Math 316
Biostatistics
Spring 2026
Syllabus and Course Information

Class meetings: Section 1   9:00 –   9:50 am
                              Section 2   10:00 – 10:50 am
Both meet Monday, Tuesday, Thursday in RAC 138

Professor: David Strong
Email: David.Strong@pepperdine.edu
Office Hours: Monday   12:00 – 12:50 p.m.
                        Tuesday   11:00 – 11:50 a.m.
                        Thursday   8:00 –   8:50 a.m.

Help is available. You are encouraged to talk with classmates or tutors or come to office hours if you need
    help. If you are unable to attend office hours, you may set up an appointment to meet at another time.
    Or you can email me: I am able to answer most questions via email.

Course Description: Statistics for the biological sciences. Random sampling; measures of central
    tendency; dispersion and variability; probability; normal distribution; hypothesis testing (one-sample,
    two-sample, and paired-sample) and confidence intervals; multi-sample hypotheses and the one- and
    two-factor analysis of variance; linear and multiple regression and correlation; other chi-square tests;
    nonparametric statistics.

Textbook: <u>Statistics for the Life Sciences</u>, Samuels | Witmer | Schaffner, **5<u>th</u> edition**, Prentice
    Hall, 2016, and corresponding Student Solutions Manual. I've posted the first three
   chapters of the book at the class homepage.   ISBN-13: 978-0321989581.

Course Site: The webpage for Math 316 is one that I maintain (rather than the Canvas site):
        http://seaver-faculty.pepperdine.edu/dstrong/26s.316/index.html.

Prerequisites: Calculus I (Math 150) or equivalent or permission of instructor.

Course Outline: We will cover nearly all of chapters 1 – 12, from the introduction and basic definitions
through probability, sampling, hypothesis testing, categorical data, ANOVA, and regression.

Course Objectives:
- Demonstrate an understanding of the concepts and skills central to the study and application of statistics.
- Demonstrate the ability to apply appropriate statistical concepts to collect, summarize, analyze and
   interpret scientific research data.
- Demonstrate the ability to analyze the basic statistical concepts used by others to examine the validity
   of their results.
- Demonstrate the ability to appropriately use statistical terminology and concepts in designing a
   statistical study and interpreting the results.
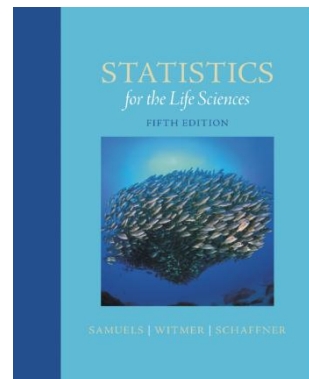
Course-Specific Learning Outcomes:
- Know the fundamental terms used in the design and analysis of statistical studies.
- Know the importance of random sampling and various techniques for obtaining random samples.
- Be able to determine and interpret frequency distributions, graphs and other techniques to visualize data.
- Understand and be able to determine measures of central tendency, variation, and position.
- Understand basic counting techniques and apply these to situations.
- Be able to construct suitable sample spaces and compute probabilities of subsets of these spaces.
- Be able to determine and identify discrete probability distributions.
- Know the importance of the normal distribution and determine probabilities based on it.
- Know why the Central Limit Theorem is central to the application of many of the statistical tests.
- Understand and be able to determine confidence intervals and know how sample size affects these.
- Know how hypothesis testing relates to probability distributions and be able to perform and analyze results from the t-test, z-test, and χ^2-test.
- Know and be able to use and interpret some of the basic nonparametric statistical methods.
- Know how to use some of the main χ^2 tests and how to analyze their results.
- Know how the analysis of variance (ANOVA) test works and be able to use and analyze the test.
- Understand the principles behind regression, and be able to use and interpret correlation and regression information.

Relation to Mathematics Program Learning Outcomes:

Math 316 partially satisfies the 2nd and 3rd **Mathematics Program Learning Outcomes**:

A student who completes a mathematics degree should be able to:
- Formulate mathematical proofs that are clear, correct, complete, and logical.
- Demonstrate an understanding of the knowledge and skills central to the discipline of mathematics.
- Demonstrate the ability to apply appropriate mathematical ideas to both abstract and real-world contexts.
- Demonstrate a willingness to serve by having participated in co-curricular activities that are central to the broader mathematical community.

Relation to the General Education Quantitative Reasoning Requirement:

As one of the options for the quantitative reasoning requirement of the general education curriculum, Math 316 works throughout the course in satisfying the following learning outcome.

Program Learning Outcome of the General Education Quantitative Reasoning:

Students reason and solve quantitative problems and explain mathematical concepts and data.

Relation to Pepperdine's Mission:

Statistics is a relatively young branch of mathematical science, but it has proven to be very powerful for analyzing scientific data in a number of fields, including the fields in which many of you are interested along with many aspects of the world's ongoing response to COVID. In science, very little is published without containing some statistical analysis. However, Statistics is also used (and often misused) in the popular media. Simply as a citizen who depends on reliable use of information, it is very helpful to have a background in Statistics. Hence, the study of Biostatistics helps prepare you for a life of "purpose, service, and leadership."

Class, Handouts, Textbook: We will have a daily handout in most class meetings. This handout will include some explanations, new words, and references to book examples. It gives us something to talk about without spending a lot of time writing things down, so that we will have more time to think, talk and work problems in class. I also want it to be a summary and introduction to the corresponding section(s) in the textbook so that reading the book on your own will be a little easier: I think it is easier to understand the details when you have some understanding of the bigger picture. Of course the class handouts are not meant to replace the textbook, which gives a more detailed and thought out explanation of things than we can possibly hope to cover in 50 minutes of class each day. In other words, read the

book! Some test questions will be book examples or variations of book examples, so you should try to understand every single example and try to understand what that example is intended to help you learn.

Homework: *Math is learned through practice!* Timely completion of assigned homework is essential to successful learning in any math course, and attendance to class will not be sufficient for mastering the material. Also, you may find it helpful do additional problems beyond the assigned homework to fully understand the material. Try to understand what principles are being checked in the homework problem and be sure you know those principles well.

Homework will be turned in at the beginning of class on the days it is due. *Late homework will be accepted* **AT HALF CREDIT** *by the next class.* If you know that you will miss class, you may turn in the homework early. Only some of the problems from each problem set will be carefully graded, but your score will include a completion grade for the whole assignment; it is your responsibility to make sure that you understand how to correctly do the whole assignment. With this in mind, after homework has been turned in, I will post solutions to all assigned homework problems.

You are encouraged to work with other students in doing the homework, but the homework turned in must be your own and represent your own thinking and your own work. Turning in the work of others, allowing others to copy your work, or copying from a solutions manual is a violation of Seaver College' Code of Ethics (see your student handbook for more information) and can lead to a lowering of your course grade as well as counting as an official ethics violation at Seaver College. Don't use AI to do your homework.

The presentation of your work in a logically consistent form is preparation for the communication skills you will need in any professional field after graduation. Homework must be neat, clearly legible, and stapled with your name, the name of the course (Math 316), the due date, and the assignment number at the top. To get you in the habit of doing things the right way, I reserve the right to deduct points if these are not done. Finally, an answer is different from a solution. A solution also includes the work done that leads to the answer. In grading, I am at least as interested in the work you did as in the answer itself. So show all work related to finding your answer.

Exams: Three in-class exams will be given during the semester. A final exam will be given during the final exam period and is a comprehensive final. If you have university-sanctioned conflicts with the exam dates, you must contact me before the exam to reschedule. No other make-up exams will be given, except in extraordinary circumstances. (If you have a serious illness or family crisis that prevents you from taking the exam, let me know before the exam if possible, and you must provide verifiable evidence upon request.)

Grades: The grade breakdown is:

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
100%	93%	90%	87%	83%	80%	77%	73%	70%	67%	63%	60%	0%
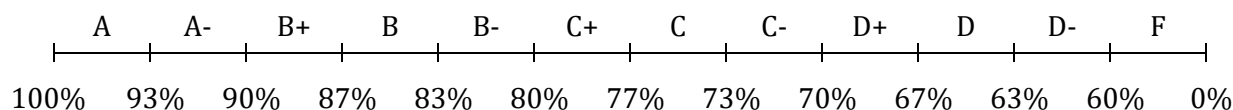
Homework 20%
Three Midterm Exams 60% (20% per exam)
Final Exam 20%

If needed, I will lower the cut-offs from one grade to the next (e.g. between an A and A-). I won't know what sort of curving might be needed until the end of the semester, once overall scores for the course have been computed for all students. **If you score better on your final exam than any of your midterms, then it will count in place of the lowest midterm.** In this case, your two highest midterms are worth 20% each (40% of your total grade), and your final exam is worth 40%.

Tips for a successful experience*:* You should be an active participant in your learning. This means that you should come to class prepared to learn. Before class you should read through the section(s) we are going to cover (just to get familiar with it—you don't need to master the material before class) and perhaps again _after_ class. You should also read through the hand I post and handout prior to class. Math is not a spectator sport. Reading a math book is not like reading a novel. You should ask: "What is the author trying to tell me here?" For each example and each problem, you should ask: "What is the point of this particular example/problem?" For each example, make sure you know how the author goes from one step to the next—often simple algebraic or derivative steps are omitted. As we progress further, steps that we previously studied and now understand are omitted. You should be able to solve each example on your own after you have studied it. Don't just memorize the steps; understand the problem, both the details of the steps, as well as the problem as a whole. _If you study to remember you will forget, but if you study to understand, you will remember_.

Do not wait for exam reviews to learn. You will read for and work on problems from this class almost every day. This is why homework is due every class. Statistics is not a topic that can be crammed into your head all at once. Nor do you simply learn it merely to pass a test. Math continues to build on itself. The logical and analytical thinking required in this class is preparing you for your work after college, even if you do not go into a field directly related to mathematics.

To help yourself, you might find some friends in the class to study with on a regular basis—small groups work best.

Ethics: As part of a university community, you are expected to respond in an ethical manner to the challenges that you will face. This is particularly true in a Christian university where Christian values are an intrinsic part of who we are. The Code of Ethics in your student handbook gives examples of conduct that would not be considered ethical. As part of maturing into a contributing member of society, you should avoid any attempt to violate that code. However, in case of an ethical violation, my responsibility is to report you and to penalize you, in fairness to the rest of the class. For your sake, the sake of the class, as well as my own sake, I hope your internal sense of fair play will keep you away from any such violations. I also hope that if you should see someone else failing to uphold the ethical code, that you would be honorable enough to report this. In this class, examples of ethical behavior would include refusing to accept help from or give help to another student during exams. Maintaining ethical conduct will help you keep a clear conscience and prevent possible grief.

Student disabilities: Any student with a documented disability (physical, learning, or psychological) needing academic accommodations should contact the Disability Services Office (310-506-6500) as early in the semester as possible. All discussions will remain confidential. Please visit https://www.pepperdine.edu/student-accessibility/ for additional information.

Recordings, copyrights, etc.: here are a few other things the university said I should I include in the syllabus. (Any of you who are wanting to be lawyers might find this exciting.)

Student and faculty privacy. *In order to safeguard the privacy of all our students and faculty in online learning environments, no individual may record, reproduce, screenshot, photograph or distribute any video, audio, or visual content from an online course. This restriction applies to, but is not limited to, live online sessions, recorded lectures, live discussions, and discussion boards. The only exceptions to this policy are the instructional recordings referenced above and one screenshot per meeting/ discussion that faculty may take as a form of attendance. These screenshots may not be shared or used for any other purpose. Any violation of this policy may subject the individual to disciplinary and/or legal action.*

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