

## **BIEB 100: Biostatistics Lecture & Lab**

**Course Information (updated 4 August 2017)**

**Fall Quarter 2017**

**Lecture: MWF 10:00-10:50AM York 2622**

**Be sure to check TritonEd for any updates.**

<b>Lab A01: Monday</b>	<b>12:00-12:50PM, ERCA 117</b>
<b>Lab A02: Monday</b>	<b>1:00-1:50PM, ERCA 117</b>
<b>Lab A03: Monday</b>	<b>2:00-2:50PM, ERCA 117</b>
<b>Lab A04: Tuesday</b>	<b>3:00-3:50PM, ERCA 117</b>
<b>Lab A05: Tuesday</b>	<b>4:00-4:50AM, ERCA 117</b>
<b>Lab A06: Tuesday</b>	<b>5:00-5:50PM, ERCA 117</b>

Please note: information in this syllabus is subject to change. Any schedule changes will be announced in class and posted on TritonEd. Make sure to frequently check TritonEd to keep updated about the readings, assignments, and exam schedule.

**Exam dates:**

**October 18 (in class): Midterm 1 (chapters 1-2)**

**November 20 (in class): Midterm 2 (chapters 3-6)**

**December 15, 8-11: Final exam (cumulative)**

## **Philosophy**

Educational research has shown that academic success in a course depends on a student investing time and effort in learning and actively participating in a course. Learning involves wrestling with new concepts, practicing new techniques, and rethinking old assumptions. My role as the professor and the role of your Instructional Assistants is to facilitate your learning by providing targeted materials for you to use, structuring your exposure to a logical sequence of topics, clarifying misconceptions, helping you work through difficult material, and giving your ongoing feedback about your progress. You should see this course as a collaboration – between you and your instructors and between you and your fellow students as we collectively work through the material. How much you get out of the course and how well you do in it will depend upon how much you engage with the material and how much discipline you apply towards mastering new concepts and deploying them. To that end, the assignments are designed to keep you from falling behind, to help guide you through the key learning goals for each section, and to give you your first exposure to new concepts, and the lectures are designed to clarify misconceptions and to work through examples of how statistical concepts are used and misused in real research questions and in public life.

Students often come to an introductory statistics course expecting to memorize a series of recipes and formulae to apply in well-defined situations. You will not get that in this course. Statistics is not a cookbook for using formulae but rather a process for getting reliable answers to interesting questions – it embodies the scientific method. Statistical formulae are sometimes (but not always, as we will see) used in this process and make no sense without the preceding components. Moreover, the wide variety of statistical tests out there to handle disparate kinds of data are all based on a common logic. **Understanding this logic transforms statistics from a hodge-podge of individual, unrelated, arcane formulae into a conceptually coherent and flexible framework for answering all kinds of questions and for thinking about the world.**

Every day you are exposed to numbers and data and conclusions drawn from them (or despite them). They are rarely as clean and clear as a textbook problem and yet they form the basis for crucial public and private decisions, political and social debate, and scientific discoveries. Statistics and the scientific method is a way of evaluating these numbers and drawing conclusions from them in a reliable and justifiable way. The US Presidential election season is almost done – how should you interpret polls, particularly when they disagree with each other? How can you evaluate the numerical claims that the candidates make? Can you really make data say anything you want? The popular press loves to report the latest in nutritional research – is red meat really bad for you? Is chocolate good? Do genes determine everything about you? How can we really know whether we are in the middle of a massive extinction event or whether climate change is caused by humans or not? What is a scientific model anyway? What do you need to know in order to properly interpret medical tests, and does your doctor know these things?

This course is designed to help you develop competence in three related areas.

The first is *statistical literacy*. This involves:

- 1) awareness of data, how they are used and misused, and the consequences of each
- 2) understanding basic statistical concepts

- 3) knowing the basics of how to collect data and summarize it
- 4) knowing how to relate statistical results back to the context of the original question
- 5) being able to communicate the results to others

The second is *statistical reasoning*. This involves:

- 1) applying statistical ideas
- 2) making sense of statistical information
- 3) interpreting graphical displays and numerical summaries
- 4) checking whether intuitive conclusions from data really hold up

The third is *statistical thinking*. This involves the following habits:

- 1) consider how to collect meaningful and relevant data to answer a particular question
- 2) keep in mind the statistical process as a whole and how the different pieces fit together
- 3) be skeptical, particularly about how data is obtained
- 4) think about the variables involved – are they the right ones for the question? how will they behave? are there other variables that might be important?
- 5) always keep the context in mind. How does the data relate back to the original question?
- 6) understand the relevance of statistics, especially when you want to make a causal claim or say something is unusual.
- 7) think beyond the textbook.

I have designed this course so that you will emerge from it with a healthy and statistically grounded skepticism about the numbers and data that pervade our society and so that you will be able to collect data and properly draw conclusions from it and evaluate conclusions that others draw from their own data. We will get to that point by carefully studying and repeatedly practicing the methodology and tools of statistical investigation. For those of you planning to go to medical or graduate school, the MCATs and the GREs are emphasizing this type of thinking more and more.

#### **Required materials:**

- The required textbook is by Lock et al. and is called *Statistics: Unlocking the power of data*. Your WileyPlus subscription gives you access to a downloadable electronic copy of the textbook if you don't want a physical one.
- Access to WileyPlus. The bookstore has the appropriate access code. There is a grace period for using WileyPlus through TritonEd before you have to buy it.
- You will need an iClicker. Older versions of the iClicker can be used as long as the remote ID can be read and the remote can be registered on TritonEd. You cannot share an iClicker remote with another student enrolled in this class (but you can share with someone who is not in our class). Please use an actual clicker and not your phone.

#### **Homework structure and purpose**

This course is organized so that the reading, homework, and lectures cover the same set of concepts at the same time. You read about them in the textbook. We discuss difficult aspects of them in class

either directly or through examples. You practice them in the homework problems. Then we move on.

Practicing statistical techniques in homework not only helps you with the mechanics of describing data, testing hypotheses, and estimating parameters, but it also helps solidify your understanding of statistical concepts. It is very difficult to learn statistics without this practice. We will use an adaptive learning system called Orion to help you learn these concepts and techniques. There will be 9 Orion assignments due in the course, one for each chapter that we will cover, each worth 10 points. The assignments are not graded strictly on the number correct but rather on proficiency, which also takes into account how quickly you answer the questions and how confident you are in your answer and your improvement. You should not expect and I do not expect you to be 100% proficient. The grading schema for these homework assignments is:

0-20% proficient: 0 points  
20-40% proficient: 1 point  
40-60% proficient: 3 points  
60-80% proficient: 6 points  
80-100% proficient: 10 points

The homework starts with 20 diagnostic questions which gauge your knowledge and let the Orion system determine which concepts you are already proficient at and which you need more practice on. It then gives you further questions to answer that are designed to help you learn the material that you do not know. You need to answer a minimum of 40 questions (including the diagnostic) in each chapter to get a grade. However, if you are not satisfied with your knowledge and score after this 40, you can answer as many more as you'd like until you reach the score you want or until the deadline. In the process, you will learn the material. After the diagnostic, you also have the option to do questions for practice and not have them count towards your grade until you are ready.

You have access to all the assignments at the beginning of the quarter. Plan ahead so that you can finish the assignments by their due dates. There is no credit for late homework. However, you can continue to practice questions using Orion after the due date to improve your understanding of the material and to study for the exams.

We will also spend time working through examples in class. Part of this will involve discussing a problem or question with other students, trying to explain a concept in your own words or arguing your case for why it is answer A and not B. Putting an idea into words and explaining it to someone else is a very effective way to determine whether you really grasp an idea. If you think you understand something but there is some aspect of it that you can't quite explain, then you have identified the weak link in your understanding. The goal of peer instruction is to expose these weak links and make them stronger.

We will use clickers as a tool for some of these in-class problems. Since these questions will mostly be based on newly presented material, they will be graded on **participation** rather than accuracy. Please see the clicker policy at the end of the syllabus for more details.

You will occasionally be asked to turn in your in-class work. This will be graded credit/no- credit based on whether you made a good-faith effort to solve the problem.

There will also be weekly lab reports. Lab sections are required and will be designed to reinforce concepts covered in class. You will receive credit for the lab reports, attendance, and participation in lab section.

## **Exams**

There will be two in-class midterms and a final exam. The midterms will cover material from chapters 1-2 (first) and 3-6 (second). The final will be cumulative, reflecting the fact that the material in the course is cumulative. Exams will have a mix of questions specifically testing higher and lower order mastery of the material. The exam questions will be similar to homework questions, but there will also be at least one question that requires you to apply what you have learned in a new context. There are two midterms so that each one covers a limited amount of material. By having the first one in the 3rd week you will get feedback on how you are doing in the course early enough so that you can change your approach to the course if you need to. These exams also give you information about what specific concepts you may be struggling with. Take advantage of office hours, the discussions board, or one-on-one meetings with your instructors to work through these concepts and correct misunderstandings.

The exam dates are on the first page of the syllabus.

## **Clicker policy and grading**

**To receive credit, you need to register your iClicker remote using the iClicker Registration link on our TritonEd course menu.** You will not see your clicker points on TritonEd until you have registered your clicker. To ensure your clicker is working properly, be sure to register RIGHT AWAY.

Note: The instructions that come with your remote ask you to register your clicker at [www.iclicker.com](http://www.iclicker.com). While you are welcome to do this, it is not necessary.

Every student in this course must have their own clicker to receive clicker points. Any students found to be clicking in for classmates who are not in lecture, or if someone else is clicking for you when you are not in lecture, will get an automatic zero for ALL clicker points for the quarter. This is considered cheating and will be reported to the Academic Integrity Office.

For the first week of class, we will be practicing with the clickers and the points will not count. (9/29-10/4). This is a great opportunity to make sure you know how to use your clicker and your clicker is working properly. I will post the points on TritonEd so you can check. Starting on 10/6 you will receive points for answering clicker questions in lecture. I will assume your clickers are working properly by this time.

## **Using your clicker**

Turn your clicker on with the orange power button. Set it to the frequency in our room (AB). I will ask questions, and you will respond by pushing buttons A – E. Please wait until I start the poll before you respond. When your answer has been received, you will see a checkmark at the top of

your clicker screen. While the poll is open, you can change your answer as many times as you want by pressing different buttons.

There will be clicker questions during lectures which are intended to spark discussion and to help both of us — you AND me — gauge how well you are understanding the material. These are graded only on participation (you get credit for clicking in, regardless of which answer you choose).

If you answer at least 80% of the questions during the quarter, you will get full credit. If you answer less than 80% of the questions, your clicker grade will be based on the proportion of questions you answered. For example:

Answered 70% of questions: Score = 70%

Answered 90% of questions: Score = 100%

### Recommendations

- Bring extra batteries (clickers require 2 AAA batteries)
- Write your name on your clicker
- Cover the ID number on the back with a piece of clear tape to prevent it from rubbing off. Make a note of your ID number in case it becomes unreadable.
- Sometimes clickers break, and some days there is a good reason for missing lecture. That is the reason for the 80% rule. It is your responsibility to use the first-week grace period to learn how to use your clicker and make sure that your clicker is working, as I do not adjust scores for malfunctioning clickers.
- It is your responsibility to have your clicker with you at lecture and to make sure it is working properly. There will be no make-up opportunities for clicker questions, for any reason, nor can you get clicker credit for handing in questions on paper, etc. Like all technologies, clickers sometimes malfunction. This is why I give full clicker credit if you answer 80% of the questions or more. **I do not adjust scores in other ways.**
- If you have problems, go through the troubleshooting guide below.
- Be sure you have registered. This means through TritonEd (NOT at [www.iclicker.com](http://www.iclicker.com)).
- Make sure your remote is on the correct frequency for this class.
- Make sure you wait until I start the question before you answer; you should see the timer going.
- Make sure you answer before time has run out. No answer is accepted after the time has ended.
- Every student in this class needs their own clicker – if you are sharing with another student one of you will not get any points.
- Are your batteries still good?

### Lost clickers

If you lose your clicker mid-quarter and use a different clicker, you need to add your new clicker number to your registration in TritonEd (don't get rid of the old one!!).

To be clear, if your clicker is not working, I will NOT award points retroactively, so you MUST figure out why it's not working immediately. No exceptions.

## **Grading**

The grading breakdown for components of the course is:

Midterm 1	17%
Midterm 2	17%
Final	34%
Lab attendance and participation	5%
Lab reports	5% (equally weighted across reports)
Orion homework	15%
Pre-class and post-class tests	2% (simply for taking them before the deadlines)
Class participation	5%

The final grades will eventually be curved, but a rough grade range guideline is:

A (90-100%) B (80-90%) C (70-80%) D (60-70%) F (below 60%)

## **Contact Information and office hours**

*Please contact me (Prof. Rifkin) only in case of an emergency. The best way to contact me is via email. Please email your IA for all other inquiries. In all emails, please put 'BIEB100' in the subject line to indicate your email is about this course. Please keep in mind that it may take a while to get back to you and that you shouldn't expect an answer after 8PM. Because there are so many students in this course, we cannot answer emailed individual questions about course content. For those questions, attend lectures, labs/sections, and IA and professor office hours; use the Discussion board on TritonEd; and talk to your fellow students. The office hours are a great way to get personal help with any questions you have on the course material.*

*Professor*

### **Scott Rifkin**

Ecology, Behavior, and Evolution

sarifkin at ucsd.edu

Office hours: Wednesdays 11:15-12:15, Muir 1208

*Instructional Assistants*

### **David Jakubosky**

Biomedical Sciences

Section: Monday 2 and Tuesday 5

djakubos at ucsd.edu

Office hours: Monday, 3:30-4:30, Leichtag lobby

### **Ruonan Wang**

Biology

Section: Monday 12 and Monday 1

ruw045 at ucsd.edu

Office hours: Thursday, 3:30-4:30, Mandeville coffee cart

**Yuansheng Zhou**

Biology

Section: Tuesday 3 and Tuesday 4

yuz461 at ucsd.edu

Office hours: Tuesday 1:30-2:30, Location TBA

**Software**

Software comes in handy for doing statistical calculations and simulations. We will make extensive use of a set of web applets which are integrated with the textbook *but also can be used for your research or other classes*. Let me emphasize this again: although these are web applets, their results are perfectly valid and you can use them to analyze data outside this class. The applets can be found at: <http://lock5stat.com/statkey/>. A guide to using StatKey can be found at that site and there are also some tips on the course page in TritonEd. We may occasionally use other applets, and there will be links to these on TritonEd.

If, after this class, you find yourself using statistics frequently to analyze data, I would highly recommend you learn R. R is both a programming language and the most widely used statistical software in the world. There are tons of online and paper resources for learning R. You can find some very good ones by searching "tryR code school", "datacamp R", "rstudio online learning", or "swirl learn R."

**Cheating**

Students are expected to do their own work, as outlined in the [UCSD Policy on Academic Integrity](#). Cheating will not be tolerated, and any student caught engaging in academic dishonesty will fail the course. He or she may also be suspended from UCSD. All exams will be closed-book and closed-notes, so all personal materials must be stowed under your seat. Only exams written in non-erasable pen will be considered for regrades. There will be assigned seats in the exams, and you will receive your seat assignment before the exam.

**Computers and phones in class and sections**

Computers, phones, and other distraction-enabled devices require care and consideration when used in class. There will be instances where we use applets to explore a topic together in class, and laptops or tablets will be handy in those circumstances. These occasions will be announced in advance. However, laptops are not a good tool for taking notes in this class. They do not have the versatility necessary for capturing text, sketches, arrows, etc. that are important for note-taking in statistics. Bring paper and something to write with to take notes in class. If you have a stylus to write on a tablet, then you may use that, although only for note-taking. We will use computers for some exercises in sections, but you are expected to be courteous to your fellow students and TA and use them only for the intended purposes. Students using computers for purposes other than those related to the class will be asked to leave. Phones are only to be used for emergencies and outside the classrooms.

**Podcasts**

The course will be video podcast. You can download video podcasts from: <http://podcasts.ucsd.edu/>. However, be aware that the video portion only captures what is projected

onto the screen from a computer. Since the chalkboards will be used heavily in lectures, the video portion of the podcast will be of limited use. You can also find an audio podcast link at that site.

## **Feedback**

Learning is a collaborative endeavor and so your feedback is crucial. Feel free to post questions and ideas on the discussion board on TritonEd and/or let your instructors know.

## **Extra supplies needed for this class**

Class demonstrations will occasionally require tools. Please go to <http://www.random.org/integers/?mode=advanced> and print out a set of 1000 random digits from 0 to 9. (For easy printing choose 15 columns in Part 1, “Bare bones text” in Part 3, and “generate your own” in Part 4). Please also use this website to print out a set of 100 random numbers from 1 to 200 and a set of 100 random numbers from 1-3. Please bring these sheets and a coin to every class. If we will need a different tool for a demonstration or for lab (e.g. dice, deck of cards, ruler, etc.) it will be posted on the website and announced in class.

## **Regrades**

If an error has been made in the grading of your homework or exam, you may submit it to your IA (homework) or Prof. Rifkin (exam) within *one week* of distribution for a regrade. **Do not go to a IA for an exam regrade. Your exam must first be submitted to Prof. Rifkin with a written description of the grading error.** Regrade requests will not be processed without a written description of the grading error. **No regrades will be given for exams written in non-permanent ink or pencil.**

## **Missed exams**

There are no makeup exams. However, unavoidable emergencies happen, like a serious illness of yourself or a close family member. If you unexpectedly miss a midterm, you will be required to provide official documentation. Without such documentation, you will receive a 0 for the midterm. If you know beforehand that you cannot be present in the classroom for a midterm and (1) can present a valid excuse (such as a note from your coach for a sporting event) at least one week in advance of the exam and (2) are receiving a passing grade in the course as of one week before the exam, then a sealed copy of the exam will be given to the coach, musical director, etc. who will administer the exam **at the class exam time**. If no UCSD official can be found to administer the exam or if the exam cannot be taken at the class exam time, then it will count as a missed exam. If you miss the midterm with a valid excuse (unavoidable emergency or a pre-arranged absence as per above) the other midterm and the final will each count 7.5% more.

The final exam is on Friday, 9 December from 8-11AM. There is no alternative final.