusions

Prerequisites/Corequisites	
Exclusions	
Electronically Enforced	No

Cross-Listings

Cross-Listings	

Subject/CIP Code

Subject/CIP Code	26.1310
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

Course Details

Course goals or learning objectives/outcomes

- understand scientific methods used in experimental and descriptive research.
- understand ecological and evolutionary processes that influence biodiversity while appreciating the associated ethical and societal issues.
- articulate to a broad audience how science is conducted and relates to the world.

Content Topic List

- • Ecology and Evolution of natural systems
  • Integrative taxonomy
  • Origins and evolution of diversity
  • Connecting with and conserving nature

Sought Concurrence

No

Attachments

- 1_EEOB2260_Biodiv_O&E_Syllabus 6Dec23_FINAL.docx: Syllabus
  (Syllabus. Owner: Hamilton,Ian M)
- 3_Research and Creative Inquiry 6Dec23_FINAL.docx: GE Research and Creative Inquiry Form
  (Other Supporting Documentation. Owner: Hamilton,Ian M)
- 4_Origins-evolution-FORM_18Oct23_FINAL.docx: GE Origins & Evolution Form
  (Other Supporting Documentation. Owner: Hamilton,Ian M)
- EEOB Curriculum Maps Dec 2023.xlsx: EEOB Curriculum Maps
  (Other Supporting Documentation. Owner: Hamilton,Ian M)
- 1_EEOB2260_Biodiv_OE_Syllabus 6Feb24-FINAL.docx: Updated Syllabus - Feb 2024
  (Syllabus. Owner: Hamilton,Ian M)
- EEOB 2260 response to NMS subcommittee.docx: Response to NMS Subcommittee
  (Other Supporting Documentation. Owner: Hamilton,Ian M)

Comments

- Please see feedback email sent 1/19/24. *(by Neff,Jennifer on 01/19/2024 02:31 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Hamilton,Ian M	01/04/2024 10:30 AM	Submitted for Approval
Approved	Hamilton,Ian M	01/04/2024 10:30 AM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	01/04/2024 05:27 PM	College Approval
Revision Requested	Neff,Jennifer	01/19/2024 02:31 PM	ASCCAO Approval
Submitted	Hamilton,Ian M	02/06/2024 03:39 PM	Submitted for Approval
Approved	Hamilton,Ian M	02/06/2024 03:39 PM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	02/06/2024 03:50 PM	College Approval
Pending Approval	Jenkins,Mary Ellen Bigler Hanlin,Deborah Kay Hilty,Michael Neff,Jennifer Vankeerbergen,Bernadette Chantal Steele,Rachel Lea	02/06/2024 03:50 PM	ASCCAO Approval

The instructors and department have addressed the committee's concerns as follows (in blue):

- **Contingency**: The Subcommittee requests that the department address the difference between the Wednesday and Thursday lab meetings. For credit hour calculation purposes, the Subcommittee notes that if both meetings are to be considered labs, then both must meet for 110 minutes even if the time will not be used in the same way. If this is the case, the meeting times will need to be adjusted throughout the syllabus. If this is not the case, then the Wednesday meetings cannot be considered lab time. [Syllabus p. 1, 6] The Subcommittee also requests that the "Credit hours and work expectations" paragraph on p. 6 be corrected as it appears to contain several mistakes.

The Wednesday and Thursday lab meeting times are now both 110 minutes. The "Credit hours and work expectations" paragraph has been replaced with the standard language that appears in the most recent version of the ASC Distance Learning Syllabus Template.

- **Contingency**: The Subcommittee recommends that the department correct the reference to a recitation under the Teaching Assistant's contact information to instead say lab. [Syllabus p. 2]

This has been corrected.

- *Recommendation:* The Subcommittee recommends that the department specify the statistical software that will be used in the course in addition to how students are expected to obtain it. This information should be included in the required software section of the syllabus. [Syllabus p. 9, 11]

This has been added to the "Required Software" section of the sylabus

Discovering Biodiversity using Integrative Research

AU 2024 EEOB 2260

Course Information

- **Course times and location:** Mondays: Asynchronous lectures (~80 minutes posted Sunday night); Wednesdays (required lab): 9:00-10:50 am Jennings 124; Thursdays (required lab): 9:00-10:50 am Jennings 124 starting August 19th to December 2nd (16 weeks)
- **Credit hours:** 4
- **Mode of delivery:** Hybrid

Instructors

Instructor 1

- **Name:** Dr. Rachelle Adams
- **Email:** adams.1970@osu.edu
- **Office location:** Museum of Biological Biodiversity, MBD 1500, 1315 Kinnear Road, Columbus, OH 43212

- **Office hours:** By appointment
- **Preferred means of communication:**
  - My preferred method of communication for questions is **email.**
  - My class-wide communications will be sent through the Announcements tool in CarmenCanvas. Please check your notification preferences (go.osu.edu/canvas-notifications) to be sure you receive these messages.

Instructor 2

- **Name:** Dr. Livia Pires do Prado
- **Email:** piresdoprado.1@osu.edu

- **Office location:** Museum of Biological Biodiversity, MBD 1380g, 1315 Kinnear Road, Columbus, OH 43212
- **Office hours:** By appointment
- **Preferred means of communication:**
    - My preferred method of communication for questions is **email.**
    - My class-wide communications will be sent through the Announcements tool in CarmenCanvas. Please check your notification preferences (go.osu.edu/canvas-notifications) to be sure you receive these messages.

Teaching Assistant

- **Name:** [first and last name of TA]
- **Email:** [lastname.#@osu.edu]
- **Lab times:** Wednesday and Thursday 9:00-10:50 am

Course Prerequisites

As a GE-Theme course (Origins and Evolution) and a Research and Creative Inquiry Course, this program integrates ecology, evolution and conservation and includes high impact research experiences. You will have opportunities to explore big picture ideas in evolution while also solving practical research problems that naturally occur when conducting research in this field. There are no specific disciplinary prerequisites because foundational knowledge needed to succeed in this course will be covered in lectures and readings. While learning about the origins and evolution of ant biodiversity in Ohio, you will use interdisciplinary tools and techniques to advance your research projects. Regardless of your background or previous experience, this course is an opportunity to learn about cutting-edge research and develop a deeper appreciation for our evolutionary connection to other species and society's influence on nature.

Course Description

Curiosity about the natural world is a gateway to developing interest in the analysis of evidence and science. This course-based undergraduate research experience (CURE) will build science literacy and critical thinking by focusing on captivating ecological relationships and the conservation of biodiversity. You will develop proficiencies and content knowledge about the study of Evolution and Origins, examine local and global natural systems, and gain an appreciation for modern principles, theories, methods and modes of inquiry used when studying and protecting nature.

This course offers you the opportunity to learn how to conduct scientific research from beginning to end. You will develop field, laboratory, and communication skills through investigations of Ohio ants and their symbiotic relationships. We will build expertise with important background knowledge (Table 1), then formulate scientific hypotheses, conduct experimental or observational studies, and finally analyze data. Team Science practices will guide collaborative projects and discussions and we will aim to publish our work in peer-reviewed scientific journals and communicate our discoveries to a broad audience. Embedded in this course is intentional inclusivity that will use universal design principles and culturally responsible pedagogy.

Learning Outcomes

The course will focus on the scientific method, with structured activities throughout the semester. You will work together on the elaboration of an Ohio Ant Guide, which will involve data collection, review of specialized literature, development of ant identification methods, and interpretation of the results obtained. In addition, you will have the opportunity to make novel scientific discoveries with the potential to impact science and technology and interpret your results for a unique product communicating your findings. Data gathered from this course will have the potential to inform novel species descriptions and management practices, enhancing our understanding of Ohio's biodiversity. The course consists of three main components: 1) Conducting science, 2) Connecting nature with ethical and societal issues, and 3) Communicating scientific processes and concepts.

Conducting science: Upon completion of this course, students will be able to understand scientific methods used in experimental and descriptive research.

1. Describe modern scientific techniques used in conservation, ecology, and evolution;
2. Engage in scholarly exploration of the scientific process and recognize it as something interactive, continuous, and collaborative;
3. Differentiate the components of a scientific study (e.g., observation, hypothesis, data collection and analysis, interpretation of the results);
4. Problem-solve challenges that arise when conducting research (e.g., molecular barcoding, integrative taxonomy; phylogenetic tree thinking);
5. Articulate research-informed perspectives regarding the importance of diversity and inclusion practices and how it relates to the advancement of science;
6. Participate in peer-review processes in a team setting, recognizing constructive feedback and effective debate practices.

Connecting nature with society: Upon completion of this course, students will be able to understand ecological and evolutionary processes that influence biodiversity while appreciating the associated ethical and societal issues.

1. Use tools to navigate digital and scientific sources and distinguish peer-reviewed science, pseudoscience, and opinions;
2. Describe land use in Ohio and our local history;

3. Recognize the development of ecological and evolutionary processes and how they are influenced by environmental change;
4. Demonstrate a sense of self as a member of society positively impacted by scientific discovery.

Communicating science: Upon completion of this course, students will be able to articulate to a broad audience how science is conducted and relates to the world.

1. Formulate clear and objective communication about scientific information and findings using the Message Box approach;
2. Recognize elements of the Message Box approach and effective ways to communicate science;
3. Demonstrate understanding of ecological and evolutionary processes through multiple forms of communication (e.g., lab report, reflections, poster, presentation, outreach pamphlets, artistic works).

GEN Theme: Origins and Evolution Goals

1. Successful students will analyze an important topic or idea at a more advanced and in-depth level than in the Foundations component. [Note: In this context, "advanced" refers to courses that are e.g., synthetic, rely on research or cutting-edge findings, or deeply engage with the subject matter, among other possibilities.]
2. Successful students will integrate approaches to the theme by making connections to out-of-classroom experiences with academic knowledge or across disciplines and/or to work they have done in previous classes and that they anticipate doing in 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.

General Education Expected Learning Outcomes

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

1.1 Engage in critical and logical thinking about origins and evolution;
1.2 Engage in an advanced, in-depth, scholarly exploration of origins and evolution;
2.1 Identify, describe, and synthesize approaches or experiences as they apply to origins and evolution;
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 your knowledge of the time depth of physical systems by providing examples or models;

3.2 Explain scientific methods used to reconstruct the history of physical systems and specify their domains of validity;
3.3 Engage with current controversies and problems related to origins and evolution questions;
4.1 Describe your knowledge of how physical systems have evolved over time;
4.2 Summarize current theories of the origins and evolution of physical systems.

This course-based undergraduate research experience (CURE) will build science literacy and critical thinking by focusing on captivating ecological relationships and the conservation of biodiversity. Students will develop proficiencies and content knowledge about the origins and evolution of species by examining local and global natural systems, and gain an appreciation for modern principles, theories, methods and modes of inquiry used when studying and protecting nature. Throughout the course, students will participate in various practical activities involving literature review, field and lab-based research, data analysis, and scientific communication. These high-impact research-focused activities will result in student contributions to public databases and scientific discoveries. Scientific methods will involve confirming species identifications through molecular barcoding, building species trees with DNA sequencing, and writing a research portfolio. Students will learn how to read and build phylogenies that represent evolutionary histories and apply this knowledge to conservation topics that relate to studying and preserving biodiversity.

How This Hybrid Course Works

Mode of delivery: This course is hybrid. We have required lectures (80 minutes/week) to be watched asynchronously on Mondays. We have two in-person labs Wednesday (2:20-3:40 pm) and Thursday (9:00-10:50 am) in Jennings 124. The remainder of your work will take place in Carmen/Canvas throughout the week.

Pace of online activities: This course is divided into **weekly modules** that are released one week ahead of time. You are expected to keep pace with weekly deadlines but may schedule your efforts freely within that time frame.

Credit hours and work expectations: This is a **4-credit-hour course**. According to Ohio State policy (go.osu.edu/credithours), students should expect around 12 hours of engagement with the class each week to receive a grade of (C) average. Actual hours spent will vary by student learning habits and the assignments each week.

Attendance and participation requirements: Research show regular participation is one of the highest predictors of success. With that in mind, we have the following expectations for everyone's participation:

- **Attendance at in-person activities**
  It is essential that you attend in-person activities throughout the course, as they are crucial to achieving the proposed objectives and producing the expected outcomes. The activities include discussions, laboratory activities (such as those on taxonomy and molecular biology), and fieldwork (involving collection and biological observation). Lectures are watched asynchronously on Mondays.
- **Participating in online activities for attendance**: **at least once per week**
  You are expected to log in to the course in Carmen/Canvas and watch all lecture videos every week. During most weeks you will probably log in many times. If you have a situation that might cause you to miss an entire week of class, discuss it with the instructors *as soon as possible.*
- **Zoom meetings and office hours**:
  Student office hours are by appointment and optional.
- **Participating in Canvas discussion forum**: **Once every two weeks**
  As part of your participation, you are to post a question related to a prompt and respond to one post backed with a reference and link to a primary literature research article.

Table 1: ***Supportive texts, articles, projects, and videos on the concepts that will be discussed in the course.*** *No textbook is required but you will advance your understanding of these broad topics by engaging with, discussing, and analyzing the resources listed below. In addition, you will be responsible for seeking, summarizing, and analyzing commentary primary literature.*

Biodiversity	**Phylogenetic Diversity** https://danielpfaith.wordpress.com/phylogenetic-diversity/ **Diversity indices** https://esajournals.onlinelibrary.wiley.com/doi/10.1890/08-2225.1 https://www.omnicalculator.com/ecology/shannon-index https://sciencing.com/calculate-species-evenness-2851.html **Species Richness** https://www.youtube.com/watch?v=mWVATekt4ZA **Project case study: BioSCAN** https://nhm.org/community-science-nhm/bioscan
Environmental Changes	**Climate terminology** https://www.ncei.noaa.gov/news/weather-vs-climate **Climate changes** https://www.youtube.com/watch?v=MEX2J_sAdGs **Collapse of Insects** https://www.reuters.com/graphics/GLOBAL-ENVIRONMENT/INSECT-APOCALYPSE/egpbykdxjvq/
Scientific Practice	**Authorship Guidelines** https://ccts.osu.edu/ [pdf LINK]
Conservation	**Project case study** https://www.nature.org/en-us/about-us/where-we-work/united-states/ohio/stories-in-ohio/year-end-highlights/ **Review** https://academic.oup.com/bioscience/article/62/11/962/263056 https://youtu.be/GlWNuzrqe7U
Ethnobiology	**Cross-cultural tools** https://www.nature.com/articles/d41586-022-04508-4 **Traditional Ecological Knowledge** https://www.fws.gov/sites/default/files/documents/TEK-Fact-Sheet.pdf **Psychological research** https://www.apa.org/monitor/2020/04/nurtured-nature
Innov-ation	**Computer-based identification systems** https://onlinelibrary.wiley.com/doi/full/10.1111/1755-0998.13567 https://www.youtube.com/watch?v=ElJ5VSHa4OI&t=1s
Natural History	**Field biology** https://www.americanscientist.org/article/why-ecology-needs-natural-history?fbclid=IwAR19dgeAq4ldSMXt81yS6qL2vRdOGez7i4JixryBGktUpZthnEHHt_Cc6M

Science outreach	**Project case study** http://robdunnlab.com/projects/school-of-ants/ Study examines conversation as a vehicle for social influence **Challenges for entomology** https://resjournals.onlinelibrary.wiley.com/doi/full/10.1111/icad.12637?s=09
Communicating science	**Visualizing** https://esajournals.onlinelibrary.wiley.com/doi/10.1002/ecs2.3786 https://ecampusontario.pressbooks.pub/scientificcommunication/chapter/infographics/ https://pubs.acs.org/doi/10.1021/acs.jchemed.8b00981 **Messaging** Message box [book chapter LINK]

Course Materials, Fees and Technologies

To participate in this course, it is necessary to have basic computer knowledge, such as how to use text editing software and access the internet. It is also important to know how to access resources from OSU, including the Carmen Learning Management system. If you are having any difficulty using technology or online resources during this course, please do not hesitate to contact us as soon as possible so we can discuss these issues.

Required Materials and/or Technologies

- All course materials will be made available in advance on the Carmen platform.
- Access to technologies capable of interacting with the Carmen platform and viewing documents in PDF format will be necessary.

Required Equipment

- **Computer:** current Mac (MacOS) or PC (Windows 10) with high-speed internet connection, including access to webcam and microphone.
- **Other:** a mobile device (smartphone or tablet) to use for BuckeyePass authentication

If you do not have access to the technology you need to succeed in this class, review options for technology and internet access at go.osu.edu/student-tech-access.

Required Software

Microsoft Office 365: All Ohio State students are eligible for free Microsoft Office 365. Visit the installing Office 365 (go.osu.edu/office365help) help article for full instructions.

SAS: All Ohio State students are eligible for free SAS. Each copy for Windows desktop use is designated for teaching/research use only. For each site license copy purchased you may use a copy on one home computer; software must be returned when you leave Ohio State.

CarmenCanvas Access

You will need to use BuckeyePass (buckeyepass.osu.edu) multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you do each of the following:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass - Adding a Device (go.osu.edu/add-device) help article for step-by-step instructions.

- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click **Enter a Passcode** and then click the **Text me new codes** button that appears. This will text you ten passcodes good for 365 days that can each be used once.
- Install the Duo Mobile application (go.osu.edu/install-duo) on all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service.

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357 (HELP) and IT support staff will work out a solution with you.

Technology Skills Needed for This Course

- Basic computer and web-browsing skills
- Navigating CarmenCanvas (go.osu.edu/canvasstudent)
- CarmenZoom virtual meetings (go.osu.edu/zoom-meetings)
- Recording a slide presentation with audio narration and recording, editing and uploading video (go.osu.edu/video-assignment-guide)

Technology Support

For help with your password, university email, CarmenCanvas, or any other technology issues, questions or requests, contact the IT Service Desk, which offers 24-hour support, seven days a week.

- **Self Service and Chat**: go.osu.edu/it
- **Phone:** 614-688-4357 (HELP)
- **Email:** servicedesk@osu.edu

Grading and Faculty Response

Descriptions of Major Course Assignments

Table 2. Course evaluation description and point assignment	Points
Discussion forum and literature summary Individual discussion contribution (60 pts) Every two weeks *you will propose one question to the class, answer it referring to primary literature, and provide one response to a classmate's post.* Group literature review summary (5 pts for instructor's review and 35 pts for final = 40 pts) *Together with group members, you will contribute to the course's primary literature database on Ohio ants and write a 3-page annotated bibliography followed by a 500-word summary of relevance. This assignment will evaluate your ability to find, collate, and synthesize primary literature.*	100
Knowledge checks, discussions, surveys Quizzes following lectures (10 pts each for a total of 100 points) *Quizzes and group discussions will require you to analyze, evaluate, and apply foundational course knowledge to solve problems or answer complex questions.* Surveys before and after activities. *Short surveys will allow students to reflect on what they have learned from a given activity, building a sense of self and personal growth. (0 points)*	100
Group research portfolio Logbook (5 pts for instructor's review and 15 pts for final = 20 pts) Vouchers (5 pts for instructor's review and 15 pts for final = 20 pts) Written 300-word research reflections (10 total = 10 pts) *The above will assess your ability to conduct fieldwork, collect, identify taxa, manage data, and maintain accurate records. A reference collection of ants and datasets containing ecological data and observations recorded during the field will be required.* Group report (50 pts) *This ~10-page report includes a literature review, methods, data analysis and interpretation of results using SAS, and detailed well-cited discussion. This assignment will evaluate your ability to analyze and interpret data based on a group question. You will use statistical software and interpret results to draw meaningful conclusions.*	100
Communicating science Individual flash talk on focal species (40 pts for presentation; 10 pts for peer-review) Field guide page on focal species (40 pts for field guide page; 10 pts for peer-review). *To complete both assignments, you will (i) conduct individual literature reviews (ii) create figures with descriptive captions; (iii) draft and revise; (iv) provide a peer review for classmates.*	100
Reflections Pre- and post-assessment survey; self-evaluations	0 (voluntary)
Total *See detailed assignment descriptions and due dates in Canvas	400

Written Assignments

Academic integrity and collaboration (also see Academic Misconduct below): Your written assignments, including discussion posts, should be your own original work. In formal assignments, you should follow the section 'Discussion and Communication Guidelines' (see below), to cite the ideas and words of your research sources. You are encouraged to ask a trusted person to proofread your assignments before you turn them in but no one else should revise or rewrite your work. We encourage the use of the tool iThenticate to check your work for plagiarism (see OSU Research Misconduct for more details).

All students have important obligations under the Code of Student Conduct to complete all academic and scholarly activities with fairness and honesty. Our professional students also have the responsibility to uphold the professional and ethical standards found in their respective academic honor codes. Specifically, students are not to use "unauthorized assistance in the laboratory, on field work, in scholarship or on a course assignment" unless such assistance has been authorized specifically by the course instructor. In addition, students are not to submit their work without acknowledging any word-for-word use and/or paraphrasing" of writing, ideas or other work that is not your own. These requirements apply to all students — undergraduate, graduate, and professional.

Late Assignments

Please refer to Carmen for due dates. Due dates are set for your grade evaluation as well as to help you stay on pace and allow timely feedback that will help you complete subsequent assignments. Due to the collaborative nature of class discussions and the importance of firm deadlines for discussion posts and quizzes, late assignments will receive a zero. For more information, see the 'How This Hybrid Course Works' section.

Instructor Feedback and Response Time

Remember that you can call 614-688-4357 (HELP) at any time if you have a technical problem.

- **Preferred contact method:** If you have a question, please contact instructors first through our Ohio State email address. We will reply to emails within **24 hours on days when class is in session at the university**.
- **Class announcements:** Instructors will send all important class-wide messages through the Announcements tool in CarmenCanvas. Please check your notification preferences (go.osu.edu/canvas-notifications) to ensure you receive these messages.
- **Canvas Forum Discussion board:** We will check and comment on messages in the discussion boards several times throughout the semester.
- **Grading and feedback:** For assignments submitted by the due date, we will try to provide feedback and grades within **seven days**. Assignments submitted after the due

date may not be graded (see assignment details in Canvas) or may have reduced feedback, and grades may take longer to be posted.

Grading Scale

93–100: A	80–82.9: B-	67–69.9: D+
90–92.9: A-	77–79.9: C+	60–66.9: D
87–89.9: B+	73–76.9: C	Below 60: E
83–86.9: B	70–72.9: C-	

Other Course Policies

Discussion and Communication Guidelines

The following are our expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Writing style**: Although there is no need to participate in class discussions as if you were writing a research paper, you should remember to write using good grammar, spelling, and punctuation. A more conversational tone is fine for non-academic topics.
- **Tone and civility**: Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always come across online. Instructors will provide specific guidance for discussions on controversial or personal topics.
- **Citing your sources**: When we have academic discussions, please cite your sources to support what you say. For the textbook or other course materials, list at least the title and page numbers. For online sources, include a link.
- **Backing up your work**: Consider composing your academic posts in a word processor, where you can save your work, and then copying into the discussion forum.
- **Synchronous in-person sessions**: During our full-group lab time, you may be called on to answer questions and share your thoughts about what is being discussed. You can always say “I pass” if you would rather not share.

Academic Integrity Policy

See Carmen/Canvas for Major Course Assignments with specific guidelines about collaboration and academic integrity in the context of this 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/.

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct **(COAM) expect that all students have read and understand the university's Code of Student Conduct** (studentconduct.osu.edu), and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the university's *Code of Student Conduct* and this syllabus may constitute "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 the work of another student, and possession of unauthorized materials during an examination. **Ignorance of the university's *Code of Student Conduct* is never considered an excuse for academic misconduct,** so we recommend that you review the *Code of Student Conduct* and, specifically, the sections dealing with academic misconduct.

If we suspect that a student has committed academic misconduct in this course, **we are obligated by university rules to report suspicions to the Committee on Academic Misconduct.** If COAM determines that you have violated the university's Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the university.

If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.

Other sources of information on academic misconduct (integrity) to which you can refer include:

- Committee on Academic Misconduct (go.osu.edu/coam)
- Ten Suggestions for Preserving Academic Integrity (go.osu.edu/ten-suggestions)
- Eight Cardinal Rules of Academic Integrity (go.osu.edu/cardinal-rules)

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.

Creating an Environment Free from Harassment, Discrimination, and Sexual Misconduct

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 at titleix@osu.edu.

The Ohio State University is committed to building and maintaining a community to reflect diversity and to improve opportunities for all. All Buckeyes have the right to be free from harassment, discrimination, and sexual misconduct. Ohio State does not discriminate on the basis of age, ancestry, color, disability, ethnicity, gender, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, pregnancy (childbirth, false pregnancy, termination of pregnancy, or recovery therefrom), race, religion, sex, sexual orientation, or protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. Members of the university community also have the right to be free from all forms of sexual misconduct: sexual harassment, sexual assault, relationship violence, stalking, and sexual exploitation.

To report harassment, discrimination, sexual misconduct, or retaliation and/or seek confidential and non-confidential resources and supportive measures, contact the Office of Institutional Equity:

1. Online reporting form at equity.osu.edu,
2. Call 614-247-5838 or TTY 614-688-8605,
3. Or email equity@osu.edu

The university is committed to stopping sexual misconduct, preventing its recurrence, eliminating any hostile environment, and remedying its discriminatory effects. All university employees have reporting responsibilities to the Office of Institutional Equity to ensure the university can take appropriate action:

- All university employees, except those exempted by legal privilege of confidentiality or expressly identified as a confidential reporter, have an obligation to report incidents of sexual assault immediately.
- The following employees have an obligation to report all other forms of sexual misconduct as soon as practicable but at most within five workdays of becoming aware of such information: 1. Any human resource professional (HRP); 2. Anyone who supervises faculty, staff, students, or volunteers; 3. Chair/director; and 4. Faculty member.

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. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting *ccs.osu.edu* or calling *614-292-5766*. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at *614-292-5766* and 24 hour emergency help is also available 24/7 by dialing 988 to reach the Suicide and Crisis Lifeline.

Accessibility Accommodations for Students with Disabilities

Requesting Accommodations

The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. 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. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion.

If you are isolating while waiting for a COVID-19 test result, please let me know immediately. Those testing positive for COVID-19 should refer to the Safe and Healthy Buckeyes site for resources. Beyond five days of the required COVID-19 isolation period, I may rely on Student Life Disability Services to establish further reasonable accommodations. You can connect with them at slds@osu.edu; 614-292-3307; or slds.osu.edu.

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 as early as possible.

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

Religious Accommodations

It is Ohio State's policy to reasonably accommodate the sincerely held religious beliefs and practices of all students. The policy permits a student to be absent for up to three days each academic semester for reasons of faith or religious or spiritual belief.

Students planning to use religious beliefs or practices accommodations for course requirements must inform the instructor in writing no later than 14 days after the course begins. The instructor is then responsible for scheduling an alternative time and date for the course requirement, which may be before or after the original time and date of the course requirement. These alternative accommodations will remain confidential. It is the student's responsibility to ensure that all course assignments are completed.

Course Schedule

Conducting science—Understanding biodiversity through conservation, ecology, and evolutionary biology while using Team Science principles

Connecting nature with ethical and societal issues—Analyzing the principles of ecological and evolutionary processes related to conservation

Communicating science—Defending and describing natural history while educating the public about Ohio ants

**Refer to the Carmen/Canvas course for up-to-date due dates.

Week	Date	Course Outline
1	**Aug. 19**	**Lectures**: What is science?; Pseudoscience vs science; Basic/Fundamental vs applied research; Experimental vs observational research **Activities**: W: Introduction to the course; Pre-assessment survey; Discussion—The collapse of insects: (Reuters Infographic) and anthropogenic effects on biodiversity I TH: Discussion—Team science: Group norms; Ant collection prep; Team logbooks (field and lab)
2	**Aug. 26**	**Lectures**: Integrative Biology: Tinbergen's four questions; Necessity of natural history; Team science: Inclusive communication practices; Case study 1: Species interactions; Introduction to phylogenetic methodologies and evolutionary theory **Reading**: Importance of vouchers and collections **Activities**: W: Ant collecting; Importance of vouchering; Sampling design; Recording natural history traits; Photography for iNaturalist TH: Ant collecting: Olentangy River Wetland Research Park; Discussion—Team science: iNaturalist
3	**Sep 2**	**Lectures**: Ant diversity: World; Ant diversity: Ohio; Communicating science: OH Division of Wildlife field guide; Case study 2: What is species?; Species concepts and ant anatomy

Week	Date	Course Outline
		Activities: W: Ant collecting; Recording natural history traits (drawing, photography) TH: Ant collecting; Photography for iNaturalist
4	**Sep 9**	**Lectures**: Integrative taxonomy I: Dichotomous keys; Interactive ant anatomy tutorial; Taxonomically informative characteristics; Introduction to natural selection **Activities**: W: Sample prep/voucher; Discussion—Morphospecies TH: MBD tour; Sample prep/voucher; Ant morphology; Introduction to AntWeb, AntMaps, Ant Wiki, HAO Portal
5	**Sep 16**	**Lectures**: Parachute science and land acknowledgments; Case study 3: DNA barcoding and extraction techniques; PCR to Sanger sequencing **Activities**: W: Preparing samples for barcoding; Practicing dichotomous keys and ant identification TH: Tutorial: Pipetting; DNA extraction (Qiagen); Practicing dichotomous keys and ant identification
6	**Sep 23**	**Lectures**: Integrative taxonomy II: Phylogenetic species concept; Case study 4: Tree thinking; Communicating science: Message Box Approach with interactive example **Activities**: W: Nanodrop then PCR; Discussion—PCR to Sanger sequencing TH: PCR Gel electrophoresis; Tutorial: Geneious practice
7	**Sep 30**	**Lectures**: Estimating biodiversity: Calculating species richness, abundance, evenness; Shannon diversity index; Functional diversity; Phylogenetic diversity; Contributing to public databases (e.g., AntMaps); Publishing species lists **Reading**: Biodiversity **Activities**: W: Tutorial: Estimating biodiversity I: Calculations from collected data TH: Building a database; Reading discussion—Biodiversity
8	**Oct 7**	**Autumn Break 10-11 of October** [open labs and catching up; Flash talk prep] ***will provide students with cleaned and trimmed COI sequences for week 9***

Week	Date	Course Outline
9	Oct 14	**Lectures**: Statistics in Evolution and Ecology; Conservation Biology; The Nature Conservancy in Ohio; Case study 5: Symbioses **Activities**: W: Sequence review in Geneious and blast lab TH: All students give flash talks on their focal species
10	Oct 21	**Lectures**: Ants in ecosystems; Importance of phylogenetic and functional diversity; Case study 6: Translating science for the public **Reading**: Habitat Conservation: Wetlands vs lawns **Activities**: W: Tutorial: Estimating biodiversity II; Understanding our data: Evaluate past and current collections TH: Reading discussion—Conservation and IUCN Red List; Tutorial: PowerPoint vs Canva; Understanding our data: Integrative taxonomy and species determination
11	Oct 28	**Lectures**: Weather vs. climate; Endangered species; Case study 7: School of Ants—Citizen science **Reading**: Endangered species **Activities**: W: Catching up on lab work/reports and starting field guide page TH: Catching up on lab work; Discussion—Anthropogenic effects on biodiversity II
12	Nov 4	**Lectures**: Science practices: publishing and peer review; Team science: Traditional Ecological Knowledge (TEK) and innovation through collaboration **Reading**: Traditional Ecological Knowledge (TEK) **Activities**: W: MBD tour; Hang poster display TH: Catching up; Reading discussion—TEK
13	Nov 11	**Lectures**: Connecting Ohio ants to the origins and evolution of everything **Reading**: Nurtured by nature: Keeping the public interested in nature **Activities**: Preparation of the Ohio Ant Guide. W: Reading discussion— Nature enthusiasts; Finishing and printing field guide page TH: MBD posters and celebration

Week	Date	Course Outline
14	Nov 18	**Lectures**: Post-assessment survey **Activities**: W: Informal group presentations/chalk talks on scientific findings; Discussion—Reflections TH: Flash talk presentations on completed field guide page; Discussion—Reflections
15	Nov 25	Thanksgiving 28th of Nov. – No class Indigenous People's Day 29th of Nov. – No class
16	Dec 2	Finals week (Dec 6-12) No final exam! Submit your group research portfolio!

GE Theme course submission worksheet: Origins & Evolution

Overview

Courses in the GE Themes aim to provide students with opportunities to explore big picture ideas and problems within the specific practice and expertise of a discipline or department. Although many Theme courses serve within disciplinary majors or minors, by requesting inclusion in the General Education, programs are committing to the incorporation of the goals of the focal theme and the success and participation of students from outside of their program.

Each category of the GE has specific learning goals and Expected Learning Outcomes (ELOs) that connect to the big picture goals of the program. ELOs describe the knowledge or skills students should have by the end of the course. Courses in the GE Themes must meet the ELOs common for **all** GE Themes and those specific to the Theme, in addition to any ELOs the instructor has developed specific to that course. All courses in the GE must indicate that they are part of the GE and include the Goals and ELOs of their GE category on their syllabus.

The prompts in this form elicit information about how this course meets the expectations of the GE Themes. The form will be reviewed by a group of content experts (the Theme Advisory) and by a group of curriculum experts (the Theme Panel), with the latter having responsibility for the ELOs and Goals common to all themes (those things that make a course appropriate for the GE Themes) and the former having responsibility for the ELOs and Goals specific to the topic of **this** Theme.

Briefly describe how this course connects to or exemplifies the concept of this Theme (Origins & Evolution)

In a sentence or two, explain how this class "fits' within the focal Theme. This will help reviewers understand the intended frame of reference for the course-specific activities described below.

This course-based undergraduate research experience (CURE) will build science literacy and critical thinking by focusing on captivating ecological relationships and the conservation of biodiversity. Students will develop proficiencies and content knowledge about the study of Evolution and Origins, examine local and global natural systems, and gain an appreciation for modern principles, theories, methods and modes of inquiry used when studying and protecting nature.

Connect this course to the Goals and ELOs shared by *all* Themes

Below are the Goals and ELOs common to all Themes. In the accompanying table, for each ELO, describe the activities (discussions, readings, lectures, assignments) that provide opportunities for students to achieve those outcomes. The answer should be concise and use language accessible to colleagues outside of the submitting department or discipline. The specifics of the activities matter—listing "readings" without a reference to the topic of those readings will not allow the reviewers to understand how the ELO will be met. However, the panel evaluating the fit of the course to the Theme will review this form in conjunction with the syllabus, so if readings, lecture/discussion topics, or other specifics are provided on the syllabus, it is not necessary to reiterate them within this form. The ELOs are expected to vary in their "coverage" in terms of number of activities or emphasis within the course. Examples from successful courses are shared on the next page.

Goal 1: Successful students will analyze an important topic or idea at a more advanced and in-depth level than the foundations. In this context, "advanced" refers to courses that are e.g., synthetic, rely on research or cutting-edge findings, or deeply engage with the subject matter, among other possibilities.

Goal 2: Successful students will integrate approaches to the theme by making connections to out-of-

classroom experiences with academic knowledge or across disciplines and/or to work they have done in previous classes and that they anticipate doing in future.

	Course activities and assignments to meet these ELOs
ELO 1.1 Engage in critical and logical thinking.	1.1 Students will explore topics on the origins and evolution through lectures and activities (e.g., weeks 2-6), focusing on focal taxa for the online discussion forum. *Students will practice the necessary skills to develop critical and logical thinking in issues related to biodiversity, with a focus on insects. There will be organized readings of scientific papers, participation in discussion forums, and critical review of studies. These activities will require students to have the ability to synthesize and critically evaluate biodiversity research from an ecological and evolutionary perspective. Engagement in discussion forums will be crucial to guide conversations around species conservation, ecosystems, and anthropogenic interference (In-class example: discussion about insect decline and anthropogenic effects).* **Group Research Portfolio**: Students will analyze data and interpret results to draw meaningful conclusions. **Discussion forum and literature summary**: Students will review and summarize topics (conservation, ecology, evolution) from the primary literature and engage in online discussion forum.
ELO 1.2 Engage in an advanced, in-depth, scholarly exploration of the topic or ideas within this theme	1.2 Students will engage with origins and evolution course topics through in-class and online discussions. They will also be required to find, review, share, and appraise relevant primary literature. *This course will build skills needed to engage in critical and logical thinking about Origins & Evolution by completing reading and discussion assignments that reflect lecture topics. Through an interactive online discussion forum, students will explore, discuss, and analyze scholarly articles about the principles of ecological and evolutionary processes related to conservation. Together, they will build a database of peer-reviewed articles and synthesize their findings on Ohio ant species.* **Group Research Portfolio**: The scientific methods explored will involve confirming species identifications through molecular barcoding, building species and gene trees with DNA sequencing, and assessing ant community biodiversity. Students will analyze several types of data and write a formal research portfolio that includes a literature review, methods, results, and discussion. Part of these exercises will involve "tree thinking" where students will learn how to read and build phylogenies that represent evolutionary histories, a skill that is universal in biological sciences.
ELO 2.1 Identify, describe, and synthesize approaches or experiences.	2.1 Students will collect and analyze ecological and evolutionary data for research projects. They will also write a research portfolio that not only includes the scientific process but personal reflections about their experience doing science (e.g., weeks 6, 10 and 13: Lab practice, reading discussion and data

	interpretation). *Throughout the course, students will participate in various practical activities, involving fieldwork (Assignment: species collection and observation, group record keeping), laboratory work (Assignment: use of dichotomous keys for species identification; sample preparation for DNA barcoding), and data analysis (Assignment: Sanger sequencing analysis; analyzing diversity data). These activities will allow students to contribute to public databases, which are important for storing and analyzing biodiversity data (Assignment: reading peer-reviewed literature on vouchers, biological collections, sample curation, and collaboration with databases).*
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.	2.2 Students will build self-esteem while learning new topics in ecology, evolution, and conservation. Research reflections and knowledge checks will help them connect nature and science through understanding. Lecture material, research projects, and discussions (Weeks 1-16) will result in creative works where they communicate science that reflect understanding. *The students will engage in the investigation of each module's topic through a combination of practical, theoretical, and scientific and didactic communication activities.* **Knowledge checks and discussions**: Students will be asked to take surveys before and after activities so that they can reflect on what their baseline understanding is and what they have learned following the completion of an assignment. They will also be asked to take graded quizzes following lectures. Students will engage in discussions expressing opinions and knowledge of course topics. **Communicating science**: Students will make individual flash talk presentations and field guide pages on focal species. These creative works will allow each student to develop unique expertise that will be shared with classmates. To complete both assignments, students will reflect on primary literature, create descriptive figures, and have an opportunity to revise assignments. Furthermore, students will provide a peer review for classmates to enhance understanding.

Goals and ELOs unique to Origins & Evolution

Below are the Goals and ELOs specific to this Theme. As above, in the accompanying Table, for each ELO, describe the activities (discussions, readings, lectures, assignments) that provide opportunities for students to achieve those outcomes. The answer should be concise and use language accessible to colleagues outside of the submitting department or discipline. The ELOs are expected to vary in their "coverage" in terms of number of activities or emphasis within the course. Examples from successful courses are shared on the next page.

GOAL 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.

GOAL 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.

	Course activities and assignments to meet these ELOs

ELO 3.1 Illustrate their knowledge of the time depth of the universe, physical systems, life on earth, humanity or human culture by providing examples or models.	3.1 Lecture topics will cover origins and evolution of biological diversity (weeks 7-10) and graded assignments will help assess student understanding of the time depth of the origins and evolution of natural systems (week 9: flash talks, week 13: field guide page); **Lecture:** Topics will cover origins and evolution of biological diversity (e.g., estimating diversity, functional and phylogenetic biodiversity, database use). An overview of these topics will be provided for a broader perspective. **Field guide page & Flash talks:** Students will systematically analyze methodologies through assignments and discussions but also demonstrate time depth knowledge when creating content for a field guide page about a focal species and presenting a flash talk.
ELO 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.	3.2 Students will utilize scientific methods to build phylogenies during weeks 9 and 10 and write their research methods in a research portfolio. **Practical Activities:** The scientific methods explored will involve confirming species identifications through molecular barcoding, building species trees with DNA sequencing, and writing methods in a research portfolio. Part of these exercises will involve "tree thinking" where students will learn how to read and build phylogenies that represent evolutionary histories.
ELO 3.3 Engage with current controversies and problems related to origins and evolution questions.	3.3 Students will debate and discuss controversies regarding, evolution, conservation, and ecological practices (e.g., insect collapse: week 1; parachute science: week 5; land acknowledgments: week 5; species concepts: week 6; conservation biology: week 9; translating science: week 10; endangered species: week 11; Traditional Ecological Knowledge (TEK): Week 12). *Topics covered in this course will allow students to analyze and debate controversial issues and their knowledge will be tested with assignments and discussions (in class and online).* **Lectures:** Throughout the course, lectures address controversial topics in scientific practice (e.g., parachute science, species concept, conservation biology in Ohio). Students will provide comments and reflections, deeply engaging with content. **Discussion:** Before starting course activities, discussions will be held on specific readings (e.g., TEK, insect collapse, anthropic effects, endangered species). These discussions will serve to guide the inventories and observations made during the course and will influence student perceptions about conservation. For example, after students learn about TEK, they will discuss how the formulation of scientific questions and the interpretation of results can be enhanced with this new perspective.

	Knowledge checks and discussions: Case studies will be presented so that students connect issues with current literature and their active research. They will build skills to translate science to a broad audience. They will also explore related topics using an online discussion forum and will take low stakes knowledge check quizzes following "case study" lectures.
ELO 4.1 Describe their knowledge of how the universe, physical systems, life on Earth, humanity or human culture have evolved over time.	4.1 Students will complete a molecular barcoding research project that provides understanding of how communities are shaped and how specific species are related. Students will learn evolutionary concepts in lectures and gain an understanding of species delimitation and genetic diversification (week 2-6, 13). **Activities:** DNA barcoding and sequence blasting; Building phylogenies; tree thinking. **Group Research Portfolio**: Students will include research reflections describing research methods that address how species are identified and related.
ELO 4.2 Summarize current theories of the origins and evolution of the universe, physical systems, life on earth, humanity or human culture.	4.2 Students will learn ecological and evolutionary theory in the context of biogeographic patterns in Ohio (weeks 1-3). **Lecture**: Topics include, e.g., integrative taxonomy, phylogenetic species concept, the origins and evolution of ants. **Knowledge checks and discussions**: Case studies based on current primary literature will cover phylogenetic methodologies and evolutionary theory. These topics will also be explored in discussions and student understanding will be tested in low stakes knowledge check quizzes.

Research and Creative Inquiry Course Inventory

Overview

The GE allows students to take a single, 4+ credit course to satisfy a particular GE Theme requirement if that course includes key practices that are recognized as integrative and high impact. Courses seeking one of these designations need to provide a completed Integrative Practices Inventory at the time of course submission. This will be evaluated with the rest of the course materials (syllabus, Theme Course submission document, etc). Approved Integrative Practices courses will need to participate in assessment both for their Theme category and for their integrative practice.

Please enter text in the boxes below to describe how your class will meet the expectations of Research and Creative Inquiry courses. It may be helpful to consult with the OSU Office of Undergraduate Research and Creative Inquiry. You may also want to consult your Director of Undergraduate Studies or appropriate support staff person as you complete this Inventory and submit your course.

Please use language that is clear and concise and that colleagues outside of your discipline will be able to follow. You are encouraged to refer specifically to the syllabus submitted for the course, since the reviewers will also have that document. Because this document will be used in the course review and approval process, you should be *as specific as possible*, listing concrete activities, specific theories, names of scholars, titles of textbooks etc.

Accessibility

If you have a disability and have trouble accessing this document or need to receive it in another format, please reach out to Meg Daly at daly.66@osu.edu or call 614-247-8412.

Pedagogical Practices for Research and Creative Inquiry Courses

Course subject & number	Biology EEOB2260

Undergraduate research is defined by the Council on Undergraduate Research (CUR) as an inquiry or investigation conducted by an undergraduate student that makes an *original* intellectual or *creative* contribution to the discipline. Undergraduate creative activity is the parallel to research, engaging in a rigorous creative process using (inter)disciplinary methods to produce new work.

In the context of the 4-credit GEN Theme High Impact Practice (which, by definition, is a more robust course than a non-HIP 3-credit Theme course—since student will take one 4-credit course instead of taking two 3-credit courses), research or creative inquiry requires a level of rigor and engagement that goes beyond what is routinely already included in a 3-credit Theme course in that discipline. It will generally mean that students are either (1) instructed in and engage in original research and the production and/or analysis of new understanding or data used in the preparation of a final paper, report, or project characteristic of the discipline, *or* (2) they are instructed in and engage in the primary production and performance or display of new creative work characteristic of the discipline.

Further comments and clarifications:

- The Creative Inquiry or Research component should be integrated throughout a *substantial* portion of the course (not just at the very end, for example).
- The Creative Inquiry or Research component should connect to the Theme and to the subject/content of the course. If the course at hand is requesting two Themes, then the research component or creative work should fully pertain to both Themes.

1. <u>Disciplinary expectations and norms</u>: Different disciplines at the university define original research and creative inquiry differently. Please explain what the expectations/norms of your discipline are for original research or creative inquiry. How is new understanding developed in your field? How does the creative process amplify knowledge in the field? (This information should also be readily visible on the syllabus.)

This course-based undergraduate research experience (CURE) will build science literacy and critical thinking by focusing on captivating ecological relationships and the conservation of biodiversity. Students will develop proficiencies and content knowledge about the origins and evolution of species by examining local and global natural systems, and gain an appreciation for modern principles, theories, methods and modes of inquiry used when studying and protecting nature. Throughout the course, students will participate in various practical activities involving literature review, field and lab-based research, data analysis, and scientific communication. These high-impact research-focused activities will result in student contributions to public databases and scientific discoveries. Scientific methods will involve confirming species identifications through molecular barcoding, building species trees with DNA sequencing, and writing a research portfolio. Students will learn how to read and build phylogenies that represent evolutionary histories and apply this knowledge to conservation topics that relate to studying and preserving biodiversity.

This course fulfills the professional expectations for biological sciences because students will develop scientific research skills through activities involving (1) literature review, the bases for any scientific study leading to evidence-based predictions and hypotheses; (2) hands-on field and lab-based data collection and analysis, a central component to research studies, and (3) scientific communication in several forms (oral, professional research portfolio, and public outreach field guide). Data gathered in this course will meet high-quality publishable standards and will contribute to public databases and eventually peer-reviewed publications therefore increasing knowledge in the field.

2. Teaching methods and practices: Which class activities and materials will be used to teach students the research methodology and/or research practices or the methods and practices of creative inquiry typical or relevant in your discipline? How will the potential ethical implications for research or creative inquiry in the field be addressed in the course? (This information should also be readily visible on the syllabus.)

Research practices

Because this a CURE, students will be engaging in scaffolded research activities throughout the semester. The Course Outline in the syllabus highlights how students will move through the scientific process by first learning what science is (week 1) and how to shape scientific questions using an integrative biology approach (week 2). We will use integrative taxonomy as a framework for our field (e.g., ant collection) and in-class activities (e.g., sample sorting and preparation, molecular techniques, phylogeny building, diversity analysis). Individuals will also choose a focal species (e.g., ant) and throughout the semester investigate what has been published about it, its range in Ohio and more broadly, symbiotic relationships, and any other interesting natural history traits.

See Table 2: Individual assignments ask that students interpret what they have learned and communicate their findings.
-Research portfolio on ecological study (includes data analysis report)
-Individual flash talk (involves the synthesis of peer-reviewed literature and interpretation of relevance to public interest)
-Field guide page (involves the synthesis of facts about a single species and literature review summary)

Ethical implications

Experiences with diversity, demonstration of intercultural competence and empathy with different people and worldview structures will be addressed during the course through lectures, discussions, and readings. See Course Outline in the syllabus.

Lecture:
Week 1: Scientific method (pseudoscience versus science), conservation biology focusing on Ohio.
Week 2: Inclusive communication practices
Week 3: Conservation biology and The Nature Conservancy in Ohio
Week 11: Case study - School of Ants (Citizen Science)
Week 12: Traditional Ecological Knowledge and innovation through collaboration

Discussion:
Week 1: Team Science - Group norms
Week 11: Anthropogenic effect on biodiversity

Reading:
Week 12: Traditional Ecological Knowledge (TEK)
Week 13: Nurtured by nature: Keeping the public interested in nature

3. <u>Implementing</u>: Through which class activities and materials will the students be given opportunities to <u>practice</u> disciplinary research or creative inquiry techniques, methods, and skills to create new knowledge or advance praxis? (This information should also be readily visible on the syllabus.)

This CURE will focus on the scientific process, with research activities that will allow students to explore peer-reviewed scientific articles, develop questions and methods, interpret results, and communicate scientific findings to a broad audience. Novel discoveries are inevitable because we will be exploring Ohio ant biodiversity in areas that lack a recent survey. The course consists of three main components: 1) Conducting science, 2) Connecting nature with ethical and societal issues, and 3) Communicating scientific processes and concepts.

<u>See the syllabus:</u>

Table 1: Topic list and example articles that will be used to guide class discussions.

Table 2: Assignments linked to the "Conducting Science" component that require the students to explore topics based on their own questions. For example, the research portfolio requires personal skill development in research (logbooks, vouchers, and reflections), then is completed with a group report based on data analysis centered on a student-determined question. Online discussions are designed to prompt student questions after searching scientific primary and secondary literature.

4. <u>Demonstration of competence</u>: Disciplines develop and share new knowledge or creative work in different ways. Through which activity or activities will students first be taught and then be involved in a demonstration of competence in an appropriate format for the discipline (e.g., a significant public communication of research, display of creative work, or community scholarship celebration)? The form and standard should approximate those used professionally in the field. (This information should also be readily visible on the syllabus.)

Students will formulate clear and objective communication about scientific information and findings using the Message Box approach. They will create two creative works, a field guide page and a flash talk. The field guide page is constrained in what can be communicated as it is based on the Department of Natural Resources' field guides produced by the Division of Wildlife of Ohio (e.g., Common Birds of Ohio, Reptiles of Ohio). These will be printed as 16 x 24" posters and displayed in the front hallway in the Museum of Biological Diversity (MBD). We will have a public reception for our installment and celebrate our achievements in week 13. Students will have an opportunity to practice their flash talk script as they present their posters. The poster will remain on display for at least one year and will be seen when museum tours are given and during the MBD annual open house event.

5. <u>Scaffolding and mentoring</u>: Explain how the creative inquiry or research project will be scaffolded across multiple assignments or one large project broken up across the course (e.g., specific explanations about reviewing literature, developing methods, collecting data, interpreting or developing a concept or idea into a full-fledged production or artistic work). Each pertinent assignment should help students build and demonstrate skills contributing to the larger project. Meaningful feedback and mentoring should be provided by the instructor at regular intervals to inform next steps in the process. (This information should also be readily visible on the syllabus.)

In the course program, there are three main components that build student competencies: (1) Conducting science, (2) Ethical and societal challenges in conservation, and (3) Communicating science (see Learning Outcomes in syllabus). Students will complete integrative taxonomy research while also studying biodiversity and the implications of conservation. The research process will naturally be scaffolded because students will gain their skills by first observing tasks, then completing the task for themselves. They will be asked to reflect on their current knowledge and then find scientific articles to increase understanding. Short quizzes following lectures will test their understanding in the short-term, and presentations and a group project will ensure retention of key concepts and methodologies in ecological and evolutionary biology.

<u>How research inquiry will be structured through assignments:</u>

Discussion forum and literature summary
Every two weeks students will propose one question to the class in the online discussion forum and answer it referring to a paper they have found in the primary literature. This will reflect the literature review they are conducting for their annotated bibliography assignment. Students will get meaningful feedback during in-class discussions and direct mentoring on the draft version of their annotated bibliography.

Knowledge checks, discussions, surveys
Methods development and understanding will occur as students complete in-class activities and tutorials (e.g., sample prep/voucher; pipetting; estimating biodiversity). Quizzes and group discussions will require individuals to analyze, evaluate, and apply foundational course knowledge to solve problems or answer complex questions independently. Following in-class active learning activities, students will take short surveys to reflect on what they have learned building confidence in their skills so that they are empowered to contribute to group projects.

Group research portfolio
Student will work collaboratively to complete a research portfolio focused on a unique research question. The report includes a literature review, methods description, data analysis and interpretation of results, and detailed well-cited discussion. This assignment will evaluate the student's ability to analyze and interpret data based on a question/hypothesis. All components of this assignment are scaffolded to ensure student understanding. Because we will be collecting insect specimens then processing and analyzing the data, students will keep personal logbooks and a voucher collection. They will receive mentoring on the quality of each component before they hand in the final logbook and voucher collection at the end of the semester. Reflections will be written as discussion prompts to receive one-on-one near-peer and instructor mentoring.

Communicating science
Student will be asked to independently synthesize and explain research they completed at the end of the semester. They will do this in two assignments (field guide page, flash talk) and one in-class activity. While the entire semester will provide opportunities for students to grow confidence in public speaking, three specific

opportunities are built into the course plan. The first will be when students turn their field guide pages into small posters and display them at the Museum of Biological Diversity. We will be celebrating the semester while the students practice presenting their posters informally to each other and completing a peer-review (e.g., visual appeal, font size, concise, clear). They will also receive instructor mentoring and have time for revisions before they present their field guide page in the classroom as a formal flash talk for a grade. Students will complete a second peer-review specifically focusing on performance qualities during flash talks (e.g., pitch, pace, volume, active voice, audience connection). Additionally, student research teams will present their scientific findings in class as informal chalk talks/discussions. This will be their opportunity to reflect on their final figures and other components of their group research portfolio before they turn it in for a grade. Again, they will receive near-peer mentoring and instructor's feedback before the final portfolio is handed in.

6. <u>Reflection</u>: Explain how the course offers students opportunities for reflection on their own developing skills and their status as learners and as researchers or creatives. (This information should also be readily visible on the syllabus.)

Students will demonstrate understanding of ecological and evolutionary processes through multiple forms of communication (e.g., research portfolio, field guide page, and flash talk) and assessment. They will have many structured opportunities to reflect and integrate learning.

Group research portfolio: This 100-point assignment is 1/4th of the entire grade. Therefore, there are several opportunities for students to receive feedback on low-stakes assignments regarding their logbook and voucher preparations. After they complete tutorials and watch lectures and apply their skills, students will be asked to write short reflections on what they have learned and how it may be applicable for their future studies or professions. For example, students will be learning how to assess biological diversity across several weeks (Weeks: 3, 7, 9, 10). They will reflect on how these analyses are important for conservation as well as other ecological studies.

Knowledge checks: Following online recorded lectures, there will be quizzes that will ask the students to analyze, evaluate, and apply course knowledge. This will ensure that students keep up with the class while at the same time provide them with clear examples of benchmarks to be successful in the course.

Field guide and flash talk: In their flash talk presentation, students are asked to synthesize what they have learned from peer-review articles and interpret findings for a public audience. They will first present their poster of their field guide page (Week 13) that will serve as a rehearsal for their more developed flash talk (Week 14).