BS 162, Organismal Biology (Lecture)
Summer I 2017, 3 credits
23 May – 24 June 2017 (5 weeks)
Tuesday and Wednesday 9:00am-4:30pm
Rooms 141 (classroom) and 139 (computer lab room) Stack Building, Kellogg Biological Station

Instructor
Dr. Andrea Bierema
Office hours are by appointment but I am typically available in my office about 8:15am on Tuesdays and Wednesdays until class begins. My office number is Stack 139A (access through 139 and 141 rooms).
Email: abierema@msu.edu
Website: https://bierema.wordpress.com

Course Materials
  Good news: your textbook for this class is available for free online (www.openstax.org/details/biology)! If you prefer, you can also purchase on iBooks for $4.99 or get a print version via the campus bookstore or from seller “OpenStax” on Amazon.com.
  You can use whichever formats you want. Web view is recommended -- the responsive design works seamlessly on any device.
• **Website Readings**: Berkeley’s Understanding Evolution 101 (http://evolution.berkeley.edu/evolibrary/article/evo_01). We will use this website for the first unit of the course. Please see the schedule for which sections to read on which days. It can be confusing on the website to determine when one section ends and another begins because there is a “next” button on each page. Follow the navigation window on the left side of the screen to determine which section you are in after hitting the next button.
  Additional readings and videos are provided in the syllabus schedule.
  We use many worksheets in this course. Calculator, lined paper and folders are recommended.
  We will be doing some activities on the computers. We have computers available, but you are welcome to bring your laptop if you prefer.
• **MSU Library Guide**: http://libguides.lib.msu.edu/c.php?g=565619

Catalog Description

Course Big Ideas
• **Evolution**
  • Variation, caused by random mutation and passed on by reproduction, provides the raw material for evolution.
  • Evolution is the change in allelic and/or genotypic frequencies in a population and is manifested in the changes in inherited characteristics over generations.
  • Evolution can be tested using the Hardy-Weinberg Equilibrium equations.
  • Evolution affects the genetic make-up of populations over time and may lead to adaptation, speciation, or extinction.
The diversity of life on Earth is the result of 3.5 billion years of evolution and
evidence for evolution comes from a variety of scientific fields.

- Population Genetics
  - Meiosis produces gametes for sexual reproduction.
  - Fundamental principles derived from Mendel’s observations can help explain
    additional patterns of inheritance.
  - Mendelian genetics predict patterns of inheritance.
  - Mendel’s principles are insufficient to explain many patterns of inheritance.

- Ecology
  - Organisms interact with their abiotic and biotic environments at multiple scales
    (molecules to ecosystems) for the purpose of obtaining resources. These
    interactions mediate movements of matter, energy, and information in ecological
    systems and are subject to physical and chemical laws.
  - These interactions mediate movements of matter, energy, and information in
    ecological systems and are subject to physical and chemical laws.
  - Humans impact ecosystem structure, function, and dynamics by acting on other
    ecological big ideas.
  - The distribution and abundance of organisms - as well as the direction,
    magnitude, and frequencies of their interactions - can change in space and time
    and are linked to availabilities of matter, energy, and other resources.

**Course Objectives**
Course objectives are concepts or practices that students should be able to
know and do by the end of the course. The instructor has a detailed list of objectives available
on D2L. Students will be assessed based on the course objectives through the course project and daily quizzes (see Grading section below for more information).

**Instructional Methods**
This course has a different format than what many of you may have come to expect from
previous experiences that identify teaching with lecturing and learning with memorization.
Instead of having your instructor learn the material for you and being evaluated by how well you
recall what your instructor tells you, you will be expected to take responsibility for your own
independent learning.

The class features some lecture, many class discussions and multiple opportunities to work in
small groups that invite you to figure out how to solve problems on your own with assistance
from your instructor. Many of the activities will occur outside. Most assignments will likewise
require you to learn material on your own or in teams. Demonstrating your mastery of both the
course material and your ability to become an independent learner will include a session-long
course project and daily quizzes.

**Grading**
Graded assessments will include reading tasks, quizzes and a session-long course project.
Daily participation will also be graded.

**Reading Tasks**
Readings (and sometimes videos) are assigned daily. The purpose of these readings are to
prepare students for the in-class activities. In order to have students reflect on the reading and
to provide the instructor some insight into which topics were of most interest and most
challenging to students, students will individually complete a short assignment following each
reading. “Each reading” refers to all reading/viewing tasks for one class period. Every day, starting with the readings due on Day 2, hand-write a two-paragraph summary that answers the following two questions in regard to the reading:

1. What was the most interesting concept in the reading/videos?
2. What was the most challenging concept in the reading/videos?

Note that although readings are listed for Day 1 there is no associated reading assignment due.

Quizzes
Each class period (except for the first day) will begin with a quiz, unless otherwise noted. These quizzes will cover and apply concepts from the previous day- they will not cover the reading that was due on that day. If there are concepts covered in the reading that was not addressed during class, then those concepts will also not be on the quiz. Students will be given a list of objectives for the day to use as a guide for preparing for the quizzes. Quizzes will be completed independently without notes. They will contain short-answer questions and focus on one or two case studies.

Questions about quiz answers. If you believe an alternative answer to a quiz question is a better choice than the answer that I have indicated as correct, please write a summary of your reasoning and email it to your instructor within the first week after a quiz is returned. The question and your summary will be reviewed and points will be credited as appropriate.

Course Project
The course project will aid students in practicing how to argue with evidence, how to write scientific papers, as well as other scientific practices. We will use the topic of de-extinction for this project. The assignments will be completed individually. The first assignment is a reflective essay that will be done after an introduction to de-extinction. Then students will develop an annotated bibliography. The third assignment is will have students work on part of their final paper. Next is a peer-review assignment that will be done in class. Lastly, students will submit the final paper and participate in a debate. Each written assignment will be handed in as a hard copy (do not email or use D2L).

Suzanne Teghtmeyer, the Collections Manager for the Walter Morofsky Library at KBS, built an online library course guide to help students find materials for the course project. The course guide is accessible directly from http://libguides.lib.msu.edu/c.php?g=565619 or from the Library’s Course Guide page (http://libguides.lib.msu.edu/courseguides).

Attendance and Participation
Attendance and participation in class activities is required of all students. The discussions and group activities scheduled for class time are an essential part of your professional preparation. I cannot stress enough that attendance and participation are necessary for your success in this class. Participation means not only coming to class, but also contributing to discussions, being helpful in the field and in class, and not complaining. If you come to class but have a poor attitude, do not participate in small or large group discussions, choose to talk off topic rather than to stay focused on given assignments, or break classroom rules you can lose participation points. Many of the activities in class will include worksheets to be completed. The completion of the worksheets will also count toward participation unless otherwise noted. Students keep these worksheets for studying for quizzes.

If you know in advance of a schedule conflict with a class session, you should inform the instructor in advance. If you miss a class session due to illness or unforeseen circumstances, it is your responsibility to contact the instructor before the next
scheduled class period. Under the instructor’s discretion, alternative assignments may be possible. This course proceeds at twice the normal speed and thus missing classes will quickly put you behind.

Summary of Graded Tasks

<table>
<thead>
<tr>
<th>Type</th>
<th>Points</th>
<th>In Class or HW?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading Tasks</td>
<td>5 *9 tasks = 45</td>
<td>Homework</td>
</tr>
<tr>
<td>Participation</td>
<td>15 *10 days = 150</td>
<td>In class</td>
</tr>
<tr>
<td>Quizzes</td>
<td>20 *9 quizzes = 180</td>
<td>In class</td>
</tr>
<tr>
<td>Course Project:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reflection Assignment</td>
<td>20</td>
<td>Homework</td>
</tr>
<tr>
<td>Annotated Bibliography</td>
<td>30</td>
<td>Homework</td>
</tr>
<tr>
<td>Candidate Species Assignment</td>
<td>30</td>
<td>Homework</td>
</tr>
<tr>
<td>Peer Review Assignment</td>
<td>30</td>
<td>In class</td>
</tr>
<tr>
<td>Final Paper</td>
<td>60</td>
<td>Homework</td>
</tr>
<tr>
<td>Debate</td>
<td>30</td>
<td>In class</td>
</tr>
<tr>
<td>Total</td>
<td>575</td>
<td></td>
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</tbody>
</table>

Extra Credit

Extra credit is extremely rare in this class, so please do not ask. If provided, an announcement will be made in class.

Grading Scale

<table>
<thead>
<tr>
<th>Final Average (%)</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;92</td>
<td>4.0</td>
</tr>
<tr>
<td>85-92</td>
<td>3.5</td>
</tr>
<tr>
<td>80-84</td>
<td>3.0</td>
</tr>
<tr>
<td>75-79</td>
<td>2.5</td>
</tr>
<tr>
<td>70-74</td>
<td>2.0</td>
</tr>
<tr>
<td>65-69</td>
<td>1.5</td>
</tr>
<tr>
<td>60-64</td>
<td>1.0</td>
</tr>
<tr>
<td>&lt;60</td>
<td>0.0</td>
</tr>
</tbody>
</table>

D2L

D2L is Michigan State’s online learning platform. The class will primarily use D2L for posting course objectives, course project assignment directions, additional materials, and grades. D2L will not be used for submitting assignments, unless otherwise noted.

Classroom Conduct

Each student in this course is a valued member of our educational community and deserves respect. We may discuss some “hot-button” issues in class about which you may have strong opinions. That is great. We look forward to hearing from all of you. Please present your views thoughtfully and with respect for the opinions and humanity of your colleagues, who may disagree with you. Also remember that as scientists, our arguments are based on evidence. As with all of your courses, please do not disrupt the class: silence your cell phones before entering the classroom, use your computers for course-related tasks only (not Facebook), treat your neighbors with respect, and avoid engaging in distracting activities.
Academic Integrity and Honesty
The Spartan Code of Honor academic pledge focuses on valuing academic integrity and honest work ethics at Michigan State University. The pledge reads as follows: "As a Spartan, I will strive to uphold values of the highest ethical standard. I will practice honesty in my work, foster honesty in my peers, and take pride in knowing that honor is worth more than grades. I will carry these values beyond my time as a student at Michigan State University, continuing the endeavor to build personal integrity in all that I do."

The excellence of science depends upon the honesty and integrity of its practitioners. As scientists, we are committed to upholding the highest standards in the pursuit of truth. This is our job and our calling. We expect a similar commitment from you. Thus, cheating in this class is a particularly poor idea. Students who cheat or plagiarize will fail the assignment, may fail the course (depending on the severity of the infraction), and may face additional university sanctions. Cheating includes attempting to pass off someone else’s work as your own, using crib sheets, using www.allmsu.com web site, falsifying data, and providing quiz answers to others. If you are not sure what sort of activities constitute cheating, please ask us.

Article 2.III.B.2 of the SRR states: “The student shares with the faculty the responsibility for maintaining the integrity of scholarship, grades, and professional standards.” In addition, this course adheres to the policies on academic honesty specified in General Student Regulation 1.0, Protection of Scholarship and Grades; the all-University Policy on Integrity of Scholarship and Grades; and Ordinance 17.00, Examinations. These can be found at splife.studentlife.msu.edu

Faculty are required to report all instances in which a penalty grade is given for academic dishonesty. Students reported for academic dishonesty are required to take an online course about the integrity of scholarship and grades. A hold will be placed on the student's account until such time as the student completes the course. This course is overseen by the Associate Provost for Undergraduate Education.

Use of Media Derived from Class
As members of a learning community, students are expected to respect the intellectual property of course instructors and other students. All course materials presented to students are the copyrighted property of the course instructor and are subject to the following conditions of use:

1. Students may audio record classroom activities and use the recordings only for their own study.
2. Students may not share the recordings with other students enrolled in the class.
3. Students may not post the recordings or other course materials online or distribute them to anyone not enrolled in the class without the advance written permission of the course instructor and, if applicable, any students whose voice or image is included in the recordings.
4. Any student violating the conditions described above may face academic disciplinary sanctions.

Laboratory Course
BS 172, Organismal Biology Laboratory is a related but separate course. Please refer to your instructor in that course for information about laboratory assignments and grading.
**Student Feedback**
Students will have an opportunity to provide anonymous feedback about the course, instructor, and teaching assistant. Feedback will be provided through the Student Instruction Rating System (SIRS Online) toward the end of the course. The instructor will not receive the feedback until after grades are submitted. If you have anything that you would like to discuss with the instructor directly, please feel free to do so.

**Things to Contact the Instructor About at the Beginning of the Term**

**Accommodations for Disabilities**
Michigan State University is committed to providing equal opportunity for participation in all programs, services and activities. Requests for accommodations by persons with disabilities may be made by contacting the Resource Center for Persons with Disabilities at 517-884-RCPD or on the web at rcpd.msu.edu. Once your eligibility for an accommodation has been determined, you will be issued a verified individual services accommodation ("VISA") form. Please present this form to me at the start of the term and/or two weeks prior to the accommodation date (test, project, etc.). Requests received after this date will be honored whenever possible.

**Religious Holidays**
If you will be absent from class to observe a religious holiday, please let us know immediately, so we can make arrangements with you.

**Missing class because of conflicts with other university activities**
If you need to be excused from class to participate in a one-time required activity for another course or university-sanctioned event, please talk with the instructor right away and bring written authorization from the faculty member of the other course or from a university administrator. We will do our best to accommodate you, within the constraints of this course. You can expect to be assigned make-up activities.
### Tentative Course Schedule

<table>
<thead>
<tr>
<th>Day</th>
<th>Date</th>
<th>Topics</th>
<th>Readings &amp; Videos (completed before class)</th>
<th>Homework Due (start of class)</th>
<th>In-class Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Evolution Unit:</strong> Evolution is the foundation of biology; therefore, this course’s first unit will be dedicated to learning about evolution. We will use the ideas learned in this unit throughout the entire course. This unit begins with an introduction to evolution and the mechanisms of evolution, such as natural selection and genetic drift. Then we will examine how to test if evolution is occurring within a population via Hardy-Weinberg and study what happens when evolution results in speciation. Finally, we will learn how to create models of evolutionary relatedness and consider the diversity that has resulted in millions of years of evolution.</td>
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<tr>
<td>1</td>
<td>Tues</td>
<td>05/23 Evolution Genetic Variation</td>
<td>Optional: Evolution 101 Website (sections: “An Introduction to Evolution,” “Mechanisms”, and “Microevolution”)</td>
<td>Reflection Essay Quiz 1</td>
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</tr>
<tr>
<td>2</td>
<td>Wed</td>
<td>05/24 Hardy-Weinberg Speciation</td>
<td>Evolution 101 Website (sections: “Speciation” and “Macroevolution”) Online Video: The Cornell Lab of Ornithology speciation video: <a href="https://www.youtube.com/watch?v=8yvEDqrc3XE">https://www.youtube.com/watch?v=8yvEDqrc3XE</a></td>
<td></td>
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<tr>
<td>3</td>
<td>Tues</td>
<td>05/30 Phylogenetic Trees Biodiversity Bring lunch for field trip</td>
<td>Evolution 101 Website (section: “Patterns”) OpenStax Section 47.1: The Biodiversity Crisis Optional: OpenStax Sections 47.2, 47.3, 47.4 Annotated Bibliography Study Species Presentation</td>
<td>Quiz 2</td>
<td></td>
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<tr>
<td><strong>Reproduction and Population Genetics Unit:</strong> Reproduction, whether asexual, sexual, or somewhere in between, is the mechanism that passes traits on to the next generation- a requirement of evolution. Therefore, after learning about evolution, we will examine the various ways in which reproduction occurs, including how it occurs at the cellular level. We will then learn how to study inheritance patterns via Punnett squares. First, we examine traits that follow classic dominant/recessive inheritance and later examine additional patterns.</td>
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### BS 162, Organismal Biology

**Course Syllabus**  
**Summer Session I 2017**

*OpenStax 11.2: Sexual Reproduction*  
*Optional: OpenStax Chapter 10 and section 11.1*

<table>
<thead>
<tr>
<th>Day</th>
<th>Date</th>
<th>Topic</th>
<th>Reading</th>
<th>Assessment</th>
</tr>
</thead>
</table>
| 5   | Tues | Mendel's Laws Punnett Squares | 12.1: Mendel's Experiments and the Laws of Probability  
12.2: Characteristics and Traits; read up to "Alternatives to Dominance and Recessiveness"  
12.3: Laws of Inheritance; read up to “Linked Genes Violate the Law of Independent Assortment” | Candidate Species Assignment |
| 6   | Wed  | Beyond Mendel | 12.2: Characteristics and Traits; start reading at "Alternatives to Dominance and Recessiveness"  
12.3: Laws of Inheritance; start reading at "Linked Genes Violate the Law of Independent Assortment" | Quiz 5 |
| 7   | Thur | Ecosystems | 46.1: Ecology of Ecosystems  
46.2: Energy Flow through Ecosystems  
46.3: Biogeochemical Cycles | Quiz 6 |
| 8   | Fri  | Communities | 44.1: The Scope of Ecology  
45.6: Community Ecology | Final Paper for Review  
Quiz 7 Peer Review |
| 9   | Tues | Populations | 45.1: Population Demography  
45.3: Environmental Limits to Population Growth  
45.4: Population Dynamics and Regulation  
45.5: Human Population Growth | Quiz 8 |
| 10  | Wed  | Conservation | 47.4: Preserving Biodiversity | Final Paper  
Quiz 9 De-extinction Debate |

**Ecology Unit**: The last unit of this course will focus on ecology, the study of how organisms interact with one another and with their environment. Ecology is traditionally separated by the scale in which these interactions can be studied. Ecosystem ecology is the study of the interactions between living and non-living components of an area, a community refers to the organisms within an area, and a population is a group of individuals of the same species living in an area. We will begin with a wide lens: ecosystems. Then we will narrow down to communities and then populations. The course will end with the topic of conservation, which can factor in any of these ecological levels.