Bi 213 General Biology III: Populations

Information Sheet and Syllabus for Spring Quarter 2018

Instructors: Drs. Laurel Pfeifer-Meister and 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, how ecological communities are formed and organized, and apply these ideas to current issues such as invasive species and loss of biodiversity. We end the term by examining how energy flows and nutrient cycle in ecosystems, how we have altered these functions, and consider the consequences of these changes for global biodiversity. 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 critical thinking, quantitative reasoning, and the development of communication skills.

Concept-based goals:

1. To identify the mechanisms 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 describe diversity at the genetic, species, and functional level, including mathematical indices.
7. To become familiar with how communities changes across space and time.To describe how matter and energy flows through ecosystems and understand some of the major fluxes and stores 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, 9:00-9:50 in room 180 PLC)

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 independently writing your own solution. You will not turn these in but your active participation will help you 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 natural selection, population genetics, plant biodiversity, phylogenetics, behavior, and island biogeography. Lab handouts will usually be turned in at the end of each lab. Each lab will be graded on a 10-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 section. This is only an option if arrangements are made in advance and permission is granted from your instructors.

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 (not to exceed 100%).

Project You will investigate an issue in ecology or evolution and give an oral group presentation in lab during week 9 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 6 grade), and an oral group presentation. Late work on the bibliography 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.

Post-lecture and Pre-lab Quizzes There will be two types of short Canvas quizzes: “single-quizzes”, worth 3 pts each, will be based on the latest lecture; “double-quizzes”, worth 6 pts each, will be based on both the latest lecture and the upcoming lab. We will drop your two lowest single-quizzes but count all of your double-quizzes. The quizzes will be posted on Canvas within a few hours after most lectures. The lecture questions will be based on the material you just learned in that lecture. The double-quizzes are all due on Wednesdays and will cover both the previous lecture and the upcoming lab. You will need to read the lab handout in order to answer the lab questions. The due dates of the quizzes are shown on the “Lecture and Lab Schedule” later in this syllabus.

Problem Sets (not graded) There will be several practice problem sets that will be posted on Canvas during the term. It is very important that you work on these during each week. We will help you to understand how to solve these problems in the help sessions. The practice problems are very similar to the types of questions you will see on the exams (in fact, many of the problems are from past exams). The practice problems are designed to help you master the material needed to do well on the exams.

Field Trip Each student will take a field trip with the class to the Mohawk Resource Natural Area 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 May 21st . See schedule for field trip days and times. Each student will attend one of the 4 trips. We will ask for your preferred date(s) during the second or third week of classes.

Exams There will be three exams: two midterms and a final. All exams will be the same format: short-answer with occasional multiple choice or true/false questions. The final is cumulative. The exams will cover material from all aspects of the course including lectures, labs, the field trip, quizzes, readings and practice 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 June 13th at 10:15 AM.

The exam portion of your grade will be calculated 2 ways and we will use whatever way gives you the highest total (you don't need to tell us which version to use). Version 1 will give a higher number of points for the midterms and lower points for the final. Version 2 counts the midterms less and the final more. See the Evaluation table for the exact breakdown.

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	Points (1000 total)
Lab Handouts (8 total, 10 pts each)		8%	80
Field Trip		3%	30
Project Annotated Bibliography		10%	100
Project Presentation		10%	100
Clicker (total points earned/85% of total possible)		3.6%	36
Single Quizzes: Post-Lecture (18 quizzes, drop lowest 2, 3 pts each)		4.8%	48
Double Quizzes: Post-Lecture plus Pre-Lab Quizzes (6 quizzes, none dropped, 6 pts each)		3.6%	36
Exams Version 1	Two Midterm Exams (140 pts each, 28% total)	57%	280
	Final Exam (cumulative, 29%)		290
Exams Version 2	Two Midterm Exams (8 pts each, 16% total)	57%	160
	Final Exam (cumulative, 41%)		410

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 <u>one week</u> after the posting to notify us about mistakes or omissions.

Learning Environment At the University of Oregon, 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.

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 have the ability to store text will not be allowed. Cell phone calculator-apps cannot be used during exams.
- ***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—you will be responsible for determining the appropriate reading by comparing to a later version on reserve) 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 lab handouts that you will need in order to answer pre-lab quiz questions and to complete the lab. A copy is also available in the Science Library. You are required to bring lab handouts to each lab.

Lecture and Lab Schedule

Week	Date	Quiz	Lecture Topic	Laboratory Topic
1	4/2 4/4 4/6	 **LL** **L**	L1: Natural Selection I L2: Natural Selection II L3: Population Genetics I	Lab 1 Artificial Selection (AS) 1: Assess hairiness Plant evolution & diversity
2	4/9 4/11 4/13	**L** **LL** **L**	L4: Population Genetics II L5: Defining Species & Speciation L6: Phylogenetics I	Lab 2 Population genetics AS2: Pollination
3	4/16 4/18 4/20	**L** **LL** **L**	L7: Phylogenetics II L8: History of Early Life on Earth L9: Evolutionary Trends in Plants	Lab 3 Phylogenetic of plant diversity *Select issues project topic*
4	4/23 4/25 4/27	**L** **LL** 	L10: Behavioral Ecology I L11: Behavioral Ecology II **Midterm Exam on L1-11**	Lab 4 Honey bee behavior
5	4/30 5/2 5/4	 **LL** **L**	L12: Populations: Exponential Growth L13: Populations: Logistic Growth L14: Populations: Human Demography	Lab 5 Field trip introduction AS 3: Harvest and Plant F1 **** Project bibliographies due**
6	5/7 5/9 5/11	**L** **L** **L**	L15: Communities: Species Interactions L16: Communities: Consumption L17: Communities: Competition	No regular lab Field trip Wed, Thurs, Fri & Sat
7	5/14 5/16 5/18	**L** **L** **L**	L18: Communities: Mutualism/Diversity I L19: Communities: Diversity II L20: Communities: Ecological Succession	Lab 6 Presentation Planning AS 4: Assess hairiness of F1
8	5/21 5/23 5/25	**L** **LL** 	L21: Communities: Island Biogeography L22: Communities: Networks/Introductions **Midterm Exam 2 on L12-22**	Lab 7 Island Biogeography AS5: data analysis
9	5/28 5/30 6/1	 **L**	*Memorial Day no class* L23: Ecosystems: Energetics & Nutrient L24: Ecosystems: Productivity	Lab 8A **Project presentations**
10	6/4 6/6 6/8	**L** **L** **L**	L25: Biodiversity & Ecosystem Function L26: Biodiversity & Global Change L27: Conservation of Biodiversity	Lab 8B **Project presentations**
Final	6/13	**Final Exam on Wednesday 10:15 -12:15 on entire course**		

L = post-lecture only (single-quiz) due dates
LL = post-lecture + pre-lab (double-quiz) due dates
all quizzes are posted by the afternoon after previous lecture and due by 8:30AM
exams, quizzes, papers and presentations are in bold

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

Lecture	6th edition		5th edition		Subject
	Ch.	Pages	Ch.	Pages	
1-2	22	435-437, 445-455	25	444-446, 453-463	evolution and natural selection
3-4	23	456-465, 469-479	26	465-475, 478-486	population genetics
4	27	540-541	30	554-555	sickle-cell anemia & malaria
5	24	480-495	27	489-502	species concepts and speciation
6-7	25	496-503	28	505-511	phylogenetics
	Bioskills 13	47-48	BS7	B10-B11	reading a phylogenetic tree
8-9	25	504-506,	28	513-516	history of life
	26	528-532	29	536-542	metabolic diversity
	27	546-549	30	559-563	origin of eukaryotes
9	28	564-587,	31	580-609	evolution of land plants
10	50	1051-1054, 1061-1062	53	1082-1085, 1091-1093	behavior ecology, communication in bees
11	50	1064-1067	53	1095-1098	altruism
12	51	1070-1079	54	1101-1108	population growth models
13	51	1079-1080	54	1108-1112	regulation of population growth
14	51	1084-1086	54	1115-1118	human population growth
15-18	52	1092-1103	55	1123-1135	species interactions
16	51	1081-1083	54	1113-1115	consumption
18-19	52	1111, 1113	55	1143, 1145	measuring diversity
	54	1140-1144	57	1173-1177	patterns of biodiversity
20	52	1107-1111	55	1138-1142	succession
21	52	1112-1113	55	1143-1144	Island biogeography
22	52	1103-1107	55	1137-1138	networks: keystone species
	54	1148-1149	57	1181	invasive species
23	53	1117-1120; 1123-1129	56	1149-1153; 1156-1162	ecosystem energetics; biogeochemical cycles
24	49	1039-1048	52	1068-1079	types of ecosystems
	53	1121-1123	56	1153-1156	productivity
25	54	1152-1154	57	1184-1187	diversity & ecosystem function
26	53	1129-1136	56	1163-1169	global change
	54	1145-1151	57	1178-1184	consequences of change
27	54	1156-1159	57	1189-1193	conservation