BISC 301 Evolution

Syllabus

Instructor: Dr. Susan Balenger
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Office Hours: By appointment
Lecture: 304 Shoemaker Hall; M, W, F 12:00 – 1:00 pm
Text: Evolution (Futuyma & Kirkpatrick, 4th ed.)

Course Description:

This course focuses on the processes of evolution and the patterns generated by these processes. The aim is to develop a scientific way of thinking about biological diversity rather than attempting to memorize the history of living things. If you can acquire an evolutionary "way of thinking" about the tremendous diversity of life, you will probably remember more, and be equipped to discuss things more intelligently, than if forced to memorize dry facts about, say, gene frequencies or the fossil record. How can we account for the extinction of dinosaurs and the existence of mites that crawl around our eyelids? How on earth did some insects come to look so much like sticks? We will seek explanations for such patterns of diversity and for the apparent "good fit" of organisms to their environment. Topics covered include elementary population genetics, the theory of evolution by natural selection, concepts of fitness and adaptation, genetic bases of evolutionary change, modes of speciation, molecular evolution, evolution of sex, and how species-species interactions influence evolution. As this list indicates, you will be introduced to the major topics within evolutionary biology. I hope that the exposure to the tremendous diversity within this discipline will illustrate why evolution is viewed as the central theme unifying all of biology. Among biologists, evolution is considered to be a central unifying discipline because it is within an evolutionary framework that the rest of biology is understood, and it is therefore evolution that connects all other biological subfields. Evolution provides the key to understanding the origin and maintenance of the diversity of life on earth.

An understanding of evolution is not just the philosophical base upon which we build our understanding of life, but it is also a field that intersects all aspects of biology. Evolutionary concepts are at the forefront of many of the most important and cutting-edge advances in ecology, medicine, and molecular biology.

The evolution of life arises from a complex set of processes that involve abstract concepts. Many people think they understand evolution yet have misconceptions or a fuzzy understanding of the topic. It's not a coincidence that evolution was properly understood by scientists over a hundred years after calculus was discovered; even though the central idea is fairly straightforward it requires an understanding of statistical variation and change over long periods of time. Because of this, the course is more than just a set of definitions to memorize.
In addition to the specific material we will also place an emphasis on the importance and precision of the words we use. We will do this because words shape our perceptions of reality and misusing them or being vague leads to us to misunderstand reality or think we do when we don't.

The course includes mathematical concepts and material. In some cases we use mathematical results to provide insight into the processes we seek to understand. In other cases the mathematical equations have a more directly practical or applied purpose.

Course Goals/Learning Objectives:

I can therefore make the following non-exhaustive list of the learning objectives of this course:

- Students will learn about the central concepts and definitions used in the study of biological evolution.
- Students will improve the logic and precision of their descriptions of scientific topics.
- Students will improve their quantitative skills by working with a variety of quantitative evolutionary topics.
- Students will learn about the philosophical approach to doing hypothesis-driven science.
- Students will gain experience interpreting and criticizing experimental data used by others to make claims about specific hypotheses.
- Students will gain skills allowing them to synthesize and think critically about primary scientific literature.
- *Graduate students:* Students will gain leadership skills. Students will further develop their ability to review the historical and current literature.

Grades (Undergraduates): Journals (25 pts.); Quizzes (25 pts.); Discussion Activities (50 pts.); 4 Exams (400 pts. – 100 pts. each). *Total = 500 pts.*

Grades (Graduates): Journals (25 pts.); Quizzes (25 pts.); Discussion Activities (50 pts.); Presentation (25 pts.); Research Paper (25 pts.), 4 Exams (400 pts. – 100 pts. each). *Total = 550 pts.*

Required Readings: Listed on the lecture outline are pages from the text (Evolution by Douglas Futuyma and Mark Kirkpatrick) assigned to the lectures for a given day. *The textbook is the 4th edition of Evolution by Futuyma & Kirkpatrick and the assigned readings are absolutely essential to success in this course.* Each week you will be responsible for the material covered in the chapter of the text assigned in this syllabus. Most of this material will be covered in lecture as well, but you are responsible for any material covered in class that is not in the text as well as any material in the text that is not directly mentioned in class. I strongly encourage you to read the textbook and use the associated website (evolution4e.sinauer.com). In order to take the online quizzes, you will need to create an account and register as a student in my class. We will go over this in class.

*In addition to the textbook, we will read primary literature to facilitate learning and discussion in this course.* Therefore, *readings should be completed prior to coming to class.* Putting the
time in to not only read the assigned papers, but think about them as you do so is absolutely essential to the success of the course and for your ability to participate in informed analysis and debate during discussions. Assigned readings are listed in this syllabus, and pdfs of each will be posted on Blackboard at least one full week before they are due.

**Attendance/Participation:** Attendance will be taken for meetings where papers are discussed and grades will reflect poor attendance and lack of participation in these discussions.

**Journals:** You are required to write about your thoughts and reflections of the week’s major ideas, activities, discussion, and remaining questions or controversies that came up either in or outside of class. These journals are mainly for you to review and reinforce what you learned each week. They have the added benefit of providing feedback to the instructor about the effectiveness of the classroom activities and readings for teaching you the desired concepts and skills. Entries are to be submitted online through the course Blackboard page before 5 pm each Friday (not including exam weeks and Spring break). You are required to write a minimum of three complete sentences to get full points, but a longer discussion is welcome as well. **Journal entries are time stamped.** You will be penalized if you submit your journal during class time.

**Quizzes:** There will be a 5-minute quiz at the beginning of class most Mondays. Quizzes will typically cover material from the previous week and be in multiple choice or short answer format. Each quiz will be worth 2 or 3 points.

**Exams:** Exam questions will include 1) true/false, 2) multiple choice, and 3) problem-solving and discussion style responses. They will cover material presented in lectures, discussions and readings and will encourage the integration of information from these sources.

**Graduate students only**

**Presentation/Paper Discussion:** A brief powerpoint presentation will be given in class that provides background on one or more papers to be discussed during class that day. You will then lead the paper discussion for the remainder of class.

**Research Paper:** Graduate students will also write an approximately 8-page paper associated with their presentation topic, to be turned in during final exam week. These papers must be double-spaced and 12 point font. This paper will address some aspect of the topic that the student finds of particular interest (especially something related to their thesis or dissertation if possible). Papers must have a minimum of 10 references drawn from the primary or secondary literature (no websites and no “gray” literature unless discussed with me first). Note that references must be cited appropriately; see the citations in this syllabus for examples of appropriate citation styles. Specific topics will be chosen mid-semester in consultation with me.
Make up work:

- Make up quizzes are NOT given.
- If you have a documented school function (marching band, game) or research-related function (conference, workshop), you will need to provide documentation in advance. A valid excused absence will result in an excuse of those quiz points from your total at the end of the semester.
- Quizzes are given at the beginning of class. If you come late (after the class has finished taking the quiz) you will not be allowed to take the quiz.
- Late journals will be penalized points. Journal entries will not be accepted more than 1 day late.

Students with disabilities:

- University policy provides for reasonable accommodations to be made for students with verified disabilities on an individualized and flexible basis as specified under Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 (ADA).
- SDS provides classroom accommodations to all students on campus who disclose a disability, request accommodations, and who meet eligibility criteria. We do not have specialized programs for specific types of disabilities.
- It is the responsibility of any student with a disability who requests a reasonable accommodation to contact the Office of Student Disability Services (915-7128). SDS will then contact the instructor through the student by means of an Instructor Notification of Classroom Accommodations form.

Cheating:

- Is, of course, unacceptable. This absolutely includes plagiarism. Any assignment including plagiarized material will automatically be given 0 points, and extreme cases of cheating and/or plagiarizing will result in failure of the course.

Disclaimer:

The instructor retains the right to modify this syllabus during the semester. Students will be notified of modifications during class.