Applied Statistics
Interdepartmental 202-01, Fall 2021
1:30-3 pm Tuesday & Thursday
Tucker 115

Professor Zoila Ponce de Leon
Office Hours: Wednesday 10-11 am & Thursday 4-6 pm
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Course Description

An examination of the principal applications of statistics to allow students to develop a working knowledge and understanding of applied statistics. Topics include descriptive statistics, probability, estimation, hypothesis testing, and regression analysis.

We are surrounded by data. Statistics is what allows us to retrieve information from data. Without statistics, data would just be numbers and words in a spreadsheet. In this course, you will develop skills in learning from data as well as drawing conclusions and critically evaluating results based on data. Students will learn the basic concepts of statistics and probability, and comprehend methods needed to analyze and critically evaluate statistical arguments.

We will discuss the complexities of research design, including operationalizing concepts and measuring them as well as the challenges and limitations of gathering good data. A very important emphasis of this course will be to critically evaluate the conclusions that we draw from data in class and in life (research by analysts, reporters, politicians, and policy advocates). Society, media, business, government and culture are becoming increasingly data oriented, placing a high value on basic statistical literacy.

We will employ an inverted teaching format, with most of the time spent "doing statistics" by means of online and in-class lab exercises.

Course Objectives

- Demonstrate understanding of the process by which statistical analysis provides evidence to answer questions, including the basic ideas of statistical inference.
- Convey basic information about data using descriptive statistics and present this information using meaningful graphical techniques.
- Interpret and critically evaluate statistical results in different applied examples.
- Develop a basic understanding of the common pitfalls of data collection and sampling.
- Translate general research questions into testable hypotheses with dependent and independent variables.
- Critically examine numerical and graphical statistical arguments appearing in mass media.

Course Requirements

The course will meet twice a week. The requirements for the course are first and foremost regular class attendance, reading of the assigned materials, and completion of tests, labs, and quizzes.

Since the majority of our class sessions will be spent "doing statistics," you will need to **bring your laptop to every session**. We will be working with our online courseware and software all the time. If you do not have access to a laptop, let me know and we will facilitate one. If you lack proficiency with computers, please let me know as soon as possible and I will work with you.

Attendance is obligatory. Classes missed immediately before and after holidays are particularly noticed. I expect everyone to **arrive on time**. Late arrivals are disruptive and distracting. I appreciate your cooperation.

Please come to office hours or contact me by e-mail if you have questions or concerns. If you have any kind of problem with the course or with life, please **communicate** with me. Let me know if my office hours are not at a convenient time for you and we will set an appointment. Do not let missed classes and assignments get out of hand. I am willing to work with you to help you succeed, but I cannot do so retroactively at the end of the semester.

The following are some guidelines to help you get started:
- *Speak up!* Ask the second you have a question or a comment. It is very possible that others may have the same concerns you do.
- *Respect* one another.
- *No cellphones in class.*

Course Materials

We will use 1) an online courseware application from Carnegie Mellon University (CMU) as our **textbook,** and 2) the online software package called **StatCrunch.** Both are available via access cards purchased at the WLU Bookstore. Payment, registration, and login are required to access both materials.

Additional (free) materials:

[Statistics Glossary](#)

If you insist on a traditional textbook, then *Even You Can Learn Statistics and Analytics: An Easy to Understand Guide to Statistics and Analytics* (3rd ed.) (2014) is available through the Leyburn Library.

Course Evaluation

Checkpoints (quizzes)	15%
Labs	25%
Midterm exam	20%
Participation + presentation	10%
Final exam	30%

Grade Assessment

Re-grading: <mark>I do not discuss grades via email.</mark> Please take 24 hours to review the initial feedback. Then, bring to my office a written note explaining the error that you think I have made.

Grades reflect the following assessment of your work in this course:

A: Excellent performance (90-100). Exceptional grasp of the material and a deep analytic understanding of the subject.

B: Good performance (80-89). Mastering the material, understanding the subject well, and showing some originality of thought and/or considerable effort

C: Fair performance (70-79). Acceptable understanding of the material, but failing in translating this understanding into consistently creative or original work.

D: Poor performance (60-69). Some understanding of the material but exhibiting significant deficiency in comprehension and/or effort.

F: Fail (59 and below). Failing to complete assignments or to comprehend the basics of the material.

Minus grades at each increment are below 63, 73, 83, and 93, and plus grades above 67.9, 77.9, and 87.9. I do not round up .5 grades. In other words, 87.5 is not a B+ and 89.5 is not an A-.

If you have concerns about your grade in the course, please come talk to me as soon as possible about strategies to improve your performance.

Checkpoints

There will be weekly open-book online "Checkpoints" consisting of multiple-choice questions, via our online courseware. You will have two required attempts for each one, with the **score** of your **best attempt** being your graded score. The graded checkpoints have specific due dates. If you miss a deadline, you must request my approval to complete the checkpoint and will only receive 50% of the credit.

These quizzes are designed to encourage you to study the course material throughout the semester rather than waiting until the midterm or final exams.

Labs

There will be a set of graded online labs consisting of cases, problems, and questions to assess your statistical capabilities and comprehension of the assigned material. The labs will be equally weighed in determining your grade. There will also be additional ungraded practice activities for additional edification.

<mark>See the complete schedule of assignments and due dates on pages 6-7.</mark>

Exams

There will be a midterm exam and a final exam consisting of problems and questions to assess comprehension of the material.

You will have up to three hours to take the **midterm** exam on **Thursday, October 21st**. You can start anytime between 8:30 am and 8:00 pm. No books, notes, or sources may be used.

Extensions for the exam will only be offered in cases of emergencies and must be arranged at least **a week prior** to the exam date. There will be no exceptions to this policy.

The **final** exam will take place during finals week (December 11-17). It will be a self-timed and will be posted on Canvas.

Participation
Students are expected to read the assigned materials prior to each class and participate actively during class meetings. Participation performance is not based on the number of times you speak up during class but on the **quality** of your input. By no means, this should be understood as having to "be right" every time. Any comment or question that contributes to our analysis of course content is highly regarded. Questions are an excellent way to participate. They show your interest in the course and your ability for critical thought.

Each of you will be assigned one class throughout the term to find statistics used in a piece of popular press about a current event. You will prepare a brief **presentation** of the current event you chose and mention the statistics used in it. Addressing how an understanding of statistics made the information more valuable and allowed you to consider it critically will be **key components** of the small presentation. You may work in pairs for this assignment.

Honor Code
For all course work, the Honor System applies. The student's signature on their work confirms that the Honor System rules were respected. Familiarize yourself with the System at http://www.wlu.edu/executive-committee/the-honor-system/the-white-book - The_Honor_System

Disability Accommodations
Washington and Lee University makes reasonable academic accommodations for qualified students with disabilities. All accommodations must be approved through the Office of the Dean of the College. Students requesting accommodations for this course should present an official accommodation letter within the first two weeks of the term and schedule a meeting outside of class time to discuss accommodations. It is the student's responsibility to present this paperwork in a timely fashion and to follow up about accommodation arrangements.

Diversity Statement
Washington and Lee affirms that diverse perspectives and backgrounds enhance our community. We are committed to the recruitment, enrichment, and retention of students, faculty, and staff who embody many experiences, cultures, points of view, interests, and identities. As engaged citizens in a global and diverse society, we seek to advance a positive learning and working environment for all through open and substantive dialogue. Please read the Politics Department Statement on Diversity and Inclusion.

Policy on Prohibited Discrimination
The University prohibits and this policy addresses discrimination, including harassment, on the basis of race, color, religion, national or ethnic origin, age, disability, veteran's status, and genetic information in its educational programs and activities and with regard to employment. Additionally, the University prohibits retaliation against any individual who brings a good faith

complaint under this policy or is involved in the complaint process. Students, faculty, and staff found to have violated this policy will be disciplined appropriately, up to and including termination from employment or dismissal from the University.

Sexual Discrimination & Misconduct Policy

W&L prohibits all forms of sexual misconduct-which includes sexual harassment, non-consensual sexual intercourse, non-consensual sexual contact, sexual exploitation, domestic and dating violence, and stalking-and retaliation. This policy provides guidance to assist those who have experienced or been affected by sexual misconduct, whether as a complainant, a respondent, or a third party. It includes detailed information about what conduct is prohibited, confidential and reporting resources, and resolution procedures.

Course Schedule

<mark>Please note that I reserve the right to make changes to the course schedule, including assignments due dates and test dates, when unforeseen circumstances occur.</mark>

Sept. 9 to Oct. 19

Learning Strategies & Big Picture

Exploratory Data Analysis
 Examining Distributions (Descriptive Stats)
 Examining Relationships

Producing Data
 Sampling
 Designing Studies

Probability
 Introduction
 Random Variables
 Sampling Distributions

October 14: Reading Days – No Class

October 19: Midterm Review

October 21: Midterm Exam

Oct. 26 to Dec. 9

Inference
 Estimation
 Hypothesis Testing (also called Significance Testing)
 Inference for Relationships

Data Science – Introduction and Initial Applications

December 9: Final Review

List of Assignments and Due Dates – INTR202-01 F2021, Ponce de Leon

The assigned readings must be done **before** class.

Date	Assignments
Tuesday, Sept 14	Read M3 & M4 Examining Distributions (omit p.23) Start Practice Lab
Wednesday, Sept 15	Checkpoints 1 & 2 due before 10 pm
Thursday, Sept 16	Read M5 Examining Relationships
Friday, Sept 17	Checkpoints 3 & 4 due before 10 pm
Saturday, Sept 18	Practice Lab due before 10 pm
Tuesday, Sept 21	Start Lab 1
Thursday, Sept 23	Read U3 Producing Data
Friday, Sept 24	Checkpoints 5, 6 & 7 due before 10 pm
Saturday, Sept 25	Lab 1 due before 10 pm
Tuesday, Sept 28	Start Lab 2
Thursday, Sept 30	Read M8 & M9 Probability & Random Variables
Friday, Oct 1	Checkpoints 8 & 9 due before 10 pm
Saturday, Oct 2	Lab 2 due before 10 pm
Tuesday, Oct 5	Start Lab 3
Thursday, Oct 7	Read M10 Sampling Distributions
Friday, Oct 8	Checkpoints 10 & 11 due before 10 pm
Saturday, Oct 9	Lab 3 due before 10 pm
Tuesday, Oct 12	Checkpoints & Lab Feedback
Tuesday, Oct 19	Midterm Review
Thursday, Oct 21	**Midterm Exam (available from 8:30 am - 8 pm) – No Class**
Tuesday, Oct 26	Read M11 & 12 Inference & Estimation, Start Lab 4
Wednesday, Oct 27	Checkpoint 12 due before 10 pm
Thursday, Oct 28	Continue Lab 4, due before 10 pm
Tuesday, Nov 2	Read M13 Hypothesis Testing I (p.146-174)
Wednesday, Nov 3	Checkpoints 13, 14 & 15 due before 10 pm

Thursday, Nov 4	Start Lab 5, due Saturday before 10 pm
Tuesday, Nov 9	Read M13 Hypothesis Testing II (p.175-177), Start Lab 6
Wednesday, Nov 10	Checkpoints 16 & 17 due before 10 pm
Thursday, Nov 11	Continue Lab 6, due before 10 pm
Tuesday, Nov 16	Read M14 Inference for Relationships I (p.178-196)
Wednesday, Nov 17	Checkpoint 18 & 19 due before 10 pm
Thursday, Nov 18	Start Lab7
Saturday, Nov 20	Lab 7 due before 10 pm
Tuesday, Nov 30	Read M14 Inference for Relationships II (p.197-203), Start Lab 8
Wednesday, Dec 1	Checkpoint 20 due before 10 pm
Thursday, Dec 2	Conitnue Lab 8
Saturday, Dec 4	Lab 8 due before 10 pm
Tuesday, Dec 7	Intro to Data Science, Readings TBD
Thursday, Dec 9	Final Review

Checkpoints:
1 & 2: Examining Distributions Checkpoints 1 & 2
3 & 4: Examining Relationships Checkpoints 1 & 2
5, 6 & 7: Sampling 1, Designing Studies Checkpoints 1 & 2
8 & 9: Introduction to Probability Checkpoint & Random Variables Checkpoint
10 & 11: Sampling Distributions Checkpoints 1 & 2
12: Estimation Checkpoint
13, 14 & 15: Overview Checkpoint, Hypothesis Testing for a Population Proportion Checkpoint & Hypothesis Testing for a Population Mean Checkpoint
16 & 17: Hypothesis Testing Checkpoint & Type I and Type II Checkpoint
18 & 19: Two Independent Samples Checkpoint & Matched Pairs Checkpoint
20: ANOVA Checkpoint