

## **G. Cobbs: Biol 350-01 and Biol 350-02, Biostatistics Syllabus, Spring Semester 2015**

### **Class details:**

**Dates:** Classes Start Wednesday Jan. 7, 2015, last meeting is April 22, 2015 (Wed)

**Schedule:** M, W 3:30-4:45:00 pm- 2:15pm in ~~HM 109~~ DA 203

M 5:00-5:50 in Life Science 025 for Biol 350-01

W 5:00-5:50 in Life Science 025 for Biol 350-02

**Final Exam Period:** Thurs., April 30, 2:30PM - 5:00PM

**Pre-requisites:** Math 180 or Math 205 or a course in calculus

**Hours of Credit:** 3

**Class Number:** 3596 for Biol 350-01

6978 for Biol 350-02

**Instructor:** Dr. Gary Cobbs

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Office Hours: T, Th, F 2:30-3:30 PM

**Text:** 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).

**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.

**Course Description:** Biology 350 is a survey course of statistical procedures commonly used in the life sciences. It is taught at an introductory level and does not require any previous experience in Bio-statistics or Statistics. The course is intended primarily for undergraduate Biology majors though majors in other areas may find the course useful. Lectures will focus on the application of statistical procedures to actual experimental situations and data sets. Statistical software packages will be used for analyzing data though much of the analysis will involve use of a hand calculator. No previous experience with statistical software is assumed. Familiarity with and access to a Personal Computer and scientific calculator is assumed. General topics to be covered are listed in the tentative lecture schedule below.

**Method of evaluation:** Evaluation will be based on three 100 point examinations and 6 homework assignments which count 16.667 points each. The total points in the course is 400. Letter grades will be determined from the total number of points earned in the course. If an

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exam is missed then the make up exam must be taken at the end of the semester. The make up exam will be given during the final exam period and covers the entire semester. Any student in the course may take the make-up exam, even if they have not missed any of the regular exams. The score on the make-up exam will replace the lowest of the scores on the three regular exams or the total points for all 6 homework assignments. If the score on the make-up exam is lower than all of the scores previously mentioned it will not affect the course grade. In certain special circumstances a student may take an exam a day or two early or late. In order to do so, a student must submit a written request to take the exam at a different time than is normally scheduled. The request **must** provide documentation of a circumstance beyond the students control which caused or will cause the exam to be missed. Such documentation is usually a letter from a relevant person who knows details of your situation and can be contacted by me (contact information must be supplied). A student may take an exam at an alternate time only if such a request has been approved by the instructor of the course. If an exam is missed without any prior arrangement, the written request must be submitted to the instructor within 24 hours of the missed exam and the student should be ready to take the exam immediately if the request is approved. All requests for reevaluation of the grading of exams or homework must be submitted in writing. You must clearly state why you believe your answer is an acceptable answer. Late homework will be assessed a penalty of 1 point per day late. After a homework assignment is graded and returned to the class or answers are posted, late submissions of that homework will not be accepted. No academic misconduct will be tolerated. If enough seats are available during exams, students are to choose seats so no students are seated side by side.

**Grading policy:** The maximum percentage cutoffs for letter grades A/A-/B+/B-/C+/C-/D+/D/D- are 93/90/87/83/80/77/73/70/67/63/60 %, respectively, of the total points for each exam or assignment. These cutoff points will not be raised but, at my discretion, may be lowered. If cutoff points are lowered for an exam the new values will be announced in class when the exam is handed back. The cutoff values for total points in the course are the sums of the cutoff values of all the assignments. There will be **NO** extra credit in the course.

**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. There will be materials (handouts) distributed in many of the class meetings and you are expected to be in class to receive all such materials. If you are not present at a meeting in which class material is distributed, you are responsible for obtaining the material from other students in the class or from the instructor.

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

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### Biology 350: Biostatistics Tentative Lecture Schedule

	Topic	Chapters in Text
I.	Types of Variables -----	1
II.	Descriptive Statistics and data presentation -----	1
	A. Graphic presentation	
	1. Scattergram	
	2. Histograms	
	a. Relative frequency	
	b. Cumulative frequency	
	3. Other kinds of graphical displays	
	B. Effect of transforms on shape of frequency distribution	
	C. Descriptive statistics	
	1. Quantitative variables (mean, median, mode, etc.)	
	2. Nominal variables (proportions, odds, information statistic, diversity indices, etc.)	
III.	Probability theory and applications -----	2
	A. Basic rules (Addition rule, product rule, etc.)	
	B. Counting techniques (Permutations and Combinations)	
	C. Conditional probability	
	D. Bayes Rule	
IV.	Random Variables and their properties -----	2
	A. Expectation	
	B. Mean and Variance	
	C. Joint Probability Distributions	
V.	Probability distributions -----	3
	A. General definitions and rules for probability distributions	
	1. Probability density functions (PDF).	
	a. Mean (expected value)	
	b. Variance and standard deviation	
	2. Cumulative probability distribution functions (CDF). -Finding areas.	
	3. Inverse Cumulative probability distribution functions (INVCDF). - Finding quantiles (percentiles).	
	B. Discrete Distributions (integer, Bernoulli, binomial , Poisson )	
	C. Continuous Distributions (uniform, normal , chi-square , t , F )	
VI.	Tests of goodness of fit -----	6
	A. Discrete distributions	
	B. Continuous distributions	
	C. Tests of independence	
	D. One sample test on a variance	
VII.	Estimation: point and interval -----	4
	A. Continuous variables: Mean, median, variance, standard deviation	
	1. Methods based on the normal distribution	

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	2. Use of transformations to achieve normality		
B.	Nominal variables (Proportions):		
	1. Exact method based on the binomial distribution		
	2. Approximate method based on the Normal approximation of the binomial		
C.	Count variables (mean, variance, standard deviation): Exact Method based on the Poisson distribution		
VIII.	Hypothesis testing - - - - -		4,5,6
A.	Parametric tests		
	1. One sample tests		
	a. Mean: one sample t-test		
	b. Proportion: Binomial test		
	(1) exact method		
	(2) approximate methods (normal, chi-square, likelihood ratio)		
	c. Count: Poisson test		
	(1) exact method		
	(2) approximate methods (likelihood ratio)		
	2. Two sample tests		
	a. Means: two sample t-test		
	(1) case of unequal variances		
	(2) case of equal variances		
	b. Proportions:		
	(1) Fishers exact test		
	(2) Approximate methods		
	(a) Normal approximation method		
	(b) Chi-square approximation method (2x2 Contingency table method).		
	(c) likelihood ratio method.		
	c. Counts: Poisson two sample test		
B.	Power and sample size		
C.	Non-parametric tests		
	1. Sign test		
	2. Wilcoxon sign rank test		
	3. Wilcoxon rank sum test		
IX.	Regression - - - - -		7
A.	Simple Linear regression		
	1. Testing assumptions		
	2. Transformation of variables		
B.	Logistic Regression		
C.	Poisson Regression		
X.	Correlation analysis - - - - -		7

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### Tentative Lecture Schedule

Date	Day	Topic	Chapters	Meeting No.
1-7	Wed	data presentation and descriptive statistics	1	1
1-12	Mon	data presentation and descriptive statistics / Probability	2	2
1-14	Wed	Probability	2	3
1-19	Mon	<b>Martin Luther King holiday</b>	“	-
1-21	Wed	Probability	-	4
1-26	Mon	Probability distributions	3	5
1-28	Wed	“	“	6
2-2	Mon	“	“	7
2-4	Wed	“	“	8
2-9	Mon	“	“	9
2-11	Wed	<b>Exam 1 (Tentative date)</b>		10
2-16	Mon	Tests of goodness-of-fit	6	11
2-18	Wed	“	“	12
2-23	Mon	“	“	13
2-25	Wed	“	“	14
3-2	Mon	“	“	15
3-4	Wed	estimation and confidence limits	4	16
3-9	Mon	“ (Last day to withdraw is 3-9)	“	17
3-11	Wed	“	-	18
3-16	Mon	Spring break	-	-
3-18	Wed	Spring break	“	-
3-23	Mon	<b>Exam 2 (Tentative date)</b>		19
3-25	Wed	one sample tests of hypothesis	4	20
3-30	Mon	“	“	21
4-1	Wed	“	“	22
4-6	Mon	two sample tests of hypothesis	5,6	23
4-8	Wed	“	“	24
4-13	Mon	“	“	25
4-15	Wed	“	“	26
4-20	Mon	Type I and Type II errors and power, trend analysis	7	27
4-22	Wed	<b>Exam 3</b>		28
<b>4-24</b>	<b>Thurs</b>	<b>Exam 4, Thurs., April 30, 2:30PM - 5:00PM</b>		29