Dr. G. Cobbs: Biology 650: Advanced Biostatistics Syllabus, Fall 2015

Class details:

Dates: First meeting is Monday Aug. 24. Last meeting is Dec. 7, 2015 (Mon)
Schedule: The class meets M, W from 4:00 PM to 5:40 PM
Room: HM122
Final Exam Period: Sat., Dec. 12, 1:45PM - 4:15PM
Pre-requisites: Math 108 or 205, An introductory course in Statistics. Some familiarity with the following topics is assumed: Probability (addition and multiplication rules, expected value), Binomial distribution, Poisson distribution, Normal distribution, t-distribution, Chi-square distribution, Hypothesis testing, one sample t-test, two sample t-test, one sample test on a proportion, two sample test on proportions, one sample test on a count variable, two sample test on a count variable, simple linear regression, RxC contingency table analysis, simple linear correlation.
Hours of Credit: 4
Class Number: 1651

Instructor: Dr. Gary Cobbs
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Office Hours: T & Th 3:30 PM- 4:30 PM, F 2:30 PM - 4:00 PM

Texts: None required.
Recommended for background information:
OpenIntro Statistics Second Edition
David M Diez, Christopher D Barr, Mine Cetinkaya-Rundel
ISBN: 978-1478217206
OpenIntro Statistics is a free textbook for introductory statistics.. The book can be downloaded for free as a PDF from http://www.openintro.org/stat/textbook.php or a paper copy purchased from amazon.com for $9.94 (get 2-day shipping with a free student trial of Amazon Prime).

Software: The R programming language will be used throughout the course. R may be downloaded for free from cran.r-project.org. Access to a personal computer is assumed.

Course Description
Biology 650 is a survey course of statistical procedures commonly used in the life sciences. It is taught at an advanced level and is intended to be a first graduate level course in statistics for Graduate students in the Biological or Health Sciences. A good working knowledge of algebra and

a cursory knowledge of calculus are assumed as well as some previous exposure to statistics. Lectures are designed to convey only a general idea of how statistical procedures are derived and will focus mostly on their application. It is imperative to have some understanding of the theory behind statistical procedures, as this will enable one to make intelligent decisions as to which, if any, of the procedures are applicable to a given set of data. Lectures will also deal with the use of R. Experience with personal computers is assumed. Tests and homework assignments will involve analysis of raw data from beginning to end. Homework and test problems will involve organizing data, entering it into a computer program, making the program do the correct analysis, and correctly interpreting the output of the program.

Course Objectives: On completion of the course a student should have an understanding of the general ideas underlying the analysis of data in the life sciences. Students should have the ability to interpret data resulting from experiments with designs similar to those presented in class.

Method of evaluation

Evaluation will be based on two 100 point take home examinations and two 100 point in class open book exams giving a total of 400 points for the entire course. Letter grades will be determined from the total number of points earned in the course according to the table below. The cutoff values for letter grades may be lowered under some circumstances but will not be raised.

%	<60	60-63	63-67	67-70	70-73	73-77	77-80	80-83	83-87	87-90	90-93	> 93
Grade	F	D-	D	D+	C-	C	C+	B-	B	B+	A-	A

Recommended Study Methods

Reading assignments will be given in class and it is recommended that you do the reading in advance of the lectures they cover. You will be responsible for all material that is presented in lectures or assigned as homework. There may be topics included in assigned reading that are not discussed in lectures. You will not be responsible for those topics.

Communications: Students are responsible for checking their University email frequently (daily is recommended) and for accessing course materials posted on blackboard.

Policy on Instructional Modifications

Students who have a disability or condition which may impair their ability to complete assignments or otherwise satisfy course criteria are encouraged to meet with the course instructor(s) to identify, discuss, and document any feasible instructional modifications or accommodations. The student should notify the instructor no later than the end of the second week of the semester/term in which the course is offered or no later than the end of the second week after such a disability or condition is diagnosed, whichever occurs earliest. The student may contact the Disabilities Resource Center

for information and auxiliary aid.

Topics to be covered in the course are listed below.

1. Types of Variables and experimental design

2. Use of the R program

3. One sample tests
   a. Continuous Response variable - t-test, median tests,
   b. Count Response variables - Exact Poisson test, approximate Poisson tests
   c. Nominal Response variables

4. Two sample tests
   a. Continuous Response variable - two sample t-test with equal variance, two sample t-test with unequal variance, tests on the medians
   b. Count Response variable - Two sample Poisson test
   c. Nominal Response variables - Dichotomous and Polychotomous responses

5. Modeling One factor designs
   a. The Generalized Linear Model
   b. Continuous Response variable
   c. Count Response
   d. Nominal Response variables - Dichotomous and Polychotomous responses

6. Modeling Two factor designs
   a. Fixed and random effect interpretation of factors
   b. Models in which both factors are fixed
   c. Models in which one factor has fixed interpretation and one factor has random interpretation (mixed model)
   d. Models in which both factors have random effect interpretation *

7. Three Factor factorial and multifactor designs *

8. Trend analysis
   a. General approaches
   b. Continuous response variable - Regression analysis
   c. Count response variable - Poisson regression
   d. Nominal response variable
      i. Dichotomous response - Logistic regression
      ii. Polychotomous response - Generalized logistic regression *

9. Models with both Nominal and continuous explanatory variables
   a. Meaning of interaction between continuous and Nominal explanatory variables
   b. Adjusting for a covariate
   c. Continuous response
   d. Count response
   e. Nominal response

10. Models of association *
   a. Multiple correlation *
   b. Partial correlation *
   c. Structural equation modeling and Path analysis *

* will be covered if time allows

Title IX/Clery Act Notification

Sexual misconduct (including sexual harassment, sexual assault, and any other nonconsensual behavior of a sexual nature) and sex discrimination violate University policies. Students experiencing such behavior may obtain **confidential** support from the PEACC Program (852-2663), Counseling Center (852-6585), and Campus Health Services (852-6479). To report sexual misconduct or sex discrimination, contact the Dean of Students (852-5787) or University of Louisville Police (852-6111).

Disclosure to **University faculty or instructors** of sexual misconduct, domestic violence, dating violence, or sex discrimination occurring on campus, in a University-sponsored program, or involving a campus visitor or University student or employee (whether current or former) is **not confidential** under Title IX. Faculty and instructors must forward such reports, including names and circumstances, to the University's Title IX officer.

For more information, see the Sexual Misconduct Resource Guide (**http://louisville.edu/hr/employeerelations/sexual-misconduct-brochure**).