Course website

http://math.pugetsound.edu/~jbernhard

Contact information

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For my office hours, see the course website. My office phone number is 253.879.3812, but the phone is usually one of the slowest ways to reach me. Email is usually much faster. (All of my email is forwarded to another account, so you may receive email from me at that account as well.) Neither phone nor email will necessarily reach me “after hours” (on nights and weekends), so please take that into account when you contact me via either one.

The course website is the best resource for information about the course. Among other things, it contains a complete calendar for the semester, including all assignments. Also, if you email me a password when I request one, you will be able to access your grade-to-date any time during the semester via the course website.

Course goals

The main goal of this course is to learn to conduct linear model analyses. This goal includes several other goals:

• To become familiar with linear models and some of their applications. You will learn about many types of statistical inference in the context of linear models, including: one- and two-sample $t$ tests, ANOVAs, simple linear regression, ANCOVAs, and multiple linear regression.

• To learn how to write a computer script as part of a statistical analysis. Nowadays any serious statistical analysis involves a computer. In this class, you will move away from a menu-driven computer interface and will learn how to write a computer script, an important part of a statistical analysis.

• To learn how to use R for statistical computations. You will become acquainted with the R statistical computing environment and how to use it for linear model analyses. R is widely used in the statistical community, and the R skills that you learn will also translate readily to other statistical packages.

More specific learning objectives for this course are listed at the end of this document.
Prerequisites

To take this course, you should have done at least one of the following:

- Successfully completed Mathematics 181 (Calculus II) or its equivalent. If you have a solid background in mathematics or science, as completing Mathematics 181 indicates, then you are prepared for Mathematics 260.

- Earned a 4 or 5 on the AP Statistics test. If you are comfortable with the material in AP Statistics, then you have the statistical background to prepare you for Mathematics 260.

- Successfully completed Mathematics 160 (Introduction to Applied Statistics) or its equivalent. If you are comfortable with the material in Mathematics 160, then you have the statistical background to prepare you for Mathematics 260.

- Obtained permission from the instructor. If you have a strong mathematics or science background, or if you are familiar with introductory statistical concepts from a context not listed here, you should seek my permission to take Mathematics 260.

For this class, you do not need to have had any prior computer experience beyond the usual email and web-browsing. In particular, you do not need any prior computer programming experience. If you have done some computer programming, that’s fine, but most students in Mathematics 260 have never programmed a computer before.

Course materials

The text for this course is an online course text that I have written for the course. It is linked from the course calendar on the course website.

Most students also find it helpful to have a computer for this course, but if you do not have one, you can use library or other campus computers instead.

Coursework

The coursework consists of:

- Approximately weekly homework assignments, usually due on Wednesdays.

- Three larger statistical projects, in each of which you will conduct and write up a full statistical analysis.

There are no in-class exams for this course, and there is no final exam. The course is finished on the last day of classes.

In the homework assignments, you will be guided through the steps of conducting linear model analyses. On the projects, you will conduct such analyses mostly unguided.
Grading

Your grade will be based on my assessment of your understanding of the material. By default, I will weight the various components of the course as follows:

- Homework assignments 40%
- Project 1 15%
- Project 2 20%
- Project 3 25%

However, these weights are subject to change due to individual circumstances, so if you believe the above components do not accurately represent your understanding of the material, please let me know. If the circumstances dictate, I can work with you to find another way to demonstrate your understanding of the material.

Late work policy

I will not accept late work without an appropriate reason, which you should explain to me before the work is late if possible. If you are falling behind or need to turn something in late, please see me so that we can discuss it.

Attendance policy

I will not be taking attendance in this class. You are responsible for the material that we cover in class whether or not you are in attendance. Since it is extremely difficult to keep up in the course without attending regularly, I expect absences to be rare. I do not ordinarily give make-up tests, so if you must be absent during one of those, please let me know as early as possible so that we can discuss the situation.

Academic honesty

On homework problems, you are allowed to work with anyone you like (including myself, other students, tutors, etc.) in any way that helps you learn the course material. (This means, of course, that your write-ups must be your own.)

On projects, you are not allowed to work with anyone else. If you would like to have someone else help you on a project with routine editing and proofreading, you must first obtain my approval to do so.

For general information on issues of academic honesty, see the official University of Puget Sound academic honesty policy at:

http://www.pugetsound.edu/student-life/student-resources/student-handbook/academic-handbook/academic-integrity/
Classroom Emergency Response Guidance

Please review university emergency preparedness, response procedures and a training video posted at www.pugetsound.edu/emergency/. There is a link on the university home page. Familiarize yourself with hall exit doors and the designated gathering area for your class and laboratory buildings.

If building evacuation becomes necessary (e.g. earthquake), meet your instructor at the designated gathering area so she/he can account for your presence. Then wait for further instructions. Do not return to the building or classroom until advised by a university emergency response representative.

If confronted by an act of violence, be prepared to make quick decisions to protect your safety. Flee the area by running away from the source of danger if you can safely do so. If this is not possible, shelter in place by securing classroom or lab doors and windows, closing blinds, and turning off room lights. Lie on the floor out of sight and away from windows and doors. Place cell phones or pagers on vibrate so that you can receive messages quietly. Wait for further instructions.

Office of Accessibility and Accommodations

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Peggy Perno, Director of the Office of Accessibility and Accommodations, 105 Howarth, 253.879.3395. She will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Copyright and Fair Use

Course materials are for educational purposes only and limited to students enrolled in the course. They are protected by copyright law and may not be copied, downloaded, stored, transmitted, shared or changed in any way.

Other

Feel free to contact me with any questions you have regarding the course. I very much want each and every one of you to succeed in this class.

I look forward to an enjoyable class with you this semester!
Learning objectives

The specific **learning objectives** for this course are as follows:

- To be able to define and apply basic concepts in descriptive statistics (such as *sample mean* and *sample standard deviation*).

- To be able to describe and apply the two basic inferential statistics concepts of *hypothesis tests* and *confidence intervals*.

- To be able to conduct and analyze a *1-sample t test* and compute and analyze its associated confidence interval.

- To be able to conduct and analyze a *2-sample t test* and compute and analyze its associated confidence interval.

- To be able to decide if a logarithmic transformation is appropriate in a linear model, and to interpret the transformed model if it is.

- To be able to use a linear model to conduct and analyze a *1-way ANOVA* and the associated *Tukey post-hoc test*.

- To be able to use a linear model to conduct a *simple linear regression* analysis.

- To be able to use a linear model to conduct and analyze an *ANCOVA*.

- To be able to use a linear model to conduct a *multiple linear regression* analysis with both numerical and categorical explanatory variables.

- To be able to use the *Akaike Information Criterion (AIC)* to perform linear model selection.