Professor:

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Course Materials:

Bb Learn

Teaching Assistants:

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Introduction:

Welcome to Biology 314 (Ecology and Population Biology). In broad terms, population biology is the study of ecological and evolutionary processes and their impact on the abundance and distribution of species. The primary goals of this course are to introduce you to the conceptual and theoretical underpinnings of this exciting field and to familiarize you with the statistical methods used to draw inferences about population level processes. An additional goal will be to illustrate the applied importance of population biology, ranging from the evolution of antibiotic resistance in bacteria to current debates over the role hatcheries should play in conserving shrinking populations of Pacific Salmon. Theoretical underpinnings and applied issues will be presented during lectures and reinforced by exams that focus on critical thinking and problem solving. Statistical methods used to draw inferences about ecological and evolutionary processes will be introduced during lab sections, practiced using simple problem sets, and reinforced through application to real-world data.

Course structure:

Course lecture periods will present conceptual material and provide opportunities to ask questions and work through practice problems likely to appear on exams. All lectures will be posted on the web prior to the scheduled class period. Laboratories will focus on developing the basic statistical skills needed to analyze ecological and evolutionary data and on the writing skills that allow results to be clearly articulated. The laboratory portion of the course will begin with an introduction to basic techniques for organizing, describing, and visualizing data, and include a problem set designed to reinforce the efficient use of these techniques. The remainder of the laboratory portion of the course will be divided into three discrete modules, each of which focuses on the analysis of a particular type of data. Modules will begin with an introductory lecture by your TA

where the statistical tools needed to analyze the data are presented. Working on a simple problem set due in the following lab period will develop familiarity with these tools. The next phase of each module will introduce a real data set, and challenge you to evaluate support for a particular hypothesis using the new statistical tools you have learned. You will be given two weeks to analyze this data set and prepare a two-page written report of your findings. Details on the required format and content of reports can be found below, and a grading rubric is available online. During weeks reserved for data analysis, your TA will be present during lab periods to assist you. Because science in the real world is a collaborative enterprise, working in groups to share ideas and approaches to data analysis is encouraged. However, each student must prepare and submit an independently written report. Directly copying other's reports, or even sections of other's reports, is not acceptable.

Exams:

There will be four 1-hour exams given during the semester. All previously covered material is fair game on each exam, so **each exam is cumulative**, and the contribution each exam makes to your final grade reflects the increasing amount of material covered by each. Thus, early exams contribute less to your final grade than do later exams. Each exam will consist of five questions of which you must answer only four of your choosing. Potential exam questions will be **drawn from practice problems worked in lectures and laboratories.** Thus, there will be no surprises on the exams. A make-up exam will be given only for legitimate and **officially documented** university approved reasons. If you feel an error has been made in the grading of your exam, you must bring this to the attention of your TA or instructor within 5 working days; **no re-grades will be performed after this time**.

Lecture Practice Problems:

Each lecture will end with the presentation of one or two practice problems based on the day's material. It is your responsibility to work through and solve these practice problems before the next lecture period. At the beginning of the next lecture period, your solutions to the practice problems will be due. The solution to each practice problem will be worth two points, with one point assigned for showing your work and another for the correct solution. After you have turned in your solutions to the day's problems, we will work through the practice problems together before moving onto the day's new topic. Exam questions will be very similar to these practice problems. Late work will not be accepted.

Laboratory reports:

The goal of laboratory reports is to clearly and concisely communicate scientific results. Laboratory reports must be prepared using a word processor and turned into your TA by the appropriate due date (see schedule below) as both a hard copy and a standard digital format (i.e., Word or PDF). **Reports may not exceed two pages and must be prepared using a font of size 10 or greater**. Each report must contain the following sections:

- Summary – Begin your report with a concise summary of your findings. Clearly state the hypothesis being tested, methods used, results found, and an evaluation of support for the hypothesis. The summary should be in bold face type and ***must not exceed 200 words***.

- Introduction – A single paragraph describing the data set and the hypothesis to be tested.

- Methods – One to two paragraphs describing the approach you took to analyze the data. Include details of all statistical tests used and any assumptions made during your analysis.

- Results – One to two paragraphs describing results of your analyses. Provide statistical details (e.g., *p* values and degrees of freedom) where appropriate. Using tables and figures to summarize your results is encouraged, but these must fit within the two-page limit for your report. Be sure to explain why each result matters, and how it helps to evaluate support for the hypothesis.

Grading of laboratory reports:

Laboratory reports must be turned in by the date specified in the lab schedule (see table below). These reports will then be graded by your teaching assistant according to the rubric available online and returned to you within one week along with detailed comments. If you are unsatisfied with the grade you received, you may revise your report in light of the comments made by your teaching assistant and turn it in again for a re-grade. **Your revision will be due within one week of receiving your initial grade**. You are strongly encouraged to discuss the suggestions made by your TA prior to turning in a revision as only one revision is allowed per report.

Grade breakdown for laboratory reports:

Scientific merit	60 points
Clarity and quality of writing	40 points
Total	**100 points**

Course Grades:

Your grade will be determined based upon the following point distribution:

Exam 1	100
Exam 2	140
Exam 3	160
Exam 4	200
Lecture practice problems	60*
Lab problem sets	40
Lab reports	300
Total	**1,000**

90% of the total points or higher will be an A, 80% of the total points or higher will be a B, 70% of the total points or higher will be a C, etc. The course is not curved, these cut-offs will be strictly applied, and final grades will not be rounded up (or down). In other words, an 89.9% is still a B, not an A.

* It may be possible to earn more than sixty points through successful completion of lecture practice problems. If this is the case, any additional points accrued will count as "extra credit".

Course Evaluations:

Although not required, your feedback on course evaluations is greatly appreciated. The most helpful feedback describes things you liked about the course and did not like and includes suggestions for improving the course and my teaching. **If 90% or more of you submit course evaluations, everyone will receive 10 bonus points!**

Learning outcomes:

The primary goals of this course are to introduce you to the conceptual and theoretical underpinnings of ecology and population biology and to familiarize you with key statistical methods used to draw inferences about population level processes. Additional goals will be to illustrate the applied importance of population biology through discussion of topics such as the evolution of antibiotic resistance in bacteria and the role hatcheries should play in conserving shrinking populations of Pacific Salmon and to promote efficient scientific writing.

Lecture and Exam Schedule

Date	Lecture
January 10	What is population biology?
January 15	Properties of populations
January 17	Malthus, Darwin, and natural selection
January 22	Genetic variation
January 24	Natural selection
January 29	Genetic drift
January 31	**EXAM 1**
February 5	Gene flow
February 7	Speciation
February 12	Population growth I
February 14	Population growth II
February 19	Life histories I
February 21	Life histories II
February 26	Niches and geographic range
February 28	**EXAM 2**
March 5	Interspecific competition
March 7	Predation
March 12	**Spring Break**
March 14	**Spring Break**
March 19	Herbivory and top down vs. bottom up regulation
March 21	Parasitism
March 26	Evolution of infectious disease
March 28	No Class **(AUBURN)**
April 2	Mutualism
April 4	**EXAM 3**
April 9	Coevolution
April 11	Island biogeography
April 16	Communities
April 18	Food webs
April 23	Pacific Salmon
April 25	**EXAM 4**
April 30	Climate change
May 2	**TBA**

Laboratory Schedule and Important Deadlines

Week	Activity	Due
January 7- January 11	No Lab	
January 14- January 18	Getting started: Organizing, Visualizing, and Describing Data	
January 21- January 25	Module 1: Frequencies and G-tests	Problem Set 1
January 28- February 1	Introduction to Data Set 1	Problem Set 2
February 4- February 8	Open lab for help with Data Set #1 analysis and report	
February 11- February 15	No activity. Report 1 due during regularly scheduled lab	Report 1
February 18- February 22	Introduction to Module 2: Means and t-tests	
February 25- March 1	Introduction to Data Set 2	Problem Set 3
March 4- March 8	Open lab for help with Data Set 2 analysis and report	
March 11- March 15	No Labs (Spring Break)	
March 18- March 22	No activity. Report 2 due during regularly scheduled lab	Report 2
March 25-March 29	Introduction to Module 3: Relationships and linear regression	
April 1- April 5	Introduction to Data Set #3	Problem Set 4
April 8- April 12	Open lab for help with Data Set #3 analysis and report	
April 15- April 19	No activity. Report 3 due during regularly scheduled lab	Report 3
April 22-April 26	Open lab for help with revisions of Report 3	
April 29- May 3	No Labs (Dead Week)	