Biology 3250, Ecology and Evolution, Spring 2018

Professor: Corey Devin Anderson, Ph.D. (Evolution, Ecology, and Population Biology)

Preferred salutation: “Dr. Anderson”

Lecture location: BSC 1202
Days and time: Mon/Wed, 2:00 to 3:15 PM.

Lab location: BSC 2073
A) Wed, 9 to 11:50 AM

Final exam: BSC 1202
Tuesday 01 May: 2:45 to 4:45 PM.

Office: 1208 Bailey Science Center
Office Hours: Wednesday 3:30 to 5 PM.
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The lectures provide a survey of key topics in the disciplines of ecology and evolution; the labs are intended to reinforce the lecture material, as well as to provide further training in statistical, computational, and field-based methods in ecology and evolution. The lab component of this class will also provide students with some training in scientific writing.

Standards

Education outcomes for BS Degree in Biology: 1, 2, & 5.
VSU General Education Outcomes: 3, 4, 5, & 7.

*Policy on appointments and “drop-ins”

If you need extra help or clarification, please use email and/or take advantage of office hours. I am also usually available after lecture if you have questions. Appointments and drop-ins are permitted, but cannot always be accommodated. **Drop-ins and appointments are particularly discouraged the day before exams**.

Course overview

This course is an introduction to ecological and evolutionary theory. Although ecology and evolution are presented as separate disciplines, their interaction is emphasized and proficient knowledge of how ecology and evolution interact is a major learning goal and requirement for passing this course.

While the course presents an integrated view of ecology and evolution, in the first half of the class, the focus is on evolution. Macroevolutionary concepts are discussed in detail, but my presentation of the course is admittedly biased towards population genetics and microevolutionary theory. The emphasis on microevolutionary mechanisms partly reflects the fact that this is my area of expertise and I feel most comfortable teaching this material. But more importantly, I believe that a solid background in microevolutionary mechanisms helps to reinforce the connection between heredity (i.e. genetics) and microevolution, as well as the connection between microevolution and macroevolution.

While basic comprehension of biological evolution requires a solid foundation in microevolution, the theory underlying this subject is largely based on probability theory applied to population genetic data. The quantitative nature of the subject makes it challenging for some students and teachers, so it is often underemphasized in most evolution textbooks (usually given a chapter or two, at most). In the present course, by choosing to emphasize microevolutionary theory, I have taken the opposite approach. My hope is that this emphasis will provide my students with a sound understanding of the mechanisms underlying evolutionary change at the most basal level (i.e., the population), and that enhanced training with this subject will put my students at an advantage over others who have received less instruction in this arena. Finally, I would like to note that most of the development of evolutionary biology over the last several decades has been perpetuated by technology breaks in molecular genetics; therefore, students in the modern era need to develop a good grasp of the genetic mechanisms underlying biological evolution.

At a certain point in the course, the focus shifts from evolution to ecology. In teaching ecology, prefer a hierarchical approach, starting with interactions between individuals in a population (i.e., population ecology) and then subsequently covering interactions between species in a community (i.e., community ecology). However, to facilitate completion of the final paper, I sometimes vary my presentation of certain subjects in ecology, depending on the nature of the course project.

As both ecology and evolution have to be covered in the same semester, there are surely many important subdisciplines and topics in evolution and ecology that are not covered in sufficient detail. Students requiring training in these areas are encouraged to investigate the topics independently, or to seek out more focused courses on these subjects.

It is very important for students in this course to understand that much of the development of ecological and evolutionary theory is based on quantitative models. These quantitative models usually present themselves as equations. However, as opposed to a course in mathematics, the goal is not simply to be able to manipulate and solve the equation, but rather to be able to model the concept. The conceptual nature of the subject represents a departure from the manner in which most biology students have been trained. This challenge is exacerbated by the fact that most students have not had previous training in ecology and evolution. These challenges, combined with the shear breadth of the

material, may make this a very challenging course for some students. You are strongly encouraged to "keep up" with the material.

Grading

I use a rank-based (or "stack rank") grading system; this means that you will be evaluated based on how well you perform (in terms of your point total) relative to other students in the class.

When possible, I like to use natural breaks in the point distribution to determine letter grades. For example, if there is a substantial point differential separating the top five students in the class from the remaining students, these top students would typically receive an "A". Conversely, natural breaks at the bottom of the distribution determine those students that do not pass (i.e., D/F). In the case that discrete natural breaks in the distribution do not exist, I will use quartiles of the distribution to assist in parsing the distribution.

There are approximately 900 points that can be earned in this course, 450 points from exams, 400 points from laboratory exercises, and 50 points for attendance. There will be three unit exams (all multiple choice format), each worth 100 points. My multiple choice tests are designed to be challenging; I expect the median score to be ≤ 65. There will also be a cumulative final (essay questions) worth 150 points. **I consider the final exam to be very important.** For students near the "borderline" (i.e., at or just below the cutoff for a passing "C"), your performance on this final test may influence my decision as to whether you will pass or fail. I will also consider your performance on this test if you fall near the cutoff between other letter grades (e.g., C/B and B/A).

The laboratory exercises come in various formats, but a big chunk of your score will be based on a written scientific paper (worth 250 points or 62.5% of your lab grade). All other labs are worth 30 points each. Unless otherwise noted, labs are due at the beginning of the next lab. Labs that are turned in late will be penalized.

Note that laboratory exercises and attendance (explained below) comprise 50% of your final grade. This means that a strong performance in lab can raise your rank considerably; conversely, a poor performance in lab can also drop your class rank. In my opinion, success in the laboratory part of this class is primarily a function of effort and attention to detail. It is the primary manner by which effort is evaluated.

Books

"Required" texts:

1) Population Genetics and Microevolutionary Theory by Alan R. Templeton; the publisher is Wiley.
2) Ecology: Global Insights and Investigations by Peter Stiling; the publisher is McGraw Hill.

Recommended texts:

3) A Primer of Ecology by Nicholas J. Gotelli; the publisher is Sinauer Associates, Inc.
4) Any general textbook on evolution, such as:

Bergstrom CT. Evolution. Norton.
Futuyama DJ. Evolution. Sinauer Associates, Inc.
Hall BK. Evolution Principles and Processes. Jones and Barlett.
Herron JC, Freeman S. Evolutionary Analysis. Pearson.
Ridley M, Evolution. Blackwell.

Why two required books???

Unfortunately, there is only one text book in print that covers both ecology and evolution in tandem; for various reasons, I have chosen not to use this particular book. On the other hand, there are many text books that cover ecology and evolution as separate subjects, but each text has its own strengths and weaknesses. For example, many ecology books are great for illustrative examples and basic concepts, but do not do a good job at explaining the mathematics underlying the various models. I have chosen Stiling's book (Ecology: Global Insights and Investigations) because it seems to do a satisfactory job at presenting both the concepts and math (albeit it covers some topics in much greater detail than I do). For a better understanding of the math underlying many basic ecological models, I highly recommend Gotelli's "A Primer of Ecology".

I have also decided to forgo a standard evolution textbook in favor of a more focused book on population genetics and microevolutionary theory. The pop gen book may be considered "overkill" by some, as its level is relatively advanced and it contains some information that is beyond the scope of the present course. However, as much time is spent covering microevolutionary theory, I think students will benefit from the additional examples and practice problems contained in this book. Moreover, many of my lectures on this subject are based directly on this text, so reading the book should help to reinforce some of the more challenging lecture material.

The downside to this plan is that the total cost of for the two books is rather expensive (~ $250+)…and students are still left without a textbook for much of the information on macroevolution presented in the course. While I am confident that I can explain the macrevolutionary concepts in sufficient detail, some students might consider buying or "checking out" a general textbook on evolution (as recommended above).

Students who cannot afford the textbooks might consider splitting them among their friends/study partners. If more affordable, students might also consider buying the books online and/or used. Since my exams are lecture based, some students can succeed without any textbooks.

Attendance policy

Attendance is requisite for all laboratories and is strongly encouraged for lecture. I will randomly survey attendance in lecture 10 times during the course. Every time that you are present you will receive five points, for a total of 50 possible points. If you are planning to miss lecture or lab, you must contact me (via email) before the lecture or lab (unless it is an emergency situation).

There are not make up labs. If you are sick, a note is required from a health professional on official letterhead…and you must contact me ASAP (i.e., preferably via email *before* the lab you are going to miss). Other excuses will be considered on a case by case basis. If you have a planned absence, you may participate in the other lab sections. It is very important that you are not late for field trips.

Although I will not take role every day of class, I may occasionally give a quiz or additional test questions (as required) during lecture. **This means that if you miss lecture, you will get a zero on these exercises.**

Field trip attire

We will be taking multiple field trips into inhospitable areas and during most of these field trips we will be "off trail". You need to wear long pants and closed toed shoes; long sleeve shirts are also recommended. To avoid mosquitoes and overheating, wear light (or earth) colored clothing. During some of these trips, you will like get muddy, wet, and downright dirty; so don't wear "nice" clothes. Insect repellent, hats, and/or sunscreen are also suggested. Don't forget to bring drinking water and to eat something before we leave (or bring food along)! Some of the places we visit DO NOT have restroom facilities, so please relieve yourself prior to departure or be prepared to use "outdoor facilities", if required.

Writing and plagiarism policy

For writing assignments, stringing together phrases and sentences from published sources is considered plagiarism and will result in a zero on that assignment. **NEVER copy lab assignments or papers from previous semesters; if you do this, you will probably fail Biology 3250.** For some of the labs, I do not mind if you work as a team; however, **for writing assignments, you must turn in your own original work** (even if you did the analyses as a team).

Cheating policy

Do NOT cheat on exams. You will receive a zero on the exam and will be reported to the Dean of Undergraduate Academic Affairs.

Calculator policy

Although I try to avoid writing test problems that require hand-held calculators, some questions may be facilitated by use of a calculator….so remember to bring one to the unit exams.

Cell phone and computer policy

Unless you have special permission, **cell phones and computers are strongly discouraged during lecture and, especially, during exams**. Students who have cell phones out during exams will receive a zero on

that exam. Any student caught photographing an exam will get an automatic “F” in Biology 3250, and will also be banned from retaking the course with Dr. Anderson.

Policy on audio recordings

I prefer that my lectures and labs not be recorded (especially without my consent), but if you feel as if you need to record my lecture, please place your recording device in the front of the classroom, so that I am aware that I am being recorded.

Students with disabilities

Students requiring classroom or testing accommodations because of documented disabilities should discuss their needs with the instructor at the beginning of the semester. Students not registered must contact the Access Office, Farber Hall, Phone; 245-2498. Website: http://www.valdosta.edu/access/