

Core Course Review Documentation

Foundational Component Area: LIFE & PHYSICAL SCIENCES

Component Area Option? No

Proposed Course: NEW Life II: Evolution and Ecology (Proposed as BIOL 1214).

Credit Hours: 4 (3-2)

Proposed by: Department of Biology

Date: October 19, 2016

Please document how the proposed course meets each of the following requirements. (You may provide a written explanation or copy and paste the appropriate information from the syllabus).

Content: *Courses in this category focus on describing, explaining, and predicting natural phenomena using the scientific method.*

This course is designed specifically for Biology and other natural science majors; however, it is open to all students who have taken the first course in the series (BIOL 1114) and passed with a C average.

The lecture component of this course will provide the student with knowledge and understanding of basic concepts underlying our understanding of Evolution and Ecology as the unifying theory of Biology and its application in ongoing biological processes. It will also provide a basic understanding of patterns and processes of Ecology as the study of interactions in a Biological context.

The laboratory component of this course will correlate with the concepts taught in the lecture and will provide students experience of experimental aspects of biology in small groups.

SKILLS: *Courses involve the understanding of interactions among natural phenomena and the implications of scientific principles on the physical world and on human experiences.*

Upon completion of this course, the students will be able to:

- Demonstrate a basic knowledge of patterns and processes in Evolution and Ecology
- Understand the mechanisms that underlie those patterns and processes.
- Discuss major advancements and innovations that led to our current knowledge in these fields
- Apply Evolutionary Theory as the unifying principle of Biology
- Demonstrate the ability to apply the Scientific Method in their laboratory exercises and projects
- Demonstrate the ability to analyze quantitative data and present that data in a scientifically appropriate manner
- Possess the ability to work as a member of a team in a laboratory group

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ASSESSMENT OF CORE OBJECTIVES: *Assessments should be authentic, intentional and direct. The following four Core Objectives must be addressed in each course approved to fulfill this category requirement:*

Critical Thinking Skills - *to include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information*

- Discussion of timely topics and pre-selected classic issues in the fields of Evolution and Ecology will be promoted and facilitated by the lecturer. On three occasions throughout the semester a peer-reviewed publication and associated media (Ted Talks, magazine articles, editorials, etc...) will be assigned and posted to D2L for students to read and prepare for discussion. Discussions will be moderated in the laboratory (because of smaller class sizes) and each student's contribution(s) to the discussion will be assessed using the Critical Thinking VALUE Rubric. While the subjects of the discussions selected for assessment may change from semester to semester, they will each be selected based upon timeliness and the suitability of the subject to provoke meaningful conversation. Such topics that span cultural and biological interests are the evolution and maintenance of human skin color, ecological effects of climate change, and species concepts.

Communication Skills - *to include effective development, interpretation and expression of ideas through written, oral, and visual communication*

- Alongside the above laboratory discussions, students will be assigned a historical figure in the field of Evolution and Ecology to prepare a 5-minute biographical presentation. There will also be two laboratory reports that must be written in a specified format to simulate the "Instructions to Authors" of peer-reviewed journals. These assignments span all forms of communication and contribute to critical thinking. Communication skills will be assessed using the AACU Written and Oral Communication VALUE Rubric. Specifically, students will be assessed on Organization, Language, Sources and Evidence, Context, and the Ability to Deliver Content in a scientifically accurate, yet understandable, format.

Empirical and Quantitative Skills - *to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions*

- Two laboratory reports will be assigned that will require students to gather, analyze, and report quantitative data as tables and graphs. Methods and Results of research discussed in class will also highlight application and conclusions of quantitative data. One laboratory report will concern a Natural Selection laboratory where students simulate selective pressures as a team and the other will concern a Diversity laboratory where each team will sample a mock habitat using different techniques and calculate two diversity indices as well as species richness. Empirical and Quantitative Skills will be assessed using the AACU Empirical and Quantitative Skills VALUE Rubric.

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Teamwork - to include the ability to consider different points of view and to work effectively with others to support a shared purpose or goal

- Laboratory investigations will require division of tasks among small-group team members in order to complete the assigned laboratory in the given timeframe. In this aspect every lab will emphasize teamwork. We will also incorporate Team-Based Learning (TBL) approaches in laboratory and lecture to stimulate intrapersonal interactions and reinforce teamwork.
- Individual student evaluation of the teamwork objective will become a component of the student's grade for laboratory. Each student will complete a teamwork assessment of each teammate as their own contribution. This will incorporate a "self-assessment" component of teamwork. This individual assessment for teamwork will be incorporated into the grading rubric for the overall assignment. Teamwork Skills will be assessed using the AACU Teamwork Skills VALUE Rubric.
- **ADDITIONAL INFORMATION:** Provide any additional information supporting course inclusion in the core (optional).
- **Learning outcomes for BIOL 1214 Lecture and Laboratory**

Lecture:

1. Define Evolution and describe the various mechanisms that contribute to it.
2. Explain why evolutionary theory is central to an understanding of Biology as a whole.
3. Describe how new organisms arise and are related as part of the tree of life.
4. Define Ecology and describe fundamental mechanisms
5. Describe major hypotheses underlying ecological relationships
6. Understand the levels of ecological study: Population, Community, and Evolutionary Ecology

Laboratory:

In addition to the learning outcomes above:

1. Apply scientific reasoning to reinforce understanding of Ecology and Evolution
2. Use inductive and deductive reasoning in laboratory investigations
3. Gather and analyze data from laboratory experiments
4. Present data orally and in writing
5. Communicate effectively the results of scientific investigations

PLEASE ATTACH THE FOLLOWING

1. Syllabus
2. Assessment for Critical Thinking Skills
3. Assessment for Communication Skills
4. Assessment for Empirical & Quantitative Skills
5. Assessment for Teamwork

Lecture Syllabus

Instructor: John/Jane Doe, Ph.D.
 e-mail: instructor@mwsu.edu
 Room: BO XXX

Office: BO XXX
 Office hours: See instructor's Schedule

Course Description:

Life II is an introduction to the principles and mechanisms of evolution and ecology. The history, evidence, patterns, and mechanisms of evolution as the unifying theory of Biology will be explored and multiple levels of biological interactions within and among species and their environment will be introduced.

Prerequisites: Life I: Cellular and Molecular Concepts with a grade of "C" or better.

Textbook: *Life: The Science of Biology*, 10th Edition. Sadava, Hillis, Heller, & Berenbaum.

Laboratory Manual: (required): Life II: Evolution and Ecology, Watson and Willis

Expected Outcomes:

Upon completion of this course, students will have a basic knowledge of patterns in evolution and ecology as well as the mechanisms that underlie those patterns. Students will understand major principles and those discoveries and innovations that led to our current knowledge of evolutionary and ecological principles. Life II provides a foundation for advanced courses in Ecology, Evolution and other courses.

Course Schedule:

Sequence of topics to be covered: timing subject to modification

| <u>Topic</u> | <u>Chapters</u> |
|--|-----------------|
| Inheritance, Genes, Chromosomes | 12 |
| Part Six: THE PATTERNS AND PROCESSES OF EVOLUTION | |
| Mechanisms of Evolution | 21 |
| Reconstructing and Using Phylogenies | 22 |
| Speciation | 23 |
| Evolution of Genes and Genomes | 24 |
| The History of Life on Earth | 25 |
| Part Ten: ECOLOGY | |
| Ecology and the Distribution of Life | 54 |
| Population Ecology | 55 |
| Species Interactions and Coevolution | 56 |
| Community Ecology | 57 |
| Ecosystems and Global Ecology | 58 |
| Biodiversity and Conservation Biology | 59 |

Course Grading:

| Grade Scale | Components of Grade |
|-------------|---------------------------|
| A \geq 90 | Lecture Exams ----- |
| B \geq 80 | Lecture Quizzes ----- 75% |
| C \geq 70 | Weekly Discussions ----- |
| D \geq 60 | Laboratory ----- 25% |
| F < 60 | |

Grading:

Your course grade will be a weighted average of your lecture and laboratory grade (75% lecture and 25% Laboratory). Your lecture grade will be determined by your performance on four exams, the last of which is the final exam. Each exam is worth 1/5 of your lecture grade with the exception of the final exam which is worth 2/5 and will be at least partially comprehensive. Your laboratory grade will be determined by weighted averages of weekly quizzes, two laboratory reports, teamwork evaluation, and an oral presentation. There will be no individual extra credit. If the instructor determines that additional credit is needed it will be offered to the whole class.

Other required subsections will be included in accordance with university policy.

Lab Syllabus

Instructor: John/Jane Doe, Ph.D.
e-mail: instructor@mwsu.edu
Room: BO XXX

Office: BO XXX
Office hours: See instructor's Schedule

Laboratory Description:

Life II Laboratory is designed to reinforce the knowledge of principles and mechanisms of evolution and ecology. This laboratory, following Team-Based-Learning (TBL) methodology, will incorporate hands-on experimentation, instructor-led discussion, and literature review/research to continue to nurture the development of the student as a future Biologist.

Prerequisites: Life I: Cellular and Molecular Concepts with a grade of "C" or better.

Textbook: *Life: The Science of Biology*, 10th Edition. Sadava, Hillis, Heller, & Berenbaum.

Laboratory Manual: (required): Life II: Evolution and Ecology, Watson and Willis

Expected Outcomes:

Upon completion of this course, students will have a basic knowledge of patterns in evolution and ecology as well as the mechanisms that underlie those patterns. Students will understand major principles and those discoveries and innovations that led to our current knowledge of evolutionary and ecological principles. Life II provides a foundation for advanced courses in Ecology, Evolution and other courses.

Laboratory Schedule:

Sequence of topics to be covered: timing subject to modification

| <u>Laboratory</u> | <u>Topic</u> | <u>Assignment</u> |
|-------------------|--|---|
| Lab 1 | Introduction Review Scientific Method Form Teams | None |
| Lab 2 | What is a Species? Phylogenetic Trees | Discussion 1 Quiz 1, Oral Presentations |
| Lab 3 | Natural Selection | Quiz 2, Oral Presentations Laboratory Report 1 |
| Lab 4 | Genetic Basis of Evolution | Quiz 3, Oral Presentations |
| Lab 5 | Linking Evolution and Ecology | Quiz 4, Oral Presentations Laboratory Report 1 Due |
| Lab 6 | Species Distributions | Quiz 5, Oral Presentations |

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|--------|----------------------|---|
| Lab 7 | Population Ecology | Quiz 6, Oral Presentations |
| Lab 8 | Community Ecology | Quiz 7, Oral Presentations Laboratory Report 2 |
| Lab 9 | Biodiversity | Quiz 8, Oral Presentations Discussion 2 |
| Lab 10 | Conservation Ecology | Quiz 9, Oral Presentations Laboratory Report 2 Due |

Grading:

Your laboratory grade will be determined by weighted averages of weekly quizzes, two laboratory reports, teamwork evaluation, and an oral presentation. There will be no individual extra credit. If the instructor determines that additional credit is needed it will be offered to the whole class.

Other required subsections will be included in accordance with university policy.