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Date	Topic	Reading [Omissions] - Zar 4th Edition
31-Mar	HOLIDAY	
2-Apr	Introduction	
4-Apr	Hypothesis Testing	Test Pac pgs. 12-13
7-Apr	Analysis of Frequencies	Zar Ch. 22 [22.7-22.10]
9-Apr	Analysis of Frequencies	Zar Ch. 23 [23.7-22.9]
11-Apr	Central Limit Theorem	Test Pac pgs. 68-71
14-Apr	One-sample t -test	Zar Ch. 7 [7.6-7.14]
16-Apr	One-sample t -test	
18-Apr	One- & Two-tailed Tests	Test Pac pgs. 20-22
21-Apr	Two-sample Tests	Zar Ch. 8 [8.8; 8.11-8.14]
23-Apr	Two-sample t -test	
25-Apr	Mann-Whitney U Test	
28-Apr	Paired-sample Tests	Zar Ch. 9 [9.6-9.7]
30-Apr	Paired-sample Tests	
2-May	EXAM	
5-May	Multiple-sample Tests; One-factor ANOVA	Zar Ch. 10 [10.2-10.3; 10.5; 10.7-10.9]
7-May	One-factor ANOVA	
9-May	Multiple Comparisons	Zar Ch. 11 [11.3; 11.5-11.9]
12-May	Two-factor ANOVA - randomized block	Zar Ch. 12 [12.2; 12.5-12.11]
14-May	Two-factor ANOVA; interaction	Test Pac pgs. 45-53
16-May	Two-factor ANOVA with replications	
19-May	Regression	Ch. 17 [17.4-17.11]
21-May	Regression	
23-May	Regression	
26-May	HOLIDAY	
28-May	Correlation	Ch. 19 [19.3-19.8; 19.10-19.14]
30-May	Correlation	
2-Jun	ANCOVA	Test Pac pgs. 63-67
4-Jun	EXAM	
6-Jun	Review	

Final Exam: Wednesday, June 11, 2008, 9:10 am - 11:10 am. Final exam is comprehensive.
 Students are responsible for any changes in this schedule which may be announced in class.
 Bring Test Pac and textbook (Zar) to each class meeting.

Objectives - Biology is a quantitative science. Skills in the quantitative aspects of biology greatly enhance the employment prospects of the biology student. This course introduces the student to statistical methods commonly used in biology. Knowledge of biometrics will aid the student in understanding, interpreting, and judging published reports on biological research. For those students who will be engaging in basic research or applied science, biometrics is an indispensable tool.

Prerequisite - Basic Biology (e.g. BIO 115) and an introductory college-level statistics course (e.g. STA 120) is highly recommended. Biometrics is dependent on a working knowledge of the material covered in introductory statistics. Students should take Biometrics within two quarters of completing introductory statistics, and that they complete introductory statistics with at least a C grade. Students lacking the basic statistics prerequisite are responsible for learning the necessary material. The first two laboratory sessions will be devoted to basic statistics review, and readings can be found in the BIO 211 Test Pac and textbook (see below).

Required Materials - All students are required to have the textbook: Zar, J.H. 1999. Biostatistical Analysis. Prentice-Hall, Englewood Cliffs, N.J., 4th edition, and the BIO 211 Test Pac. Both are available at the Bronco Bookstore. The BIO 211 Test Pac is also available free of charge on world wide web: <http://www.csupomona.edu/~djmoriarty/>

Click the link to the Biometrics (BIO 211) home page.

Note: The Test Pac file is available on the web in pdf format. Students are responsible for all aspects of downloading, handling, and printing the file, as well as for correcting any errors caused by platform conversions or font substitutions.

The textbook contains over 150 pages of tables. It is important that you bring the book to lecture in order to learn the correct use of the tables. Answers to the problems at the end of each chapter can be found on pages Ans1 - Ans11.

Each student is required to have a calculator capable of addition, subtraction, multiplication, division, and square root.

Lecture Exams - Two hourly exams and a final will be administered. The final will be comprehensive, the hourly exams will not. Students must take exams with the section in which they are enrolled. Each of the two hourly exams will be worth 100 points. The final exam will be worth 120 points. No extra credit projects are allowed. Exams must be taken at the scheduled time. No early or make-up exams are allowed. Missed exams will be scored as a zero (0). There are no exceptions to this policy.

Exams will consist of two parts. Part one will be closed book and consist of multiple choice questions dealing with definitions and concepts. Scantron form 882 and a #2 pencil are required for the closed book sections of all exams. When part one is completed and handed in, part two will be handed out. Any books or notes may be used on part two of the exam, which will consist of solving problems. Answers to problems in part two must include methods of calculation and intermediate values to allow the grading of procedure. Answers without methods and intermediate values will receive no credit. Exams will not be returned to students. Students may not remove exam materials from the classroom under any circumstances; this will be considered theft of university property.

Scores on all exams and the final course grade will be made available to students via the Blackboard system:
<https://blackboard.csupomona.edu/webapps/login>

Attendance - Attendance is required on days of scheduled hourly and final exams. By enrolling in this course, you are agreeing to take the exams as scheduled.

Behavior – Students must not engage in disruptive, disrespectful behaviors such as talking, passing notes, eating, entering or leaving while class is in session. Students may not use computers during the lecture unless approved by the DRC or other appropriate campus authority. Individuals engaging in disruptive behaviors will be excluded from the class without notice per university policy. See the current version of the University Catalog. Check the index under “Exclusion of Students from Classes.”

Calculator/Computer policy - Each student must have a calculator capable of addition, subtraction, multiplication, division, and square root. Any type of calculator, including statistical calculators, programmable calculators, and graphing calculators will be allowed only on part two (open book) of the exams. Laptop or notebook computers are not allowed. Definition of a computer vs. a calculator is at the discretion of the instructor.

Laboratory - Attendance at the laboratory sessions is very strongly recommended. The laboratory is devoted to exercises in analytical thinking and problem solving that are tested on the lecture exams, with the intent of improving student performance on these exams. Some material appearing on the lecture exams may only be discussed in the laboratory.

Student performance in the laboratory can not lower (but can raise) a student's letter grade in BIO 211 and BIO 211L. Please refer to the Grading and Grading: Hypothetical Example parts of this document for further information.

Academic Integrity - Cheating and plagiarism are violations of university policy and are considered serious offenses. The Department of Biological Sciences takes all incidences of academic dishonesty seriously and acts accordingly.

Grading - Students will receive the same grade for lecture (BIO 211) and laboratory (BIO 211L).

In lecture, 2 hourly exams (100 points each) and a final exam (120 points) will be administered for 320 total points. The lab will be worth 100 points. Lecture and lab combined therefore have 420 points.

A curve will be constructed using percentages obtained by all students from the lecture exams and the final (i.e. percentage of 320).

Students will have a lecture percentage calculated (i.e. percentage of 320), as well as an additional percentage based on lecture and lab (i.e. percentage of 420). Grades for *both* lecture (BIO 211) and lab (BIO 211L) will be assigned from the curve using the *higher* of the two percentages. Therefore, a student's performance in the lab can raise their grade in the course, but cannot lower it.

Grading: Hypothetical Example - All percentages discussed below are rounded to the nearest whole percent.

Consider the following **hypothetical** example. Based on performance of all students on the hourly exams, the following grading scale is determined:

90 - 100%:	A
80 - 89%:	B
70 - 79%:	C
60 - 69%:	D
0 - 59%:	F

Further consider four hypothetical students. Student 1 did not attend the lab; students 2, 3, and 4 did the lab work. Their exam/lab scores and grades earned are:

Student	1	2	3	4
Hourly 1	91	91	93	61
Hourly 2	87	87	89	64
Final	106	106	105	75
Total	284	284	287	200
% of 320	89%	89%	90%	63%
Lab Total	0	92	70	92
% of 420	68%	90%	85%	70%
Grade	B	A	A	C

Student 1 receives a B in BIO 211 and BIO 211L.

Students 2 and 3 receive an A in BIO 211 and BIO 211L.

Student 4 receives a C in BIO 211 and BIO 211L.

Access to Laboratory Materials - Under no circumstances will quizzes or any other laboratory materials be made available to students who fail to attend lab sessions. Students must attend the laboratory section in which they are enrolled.

Practice Problems for Exams – The BIO 211 Test Pac has two practice exams for the first hourly (Practice Exams 1A and 1B), and two practice exams for the second hourly (Practice Exams 2A and 2B). These practice exams are only for the open book portion of the exams, not for the multiple choice section.

In addition, practice problems for both hourly exams and the final may be found on the web at the BIO 211 home page:

<http://www.csupomona.edu/~djmoriarty/>

Click the link to the Biometrics (BIO 211) home page.

Data = numerical facts

Statistic = estimate of a population parameter

Population parameter = numerical feature

Population is defined biologically

Estimate means a "guess" – not the correct value

Values for population parameters can never be known:

Populations are too big and dynamic

Therefore, we estimate a parameter from a random sample

Random sample = representative of the population with respect to the variable being estimated

All sample estimates (statistics) are "wrong"; they are guesses

Sampling error (sample error) refers to the fact that any sample estimate is a guess.

A statistic will never be exactly equal to the population parameter it is estimating

Biologists need to make conclusions at the population level

Biologists have to work at the sample level

In order to make conclusions at the population level using sample estimates, you must deal with sampling error

Statistics (statistical tests) are tools that allow biologists to handle sampling error in an objective manner

Statistical tests allow biologists to make conclusions about population parameters using sample estimates

The conclusions are based on probability, that is, what is the probability a conclusion is correct or incorrect

Inferential statistical tests are used to make a conclusion at the population level, using data at the sample level

All statistical tests have a common approach to reaching these conclusions. The details can be very different in different tests, but the general approach is always the same.