

Capstone I AY16 Program Review: Program Outcomes and Capstone Assignment Alignment

BIOLOGY/BOTANY

Program Learning Outcomes (PLOs)

- Breadth of **Content Knowledge** in Biology: Students will master the basic foundational content in the field of biology and apply it to critical analysis and creative application of that content.
- **Creative Inquiry**: Students will demonstrate the ability to design (create) and conduct experiments to answer biological questions. This process is based upon the tenets of the scientific method.
- **Integrated Learning through Critical Thinking**: Students will integrate their knowledge (content) of biology, chemistry, physics, and social systems through critical analysis of ecosystems, biological evolution, and the biotechnological revolution.
- **Community/Civic Engagement**: Students will learn to engage in and apply scientific inquiry to conservation activities that involve the wider regional community.

Capstone Assignment

Eastern Oregon University

College of Arts & Sciences
Division of Science and Mathematics
Course Syllabus

Number of Course: BIOL 490

Name of Course: Evolution

Catalog Description: A capstone experience in biology providing a synthesis of the principles of biology in the context of evolutionary theory. Prerequisites: BIOL 357, 341, 342, 431, and 432 or 433; and senior class standing

Credit Hours: Three

Learning Outcomes: Students will be able to*:

1. Discuss the history of evolutionary thought throughout the past 400 years.
2. Understand the context within which Charles Darwin and Alfred Russel Wallace developed their ideas about natural selection.
3. Outline the essential components detailing how natural selection operates to produce evolution.
4. Discuss the application of Mendel's law to Darwinian evolution by the developers of the new synthesis during the first half of the 20th century.
5. Discuss the other proposed mechanisms for evolution, including genetic drift, sexual selection, neutral and nearly neutral theory, and the six others which Darwin proposes in *The Origin of Species*.
6. Define the major terms used in modern evolution thought and research-examples include adaptive radiation, fitness, selection pressures, speciation mechanisms, micro- and macroevolution, punctuated equilibrium, plus many others.
7. Discuss the applications of population genetics and the Hardy-Weinberg equilibrium to analyzing the effects of selection on animal populations.
8. Solve problems, using population genetics and genetics and selection, about the change in allele frequencies over time within selected populations.
9. Analyze and discuss original articles by the principal developers of modern evolutionary theory, including

Darwin, Haldane, Wright, Gaylord Simpson, Fisher, Dobzhansky, Mayr, Maynard Smith, Williams, Dawkins, Gould, and Lewontin.

10. Describe the roots of the evolution-creationism controversy and list the reason why creationism lack scientific rigor and provides an inadequate description of how life on this planet reached it's present state of complexity.

11. Describe very recent advances in evolutionary thinking and research.

*The level and sophistication of each student's achievement of each learning outcome will depend to some extent upon the student's standing in the class. Students in the top third of the class will meet these outcomes at a higher level of understanding and appreciation, while the achievements of students in the bottom third of the class will be fairly minimal.

Brief Outline of Course Content:

1. Darwin in temporal context
2. Fitness and natural selection
3. Other theories of evolution
1. Adaptation, diversity, and microevolution
5. Speciation and macroevolution
6. Evolution and creationism

Text or Suggested Materials:

Texts: Various texts are used, including a textbook and readings in evolutionary biology, both at the primary and the popular levels

Means of Assessment, Including UWR Requirements (NOTE: This course must be completed with a C- or better to qualify as fulfilling upper-division writing-intensive University Writing Requirement)

Written Long Assignments: Students prepare 6-8 long written assignments of 4-6 pages each on a broad variety of topics within the field of evolutionary biology and relating to reading assignments and topics presented in class. At least two of these assignments will be revised and resubmitted by students. Revision will be peer-driven and will include correction and analysis of writing mechanics as well as logical analysis of the points raised and supported by the papers. Students will be required to integrate multiple sources, including their reading assignments, material from the internet, and primary research articles and reviews. Papers will be evaluated for content, logic, strength of arguments, and mechanics. Papers submitted as finished products are worth 100 points each; papers to be resubmitted after revision will be worth 50 points, with the revision worth an additional 50 points. **Students should seek assistance from a Writing Tutor in the Writing Lab when needed and when referred by the instructor.**

Short Precis Writings: Students will prepare weekly 1-page arguments supporting or refuting various topics and arguments in the creation/evolution/intelligent design controversy. Papers will be discussed and revised in class as part of a group activity. Papers will be evaluated for content, logic, strength of argument, and mechanics. These papers are worth 10 points each.

Assessment Exam: Students will be given a subject exam prepared by ETS (Educational Testing Service) as an assessment of their knowledge gained in their major study as well as providing key information to the program on how well learning outcomes of required courses in biology are being met. The score on the exam will be weighted with respect to the student's percentile performance and will be worth a maximum of 100 points, the point total being reflected in the individual student's percentile score.

Syllabus prepared by:

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If you have a documented disability or suspect that you have a learning problem and need accommodations, please contact the Disability Services Program in Loso Hall 234.
Telephone: 962-3081

Statement on Academic Misconduct: Eastern Oregon University places a high value upon the integrity of its student scholars. Any student found guilty of an act of academic misconduct (including, but not limited to cheating; plagiarism; or theft of an examination or supplies) may be subject to having his or her grade reduced in the course in question, being placed on probation or suspended from the university, or being expelled from the university - or a combination of these.

See Section II of the Student Handbook and Planning Calendar for clarification.

Closing the Loop Statement

BIOL 490: Evolution constitutes Biology's Capstone. A capstone experience in biology provides a synthesis of the principles of biology in the context of evolutionary theory. It certainly meets the Breadth of Knowledge Outcome by emphasizing the synthesis of key concepts learned in the program as reflected in the course Prerequisites: BIOL 357, 341, 342, 431, and 432 or 433; and senior class standing. Creative Inquiry, emphasizing experimentation, is required throughout the BIOL program from the 100- through the 400-levels. In BIOL 490, experimentation takes the form of statistical modeling of population genetics principles, with analytical summary by the students as an outcome of the experimentation. However, as currently set up, it does not exactly meet the spirit of the Creative Inquiry outcome because students follow a prescribed protocol. In the future we may be able to address the Creative Inquiry outcome by presenting students with the problem of figuring out how to statistically model population genetics and changes in allele frequencies, and have THEM figure out a protocol. In fact, that would be a great way of addressing the outcome on BIOL 490. Because of the emphasis on synthesis, the course requires students to integrate their learning through critical thinking. Community/Civic Engagement is not required in BIOL 490 and in fact occurs only in BIOL 213. Therefore, as a scaffolded program outcome, Civic Engagement will be reconsidered next year by program faculty. Overall, the Biology/Botany Capstone aligns with the program's PLOs, with the exception of Community/Civic Engagement.

Action Plan:

- 1) Refine the approach to Creative Inquiry in the capstone.
- 2) Reassess the Civic Engagement Outcome to ensure all students address the outcome in a scaffolded way in the curriculum, aside from the Capstone.