Bi 213 General Biology III: Populations

Information Sheet and Syllabus for Fall Quarter 2017

Instructor: Dr. Peter Wetherwax

Course Overview

In this third term of the general biology sequence we build on concepts of how cells and organisms function to study the patterns and mechanisms of evolutionary change over the past 4.5 billion years that have led to the diversity of life that exist on earth today. We begin by examining mechanisms that cause genetic change in populations over time with a special focus on natural selection. We then examine the species concept and look at patterns of evolutionary change over long time periods. In the second half of the term we examine ecological theory including different models of population growth and factors that regulate population growth in various organisms. We study ways in which two or more species interact and apply these ideas to current issues such as invasive species and loss of biodiversity. We end the term by examining ecosystem processes such as energy flow and nutrient cycling between various ecosystem components. Students participate in a field trip to collect data on plant diversity in a local forest which is used as the basis of understanding evolution of land plants, succession and diversity.

The goals for BI 213 fall into two general categories: (1) to learn the foundational concepts related to evolution and ecology (2) to build on the skills developed in BI 211, including the use of analytical thinking and the development of communication skills.

Concept-based goals:

1. To identify the mechanisms of that cause biological evolution in populations; to identify and explain the tenets of natural selection.
2. To apply the Hardy-Weinberg model to populations to investigate evolution.
3. To understand the connections between some of the major events in the history of life on earth.
4. To apply mathematical models to understand growth in populations; to describe the factors involved in regulating population growth.
5. To identify the important types of species interactions, such as competition and predation, that are important for shaping biological communities.
6. To define ecosystem productivity; describe and illustrate the flow of energy through ecosystems.
7. To describe and illustrate the major stores and fluxes in biogeochemical cycles.
8. To understand some of the ways in which humans have impacted the natural world.

Skill-based goals:

1. To develop competency in the basic terminology and methodologies used in the biological sciences.
2. To learn the process of scientific inquiry and its applications.
3. To learn how to learn about biology.
4. To learn to communicate knowledge, ideas and reasoning clearly and effectively in oral and written forms appropriate to the biological sciences; to prepare an oral presentation and practice public speaking.
5. To become familiar with the use of science relevant search engines, and learn to identify primary work; to develop the ability to think critically about information, evaluate the validity of arguments, and weigh the merits of disparate scientific conclusions.
6. To experience the collaborative nature of the biological sciences.

Course Format

Lectures (Mondays, Wednesdays and Fridays, 11:00-11:50 in room 100 Willamette)
You should do the assigned readings before coming to the lectures. During some of the lectures there will be activities that will help you to learn concepts; these will often be done collaboratively with students discussing the problem together for a few minutes before each independently writes a solution. You will not turn these in but your active participation will help you to better understand the material and prepare you for exams.

Lab/Discussion (Wednesdays and Thursdays in room 112 Huestis)
We consider the labs to be an integral part of the course. We have tried to design active learning experiences that will broaden your understanding of what ecology and evolution are about. Often you will be working in groups, posing questions, designing experiments or making observations, and presenting your findings in written or oral form. There will be labs dealing with behavior, plant biodiversity, phylogenetics, population genetics and population growth. Lab

handouts will be turned in at the end of each lab. Each lab will be graded on a 5-point scale. Part of this grade will be based on participation in lab. Most labs cannot be made up because they involve special material or equipment. Late lab reports will not be accepted. If you let us know in advance about a lab you cannot attend, it may be possible to attend another lab. This is only an option if arrangements are made in advance and permission is granted from your instructors.

Problem Solving Sessions (Mondays from 3-3:50 in room 112 Huestis on weeks where problem sets are due. Times of office hours and tutoring sessions will be posted on Canvas after the start of classes.)
The single biggest problem students have in general biology is solving the kinds of problems presented in homework problems and exams. These are similar to the kinds of questions that biologists ask; they can't be solved by memorization of facts. In the problem solving sessions we will go over practice problems and discuss ways to approach these problems. Although attendance is not required, we strongly encourage you to attend the sessions on a regular basis, or to regularly attend the office hours of one of the GEs. There are also Biology Undergraduate Tutors (BTUs) who hold regular tutoring session hours and are prepared to help you with practice problems and general course material. The GE office hour schedule and the schedule for the BTUs will be available on Canvas.

Clickers (Personal Response Systems) Clickers will be used in almost every class to encourage participation and to provide valuable feedback to instructors and students. (The original iClicker or iClicker 2 will both work for this course.) Each student is expected to purchase a clicker for use in this class. You should register your clicker on the course Canvas site. Questions during lecture that require clickers will be multiple choice. Points will be earned two different ways: (1) 2-point questions: 2 points will be awarded based on participation alone, not on whether the question is answered correctly; (2) 4-point questions: 4 points for correct answer, 2 points for incorrect answer. Total percent for the clicker portion of your grade will be based on 85% of the total possible points: your clicker grade = total points earned/85% of total possible.

Project You will investigate an issue in ecology or evolution and give an oral group presentation in lab during week 8 or 10. Projects will consist of an annotated bibliography done by each person individually, a written plan for your presentation (one per group for lab 8 grade), and an oral group presentation. Late work on the first two parts will be accepted but discounted 2% for each weekday during the first week that it is late; it will not be accepted if turned in more than one week late. Each group will present their project in lab. There will be no late presentations.

If you are retaking this course, you will not be allowed to resubmit issues project work from the previous time you took Bi213. The work you do this term must be original and on a different topic.

Problem Sets (practice and graded) There will be five practice problem sets that are in your course packet. It is very important that you work on these each week. We will help you to understand how to solve these problems in the office hours, tutoring sessions and problem solving sessions. The practice problems are very similar to the types of questions you will see on the exams (in fact, most of the problems are from past exams). The practice problems are designed to help you master the material needed to successfully solve the graded problem sets and to do well on the exams.

There will be five graded problem sets posted on Canvas from Tuesday 5PM until Thursday 9:30AM. You will submit your answers to these graded questions on Canvas. <u>No late sets will be accepted</u>. The solutions to each week's practice problems and graded sets will be posted on Canvas by Thursday afternoon. You must do your own work on these graded questions. Copied work will be treated as academic dishonesty.

Field Trip Each student will take a field trip with the class to Fall Creek to investigate succession of woody plants. The material covered on the trip is an integral part of the course. If you cannot attend the trip, you will be given an alternative assignment (see handout on *Canvas*): a 4-5 page paper on plant succession in Cascade forests that will be graded - Due by 5PM Oct 27th . See schedule for field trip days and times. Each student will attend one of the 3 trips. We will ask for your preferred date(s) during the first or second lab.

Exams There will be three exams: two midterms and a final. All exams will be the same format: short-answer. The final is cumulative. The exams will cover material from all aspects of the course including lectures, labs, the field trip, readings and homework problems. Exams will be designed to probe a deep understanding of the concepts and principles discussed, and an ability to apply the concepts to novel situations rather than a memorization of detail. Exams cannot be made up. Exams are graded by the GEs under the supervision of the faculty. To promote consistency, a single GE grades each question. **There will be no early or late midterms or final exams given. Everyone is required to take the final on Wednesday December 6th at 10:15 AM.**

Exam regrade policy To be fair to all students, it is essential that all exams be graded according to the same criteria. If you wish to submit a midterm for a regrade, you must use the following guidelines. First, refer to the exam key

available on Canvas to see how closely your answer(s) match the key. If you still wish to have a midterm exam answer regraded, you must submit a written statement within one week of the return of the exam, along with your original exam, explaining specifically why your answer merits a higher score. Keep in mind that we will regrade the entire exam and a regrade may result in a higher, lower, or unchanged score. Please do not abuse this system. We reserve the right to eliminate this option at our discretion.

Evaluation

COMPONENT	PERCENT of GRADE
Laboratory Handouts (8 labs)	**8%**
Problem Sets (5 sets)	**5%**
Clicker questions in lecture (total points earned/85% of total possible)	**4%**
Field Trip	**3%**
Exams (60% total)	
Two Midterm Exams (15% each)	**30%**
Final Exam	**30%**
Project	**20%**
annotated bibliography (10%)	
oral presentation to peers in lab (10%)	

Posting of Grades Scores for assignments and exams will be posted on Canvas. Check your scores every time we post them, as you will have only one week after the posting to notify us about mistakes or omissions.

Learning Environment The University of Oregon and we are working to create inclusive learning environments. Please notify us if there are aspects of the instruction, or design of this course that result in barriers to your participation. You may also wish to contact the UO Accessible Education Center in 164 Oregon Hall at 346-1155 or uoaec@uoregon.edu

Professional conduct We will work hard to make this course valuable to your learning. We welcome suggestions from you at anytime about things you think could be done to improve the course. In return, we ask that you arrive to lab and lecture on time and stay until class is over without making unnecessary noise that could distract your classmates. **Please put away and do not use your own computers, cell phones, or other electronic devices during lecture or lab.** Computers are not a very good way for taking notes in biology courses and they are distracting to other students.

Cheating devalues the reputation of our institution, its faculty, its students, and your academic degree. Academic misconduct is particularly unfair for students who do their work with integrity and honor. The University Student Conduct Code (http://studentlife.uoregon.edu/StudentConductandCommunityStandards/StudentConductCode/tabid/69/Default.aspx) defines academic misconduct. Students are prohibited from committing or attempting to commit any act that constitutes academic misconduct. By way of example, students should not give or receive (or attempt to give or receive) unauthorized help on assignments or examinations without express permission from the instructor. Students should properly acknowledge and document all sources of information (e.g. quotations, paraphrases, ideas) and use only the sources and resources authorized by the instructor. If there is any question about whether an act constitutes academic misconduct, it is the students' obligation to clarify the question with the instructor before committing or attempting to commit the act. Additional information about a common form of academic misconduct, plagiarism, is available at www.libweb.uoregon.edu/guides/plagiarism/students.

We want you to learn and to do well in the course, but we will not tolerate academic dishonesty. Sanctions for academic dishonesty will be a lowering of the final grade or failure. If you find yourself in trouble, or if you are aware of academic dishonesty occurring, please talk to one of the instructors.

Personal crises do happen. If you are having difficulties that are interfering with your ability to do well in the class, please tell an instructor as soon as possible. We may be able to refer you to someone for help or to make special arrangements if the need is real and if you have done your best to deal with the situation in a timely manner. There is a crisis center on campus that you should not hesitate to call if you, or a friend, are in need of assistant. Their phone number is 346-4488. Finally, we promise to respect you as students and as individuals, and ask that you return that respect to us and to your fellow classmates.

Lecture and Lab Schedule

Week	Date	Lecture Topic	Lab/Discussion
1	9/25 9/27 9/29	L1 Evolution and natural selection L2 Behavioral ecology of honey bees L3 Behavioral ecology of social organisms	Lab 1 1) Honey bee behavior 2) Fern spore inoculations
2	10/2 10/2 10/4 10/5 10/6	L4 History of life on earth **Problem solving session on Monday 3PM** L5 Evolutionary trends in the plant kingdom **Problem set #1 due by 9:30AM Thursday** L6 Species definitions	Lab 2 Plant diversity
3	10/9 10/11 10/13	L7 Speciation L8 Phylogenetics **no lecture:field trips 10-5 on Fri, Sat and Sun**	Lab 3 1) Phylogenetic of plant diversity 2) Plan for field trip **Select issue topic**
4	10/16 10/16 10/18 10/19 10/20	L9 Evolution **Problem solving session on Monday 3PM** L10 Population genetics **Problem set #2 due by 9:30AM Thursday** **Midterm Exam #1 (lectures 1-9)**	Lab 4 Population genetics: part 1
5	10/23 10/25 10/27	L11 Population genetics L12 Population ecology: exponential growth model L13 Population ecology: logistic growth model	Lab 5 Population genetics: part 2 **Annotated bibliography due in lab**
6	10/30 10/30 11/1 11/2 11/3	L14 Population ecology: human demography **Problem solving session on Monday 3PM** L15 Population ecology **Problem set #3 due by 9:30AM Thursday** **Midterm Exam #2 (lectures 10-14)**	Lab 6 Population ecology and genetics
7	11/6 11/8 11/10	L16 Community ecology: species interactions L17 Community ecology: consumption L18 Community ecology: competition	Lab 7 Issues presentation planning
8	11/13 11/13 11/15 11/16 11/17	L19 Community ecology: mutualism, keystone **Problem solving session on Monday 3PM** L20 Community ecology: succession **Problem set # 4 due by 9:30AM Thursday** L21 Community ecology: biodiversity	Lab 8A Project presentations (only required to attend the week you present)
9	11/20 11/22	L22 Ecosystem ecology: productivity L23 Ecosystem ecology: energetics Thanksgiving	Thanksgiving: no labs this week
10	11/27 11/27 11/29 11/30 12/1	L24 Ecosystem ecology: nutrient cycling (nitrogen) **Problem solving session on Monday 3PM** L25 Ecosystem ecology: nutrient cycling (carbon) **Problem set # 5 due by 9:30AM Thursday** L26 Conservation biology	Lab 8B Project Presentations (only required to attend the week you present)
Finals	12/6	**Final Exam on Wednesday at 10:15**	

Course Materials

- ***Calculator*** You will need a scientific calculator capable of doing natural logarithms and square roots for use on problem sets, in lab, and on exams. Calculators that graph, do statistics or have the ability to store information will not be allowed.
- ***iClickers*** The original iClicker or iClicker 2 will both work for this course.
- ***Textbook*** The text, *Biological Science,* 5th or 6th edition (4th ok, but not recommended) by Scott Freeman, should be used as a general reference. The readings include background material useful for preparing you for lecture and for studying for exams. We don't expect you to remember all the details in the text. A good strategy would be to skim over the entire chapter first, concentrating on the major concepts, then to read more carefully the specific pages that are assigned. There are copies of the text on reserve in the Science Library.
- ***Course Packet*** The packet is available in the UO Bookstore. It includes lecture handouts, lab handouts, practice problem sets and the issues project instructions. A copy is also available in the Science Library.
- ***Journal Articles*** These will be posted on the course Canvas site during the term and announced.

Assigned Readings from Textbook
(5th or 6th editions are recommended)

Lecture	6th edition		5th edition		4th edition		Subject
	Ch.	Pages	Ch.	Pages	Ch.	Pages	
1	**25**	435-437, 445-455	**25**	444-446, 453-463	**24**	414-416, 422-432	evolution and natural selection
2	**50**	1051-1054	**53**	1082-1085, 1091-1093	**51**	1019-1020, 1027-1030	behavior ecology, communication in bees
3	**50**	1064-1067	**53**	1095-1098	**51**	1031-1034	altruism
4	**25**	504-506,	**28**	513-516	**27**	481-484	history of life
	26	525-532	**29**	536-542	**28**	506-510	metabolic diversity
	27	546-549	**30**	559-563	**29**	526-529	origin of eukaryotes
5	**28**	565-587,	**31**	580-609	**30**	549-577	evolution of land plants
6-7	**24**	480-493	**27**	489-502	**26**	458-471	species concepts and speciation
8	**25**	496-503	**28**	505-511	**27**	474-479	phylogenetics
	Bioskills 13	47-48	**BS7**	B10-B11	**BS3**	B4-B6	reading a phylogenetic tree
9	**TBA**	TBA	**TBA**	TBA	TBA	TBA	Evolution
10	**23**	456-465, 469-477	**26**	465-475, 478-486	**25**	435-452	population genetics
11	**27**	540-541	**30**	554-555	**29**	520-521	sickle-cell anemia & malaria
12	**51**	1070-1079	**54**	1101-1108	**52**	1037-1044	population growth models
13	**51**	1079-1080	**54**	1108-1112	**52**	1044-1047	regulation of population growth
14	**51**	1084-1086	**54**	1115-1118	**52**	1050-1053	human population growth
15-17	**52**	1092-1103	**55**	1123-1135	**53**	1058-1070	species interactions
16	**51**	1081-1083	**54**	1113-1115	**52**	1047-1050	consumption
19	**52**	1104-1105	**55**	1137-1138	**53**	1072-1073	keystone species
20	**52**	1103-1111	**55**	1135-1142	**53**	1070-1077	succession
21	**52**	1111-1113	**55**	1142-1145	**53**	1077-1080	biodiversity and biogreography
22	**49**	1039-1048	**52**	1068-1079	**50**	998-1008	types of ecosystems
	53	1116-1117	**56**	1148-1149,	**54**	1083	intro to ecosystem ecology
23	**53**	1117-1123	**56**	1149-1156	**54**	1084-1092	ecosystem energetics
24	**53**	1123-1129	**56**	1156-1162	**54**	1092-1097	biogeochemical cycles
25	**53**	1129-1136	**56**	1163-1169	**54**	1098-1102	human impacts on ecosystems
26	**54**	1139-1151	**57**	1172-1182	**55**	1105-1113	conservation