Biology 352: GENETICS AND EVOLUTION
Spring 2014

Lecture: 10:00 – 10:50 Monday and Wednesday in North Education 60
Activity Sections: various times in Life Sciences North 235

Class Syllabus

Instructor contact information  Office Hours
Andrew Bohonak, Professor 619-594-0414  M, W 11:00-12:00 or by appt.  LS North 212
abohonak@mail.sdsu.edu
Annalisa Berta, Professor 619-594-5392  M, W 1:30-2:30 or by appt.  LS South 250
aberta@mail.sdsu.edu

Organization
Biology 352 is divided into two sections: transmission and population genetics, and evolutionary biology. A faculty member with the appropriate expertise will teach each section. Weekly activity sections with a graduate teaching assistant will be used to reinforce the learning objectives using computer activities, worked problem sets, and discussions of scientific papers. Note that food and drinks are NOT allowed in the rooms where activity sections are held.

Textbooks
   Additional resources available at http://tinyurl.com/carroll2
4) Reader for the weekly activity section (available in the bookstore).

A copy of each textbook will be on reserve in the library. Search under “Biology 352” (http://libpac.sdsu.edu/screens/rbr.html), and check under the names of any/all instructors that appear.

Population genetics (weeks 5-8) is covered only adequately in Pierce. Some students in past semesters have requested additional help and practice problems for this section of the course. For those who want additional help, we recommend this optional supplemental book:


Ayala is now out of print, and because it was published in 1982, it contains almost no information on DNA. Nevertheless, this book most closely parallels the material presented in the second portion of the course. A copy of this book is on reserve in the library, and Dr. Bohonak has a second copy that you may look through during his office hours. You may also be able to find a used copy through Amazon.com or a similar source for less than $10.
Prerequisites
Biology 203, 204 and 215 are necessary and required. Another statistics course may be substituted for Bio 215 as a prerequisite: consult with the Bioadvising office (LS 135).

We welcome all students who have fulfilled the three prerequisites to Biology 352. If you are a Biology major (and not enrolled as a “Premajor”), then you should have these. Students that are enrolled for the course but do not have the appropriate prerequisites will be dropped by the instructors. If there is any confusion on these matters, please contact the instructor.

Crashing
We will take crashers if there are available seats. If you are not registered at this time, you may obtain an add code by showing up at the first meeting of one or more activity sections. Bring your Degree Audit Report so that the TA can verify that you have the prerequisites. We will prioritize crashers by seniority, using the number of units you have in the major (not overall units).

Dropping Biology 352
After the first two weeks of the semester (exact date is on the SDSU academic calendar) it is very difficult to drop any course at SDSU. All requests after that date are reviewed by the University’s registrar office or an assistant Dean, not by the instructors of the course. Unless you have a serious, compelling and well-documented medical or personal problem (e.g., death in the immediate family), your request will probably be denied. In the event that you need to petition for a late drop, see your major advisor immediately.

Cell phones
The use of cell phones in any way (including text messaging) is distracting to other students and the instructor. TURN OFF CELL PHONES prior to lecture. The use of all electronic devices except calculators is strictly prohibited during quizzes and exams. This includes cell phones and PDAs. Put a calculator in your backpack and leave it there, so you will have it for quizzes and exams.

Class Blackboard site
All class material will be posted on Blackboard (https://blackboard.sdsu.edu). This will include outlines, exam scores and keys to exams. The lecture outlines will be available prior to each lecture for you to print and bring with you. The Blackboard site is likely to be updated weekly.

You will have access to two Blackboard sites for this course. One will include all of the lecture materials, and the activity section handouts. The second will be maintained by your TA to post the activity section scores, and any messages specifically from your TA. If you do not have access to both Blackboard sites, please let your TA know.

The lecture material provided on the Blackboard site will be outlines and some figures, rather than a complete set of notes. We emphasize that these outlines do not take the place of lecture notes and they DEFINITELY do not take the place of coming to class. You are expected to attend class and take your own lecture notes.

We expect you to print out materials from Blackboard BEFORE a given lecture, and that you BRING them to class. The pace of the lecture assumes that you have these materials with you in class so that you need not write down information already available from Blackboard.
Evaluation: exams in lecture
1. The course is divided into four sections. Each section will be concluded with an exam (25 questions, 50 points) over that section’s material. The final (80 points) will include 25 questions from the final part of the course and 15 questions that integrate material from across the entire semester. Exams will primarily be multiple-choice questions.

For all exams, bring a red ParSCORE form F-289-PAR-L.
You will not be able to take exams without a ParSCORE form and a pencil!

* * The final is already scheduled for Friday, May 9 at 10:30 AM. * *
* * Do not schedule personal travel during the final. * *

Evaluation: activity section
1. There will be a quiz (2-3 questions, 3 points total) at the beginning of each week’s activity section, beginning in week 2. Quizzes will be primarily short answer. The questions will be specific to the handout for that particular activity. Pay close attention to the instructions at the beginning of each handout regarding your preparation. Make-up quizzes and exams will not be given for traffic delays, so plan accordingly.

2. In some weeks (see schedule), an additional 5 points will be assigned to homework. Homework will be collected one activity section after it is assigned, at the beginning of the activity section.
   a. If you are absent from the activity section, the homework is still due at the same time. Send an electronic copy to your TA, or have a friend turn in a printed copy. If you are unable to complete your homework on time due to an excusable absence, you must contact the TA before the due date to request an extension.
   b. If the homework is not turned in at the start of activity section, 50% of the possible points will be deducted. No points are possible if the homework is turned in later than the beginning of activity section one week after it was due.

3. In some weeks (see schedule), you will need to read a paper prior to discussion participation (specific weeks; see schedule). For discussions, each student will present and lead the discussion of one question from the assignment handout (as chosen by the TA). Students are also expected to answer questions that others bring up, and come up with novel questions and insights. For full discussion credit (2 points), you must do the following:
   a. For one question, lead a short discussion. Go beyond simply telling the class the question and response. Solicit participation and demonstrate the logic behind the answer.
   b. Participate in discussions generated by at least three other students during the class period.

4. Microsoft Excel will be used in some activity section. You will need to have access to a computer with Excel in order to complete the homework. Notify your TA as soon as possible if this is a problem.
Evaluation: writing assignment homework

In some weeks, your homework for the activity section will be a writing assignment. Spelling and grammar will be considered when assigning points, although not as much as content. For full credit, you will need to do more than simply rephrase the Abstract of the paper that was the focus of the assignment.

1. Your written assignments will be submitted electronically through TurnItIn on your activity section Blackboard site. On your Blackboard site, click on the "Assignments" link on the left. Within that folder will be a link for each assignment.

2. You must also bring a hard copy to the activity section when the assignment is due. For full credit, the hard copy and the upload to TurnItIn must both be completed by the due date and time.

Academic dishonesty: plagiarism

You must appropriately cite ideas that are not your own. Directly quoting your textbook is highly discouraged for full credit. Rephrase ideas in your own words. If you must directly copy one or more sentences, use quotation marks and cite the source.

You should also cite the textbook or the scientific paper once at the end of an extended explanation, even if you have rephrased the text in your own words. For example, if three or more sentences in a row provide a simple textbook summary, and you have not added any new ideas of your own, you should cite the textbook at the end of that section.

Plagiarism will be reported to the Center for Student Rights and Responsibilities for review. Plagiarism includes:

- Copying text verbatim from any source and not putting quotation marks around it. (Even a single sentence or complex technical phrase.) This includes web pages.
- Copying text verbatim from any source and not stating what that source is. (Even a single sentence or complex technical phrase.) This does not include the material presented on a PowerPoint slide in lecture.
- You may rephrase text without citation if the source was one of the two textbooks assigned to this course, or your activity section handout. If you rephrase text from any other source, you must cite that source immediately following the text.

To be clear: if you turn in a homework assignment that is not your own work, the incident will be reported to the Center for Student Rights and Responsibilities for review. This includes copying homework answers from any other source. This includes any situation in which identical text is turned in by two students on a homework assignment, whether they are both in the course now, or one has taken the course previously.

Academic dishonesty: cheating

We have a zero-tolerance policy for cheating of any sort. If you are caught cheating on an exam or quiz you will receive a grade of zero on that exercise. The incident will be reported to the Center for Student Rights and Responsibilities and may lead to your suspension or expulsion from the University.

Academic dishonesty includes looking at your neighbor’s test during an exam.
Biology 352: GENETICS AND EVOLUTION  
Spring 2014

**Final grading scale**

<table>
<thead>
<tr>
<th>Exam</th>
<th>Points</th>
<th>Description</th>
<th>Points</th>
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</thead>
<tbody>
<tr>
<td>Exam 1</td>
<td>50 pts</td>
<td>13 weekly quizzes (3 pts each)</td>
<td>39 pts</td>
</tr>
<tr>
<td>Exam 2</td>
<td>50 pts</td>
<td>11 homeworks (5 pts each)</td>
<td>55 pts</td>
</tr>
<tr>
<td>Exam 3</td>
<td>50 pts</td>
<td>6 discussions (2 pts each)</td>
<td>12 pts</td>
</tr>
<tr>
<td>Final</td>
<td>80 pts</td>
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**TOTAL: 336 points**

Note that there are 106 points for the activity section (quizzes + homework + discussions). This is approximately one-third of your total points in the course.

The total points at the end of the course will be curved. An interim grading scale will be posted halfway through the semester. Without exception, students receiving less than 50% of the total points at the end of the course will be given a grade of F for the semester. +/- grades are used in this course.

**Make up quizzes and exams**

We will accommodate students who cannot take quizzes or exams, provided there is an unavoidable conflict or illness, and the student has given the instructor prior notice. Decisions for administering a make up exam or quiz will be made on an individual basis, with the following guidelines:

1. **Make-ups will not be given for traffic delays, work-related conflicts or personal out-of-town travel.**
2. **Prior notice must be given to the instructor if at all possible.**
3. **If last-minute severe illness or exceptional personal problems prevent a student from taking a quiz or an exam, the instructor should be notified by email (preferable) or phone as soon as possible, and definitely before class.** Documentation may be requested.
4. **Make-up quizzes and exams will be different than those given in lecture.** The format of a make-up will be short answer, essay, or some combination of these, rather than multiple choice.
5. **Unavoidable conflicts with religious holidays, major sporting events for student-athletes, or academic activities should be kept to a minimum and documented by the appropriate university office.** Documentation should be presented to the instructor during the first two weeks of class.
6. **Events that require prolonged absence (more than three lectures or more than two activity sections) should be discussed with the instructor and the Biology undergraduate advising office.**

**Posting scores**

All scores will be posted on Blackboard as soon as they are available.

**Calculators**

Calculators may be permitted on some exams and quizzes, but you must use only your own. Read the following carefully:

1. **Bring your own calculator every time.** You may not borrow a calculator from another student during an exam or quiz.
2. **Only simple non-programmable calculators are acceptable.** Calculations will involve square roots, exponents and scientific notation … but nothing more difficult than that.
3. **If you do not own an appropriate calculator, buy or borrow one before the first exam.** Programmable calculators, PDAs, cell phones, etc. will not be permitted.
Students with Disabilities
If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact Student Disability Services at (619) 594-6473. To avoid any delay in the receipt of your accommodations, you should contact Student Disability Services as soon as possible. Please note that accommodations are not retroactive, and that I cannot provide accommodations based upon disability until I have received an accommodation letter from Student Disability Services. Your cooperation is appreciated.

I need to get a good grade in this class !!!
The goal of this course is to give everyone the tools necessary to master the material, and meet the course's learning objectives. Those of us who have taught Biology 352 for many years know that many students who have difficulty grasping the course concepts ultimately earn a grade of C or less. Students who struggle often have the following comments:

1. **I didn’t take the activity sections seriously.** There are only a small number of points each week for the quizzes, discussions and homeworks in the activity section. But these gradually add up to 106 points. For comparison, the first three exams are worth 50 points each. So make sure you prepare for activity section each and every week to get these points!

2. **I have seen a lot of these concepts in previous courses, so I thought it would be easy.**  Biology 352 goes far beyond the brief introduction you had to Punnett squares, Hardy Weinberg equilibrium, natural selection and evolution in introductory courses. The topics all seem familiar and make sense during lecture. So many students do not study as much as they would for a course in which everything is brand new. This is a huge mistake. Stay on top of your studying every week, because the course gradually gets more difficult.

3. **I didn’t put enough time into studying for this course.** Most students are carrying a full load, with several other upper division courses. Nonetheless, read the text before every lecture and review your notes after every lecture. Do not fall behind! The topics in this course will continue to build on one another, lecture after lecture throughout the semester. Almost every lecture assumes that you remember and understand everything up to that point. If you fall behind after a few weeks, you will have a very difficult time recovering later.

4. **I don’t understand math.** Genetics and Evolution is a course that focuses on the application of quantitative concepts to many kinds of problems. By its very nature, much of the course is focused on quantitative reasoning. There is no way around this. However, there is less math in this course than in a high school algebra class, although it requires some statistical concepts from Bio 215 (Statistics).
5. I study and study but I just don’t get it! You cannot pass Genetics and Evolution by simply memorizing facts. This is a course that requires quantitative reasoning and problem solving. It requires you to apply principles from lecture to a brand new situation on the exam. You will be tested on your ability to integrate different concepts and decide what the results of a particular experiment would look like – or determine whether natural selection or random drift would be more important in a real life situation. This requires a deeper level of understanding than simple memorization. Study in small groups. For students who have difficulty integrating these concepts, group study seems to help. To explain a difficult concept to one of your peers, you need to really understand it yourself.

6. “The tests are tricky.” We do our best to make sure that every question on the major exams has one and only one correct answer, and that the focus of the question is clear. Every exam will have a mixture of some simple definitions, some straightforward calculations or breeding experiments, and some more complicated scenarios that require you to apply concepts to brand new situations. The “more complicated scenarios” are often presented as word problems. Several suggestions:
   a. Take advantage of all practice exams provided on Blackboard. This will show you the style of questions we are likely to ask, and the level of understanding that is required. Take the practice exams “cold”. Pretend it is a real exam, take it in one sitting, and do not refer to your notes. In our experience, performance on the practice exams is a very good predictor of performance on the actual exam.
   b. If you know the right answer, do not talk yourself out of it! This is a common problem. Some students perform better if they decide what the correct answer is before looking at the answers provided. Then search through the list of possible answers for the correct one.
   c. Many students benefit from group study for conceptually challenging topics. Form a study group with a small number of your peers.
   d. Take advantage of office hours with your TA or the instructor, and immediately address any unclear concepts. The topics for each lecture build upon previous lectures, so any confusion or misconceptions will get compounded as time goes on.
Course Objectives

By the end of Biology 352 you will have learned much about genetics and evolution. Below is a broad outline of this material. You can think of these as the BIG QUESTIONS that you will be able to answer. We strongly suggest that you keep this list of objectives accessible. On each exam, you will be expected to integrate the detailed lecture material with these broader objectives.

TRANSMISSION GENETICS

I. Students should have a mechanistic understanding of segregation, independent assortment, linkage and crossing over and how these influence patterns of inheritance.

II. Students should have an understanding of the nature of the basic structural elements of genetics (chromosomes, genes, and alleles) and how these elements are related to one another.

III. Students should have an understanding of the basic modes of Mendelian inheritance: dominance/recessiveness, incomplete dominance, sex -linkage, and epistasis. They should be able to discern these modes from distributions of phenotypes resulting from crosses and from pedigrees.

POPULATION GENETICS

I. Students should understand Hardy-Weinberg equilibrium, the null model that provides a basis for population genetics. This includes knowing the assumptions of the H-W model, and being able to determine departures from H-W equilibrium statistically.

II. Students should qualitatively and quantitatively understand the sources of genetic variation: gene flow and mutation.

III. Students should qualitatively and quantitatively understand modes of sorting in population genetics. These include drift, assortative mating, inbreeding, and natural selection.

EVOLUTIONARY BIOLOGY

I. Students should know the basic principles and ideas underlying evolutionary theory and its history.

II. Students should understand how one determines phylogenetic relationships using morphological and molecular data.

III. Students should have a general understanding of modes of sorting for biological variation (e.g., natural selection, sexual selection, group selection, kin selection, random drift, neutral theory).

IV. Students should know broadly what species are and how they form.

V. Students should know how evolutionary changes are related to developmental processes

VI. Students should know the broad outline of major evolutionary events in the history of life and how they have shape the biota.