417/517 Biostatistics
Spring 2015

Course description: Statistical skills for biological/biomedical research, with emphasis on applications, experimental design/survey sampling, estimation/hypothesis testing procedures, regression, ANOVA, multiple comparisons. (PR: BSC 302, 320, 322, or 324)

Instructor: Jeff Kovatch, PhD **Office**: S-122A
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Office Hours: Open hours Mon. 8:30-11:30 and Tues. 8:30-11:30
An appointment is required if you want to meet outside of open office hours.

Lecture: 276 Science Building **Times:** M & W 14:00 to 15:15

Required Tools: A calculator (see below).
Intuitive Statistics: A nonmathematical guide to statistical thinking, 3rd Edition, 2014, Motulsky, Oxford Univ. Press.

Exams: There will be four exams. Each exam will be worth 22% of the total course grade; raw exams scores will scaled to all be of equal value of 100 points. The fourth exam will be given on the day scheduled for the final. Material on examinations can include information from lectures, assigned readings, and assigned homework. Please notify me in advance if you know you will miss an exam (see Attendance Policy below). *I do not offer extra credit assignments.*

All exams will be open-book, open-notes. You are expected to bring a calculator, extra paper, and a pencil to all exams. You are not allowed to bring or use a cell phone or electronic device other than your calculator to exams (for example, you may not use the calculator function on your cell phone for examinations).

Exams with correct answers that do not show work will receive only partial credit, and partial credit will be given for work shown that has minor arithmetic errors. Answers without correct units will not receive full credit. You will be asked to show all work on examinations. Any work you do on scratch paper for an exam must be turned in with your name on each page with your exam.

When completing calculations for homework, exams, or quizzes, you are required to complete all intermediate calculations to four decimal places. When you report a final answer, answer it to two decimal places. If a final answer to one question is an intermediate calculation for the next question, then use the four-digit value to continue calculations in the subsequent question. That is, do not introduce rounding error at intermediate steps. Appropriate units (e.g., mg O_2/ml H_2O) are expected on exams.

Out-of-Class Work: You used to call it homework in high school. For this course, you will receive regular assignments that you are expected to work on outside of class as they are assigned. I will not collect these completed assignments, but rather, you should consider them to be practice for the exams. I strongly recommend that you bring this completed work with you to the exam.

Online Quizzes: Short (~ 5 questions) online quizzes will be posted for each lecture section. The sum of these 5 points quizzes (Σ = 55) will be worth 12% of the total grade. Quizzes for each Unit will be open until midnight before the scheduled exam for that Unit. That being said, I advise that you do not wait until then to complete the quizzes. If you have problems with the quizzes you need to come see me as soon as possible.

Grades:

Range	Grade	Grade Meaning (BSC 417)	Grade Meaning (BSC 517)
≥ 90%	A	Indicates mastery of the subject matter.	Indicates mastery of the subject matter.
80-89.9%	B	Indicates above-average understanding of the subject.	Indicates adequate understanding of the subject matter.
70-79.9%	C	Indicates adequate understanding of the subject matter.	Indicates inadequate understanding of the subject matter.
60-69.9%	D	Indicates below-average understanding of the subject matter.	
< 60%	F	Indicates failure to understand the subject matter.	

Math: Math is an integral part of statistics. I will assume you are comfortable with basic algebra, orders of operations, substituting values into formulas, carrying out arithmetic functions, powers, roots, and logarithms. It is not the purpose of this course to teach you these math skills. An understanding of calculus or other higher order math is not necessary for this course.

Calculator: You must have a calculator that can do at least one list function; you will be able to tell by looking for the Σ symbol on one of the keys. I recommend one that can do two lists (so that it can calculate bivariate statistics like correlations); you will be able to tell this because it will have *x* and *y* notations on the keys. You must also know how to use this calculator without my help. I recommend any of several made by Texas Instruments (e.g., TI-30 series or higher) that are reasonably priced; you do not need anything as fancy as the TI-80 series or higher, although you are welcome to use those. Use of calculators will be permitted on exams and in class. Calculator functions on phone and tablets or related devices will not be permitted at any time during class.

Computers and Statistics Programs: There are many statistical computer programs and packages available: SAS, SPSS, R, Statistica, StatView, SYSTAT. For the purposes of this first course in statistics, learning the concepts and methods is the focus, rather than learning a statistical package. You will be shown how to do a number of statistical operations in MS Excel. Although Excel is not a statistics program, it can do many basic operations. If you have a computer you should have a copy of Excel. Otherwise you can obtain a licensed version from the University or use any University computer.

University and Course Policies:

1. UNIVERSITY POLICIES: By enrolling in this course, you agree to the Marshall University Policies (listed in the link below). Please read the full text of each policy by going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to http://www.marshall.edu/academic-affairs /?page_id=802 for Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment.

2. ATTENDANCE POLICY*:* Attendance in lectures is expected. Students are responsible for all activities and announcements that occur during lecture. It is expected that students actively participate in the course by coming to class prepared and ready to learn. Students should bring questions about the reading material or homework to class for discussion. Students can expect to be called on to verbally participate in this course. Failure to be prepared for class or disruptive behavior, at the instructor's discretion, can lead to dismissal from the class for the day.

Students are expected to be on time for lectures and exams. Arrival for an exam after the first person has handed in their exam will result in you not being allowed to take the exam.

Absences and from exams due to illness, death in the family, or institutional activities will be excused only with an official university excuse from the MU Student Affairs Office (MSC 2W38). Make-up exams will only be administered for excused absences. The instructor must be notified within 10 days of the missed exam in order to be eligible for a make-up

exam (see Policy 1).

3. COMPUTER LITERACY: I make use of MUOnline (http://www.marshall.edu/muonline) for posting the syllabus, delivering homework assignments, posting quizzes, recording grades, posting supplementary material, and providing announcements. I do not use the MUOnline email feature. To email me, please use your Marshall account and contact me at kovatch@marshall.edu. Notify me within the first week of class if you cannot access this course on MUOnline.

4. STUDENTS RESPONSIBLY: Students are responsible for reading the appropriate material from the textbook, reading other posted materials, and completing homework. Students are required to stay on task during the lecture exercises. Students may be asked to work in groups during class time. Students are responsible for any material missed. Missed information should be obtained from classmates.

Communications from the instructor may come via your Marshall email account, MUOnline and/or lecture. It is your responsibility to check both your Marshall email account and MUOnline regularly. Electronic communications to the instructor must have BSC 417 or BSC 517 in the subject line, include your full name in the message, and be written formally. Again, do not use the email option with MUOnline.

5. RECORDS: Grades will not be given or discussed over the phone or email. Exams will not be returned to you. However, you are encouraged to come to my office hours to review your exams. All grades appeals must be done formally in writing and with 10 calendar days of the returning of the grade or graded item to the student.

6. ELECTRONIC DEVICES: You may leave your cell phone on in my classroom. However, you must place the ringer on silent (preferably) or vibrate (if you must). There are multiple reasons that one may need to have a phone on, but there is not a reason that a phone needs to disturb others in the classroom. Do not use iPods, MP3 players, MP4 players, and remove any earphones or other listening devices. The classroom is not a place to listen to music, to email or text friends, check Facebook, chat with friends or surf the internet. I will ask you to leave the classroom for the day if you use technology in ways that are distracting or disrespectful to me or others around you. Repeat offenders may be removed from the course.

Laptops are acceptable for notetaking and making computations only, although notetaking with laptops will be cumbersome for this course due to the equations and mathematics. If I should discover anyone using a laptop for any purpose other than for notetaking during lecture, I will ask you to leave the classroom and to return only when prepared to take paper notes, as research shows that these kinds of uses also distract others around you and lead to decrements in their performance as well as in yours.

Audio or video recording or taking still images of lectures or material presented in lecture is not permitted without prior consent of Dr. Kovatch.

Student Learning Objectives

Course Objectives	Opportunities to Practice Course Objective	Course Objective Assessment(s)
Demonstrate ability to use common research methods and designs in biology	In-class exercises and practice problem sets, homework	All examinations
Discuss the use of critical thinking and, when possible, the scientific approach to solve problems within the field of biology	In-class exercises and practice problem sets, homework	All examinations
Explain, calculate, and interpret descriptive statistics	In-class exercises and practice problem sets, homework	Exam 1
Explain, calculate, and interpret inferential statistics	In-class exercises and practice problem sets, homework	Exams 2-4

Tentative Course Schedule

Date	Topic	Unit	Book Chaper
12-Jan	Course Intro	1	44 & 45.
14-Jan	Fog of War	1	
19-Jan	*MLK*		
21-Jan	Probability	1	1 & 2
26-Jan	Probability	1	1 & 2
28-Jan	Descriptive Statistics	1	7 - 9, 12-14
2-Feb	Population distributions	1	10 & 11
4-Feb	Correlation	2	32
9-Feb	Correlation	2	
11-Feb	Unit 1 Exam	1	
16-Feb	Statistical Significance	2	16-19
18-Feb	*No Class*	2	
23-Feb	Regression	2	33
25-Feb	Models	2	34, 35
2-Mar	Models	2	
4-Mar	Models	2	36-38
9-Mar	Review	2	
11-Mar	Unit 2 Exam	2	
16-Mar	*Spring Break*		
18-Mar	*Spring Break*		
23-Mar	Inferential Stats	3	27-31
25-Mar	Inferential Stats	3	
30-Mar	t-tests	3	
1-Apr	t-tests	3	
6-Apr	t-tests	3	
8-Apr	ANOVA	3	39-41
13-Apr	ANOVA	3	
15-Apr	Unit Exam 3	3	
20-Apr	ANOVA	4	
22-Apr	ANOVA	4	
27-Apr	ANOVA	4	
29-Apr	ANOVA	4	
4-May	Unit 4 Exam	4	