 ST.110.06. Introduction to Statistical Methods and Data Analysis

**Fall 2022**

**T/TR 4:30 pm – 5:45 pm,**

**Knott Hall, Room 009**

**INSTRUCTOR:** Mr. Anthony J. Calise; Knott 009; acalise@loyola.edu.

**OFFICE HOURS:** T/TR Knott Hall, Room 108 & Virtual Meets by Appointment Only

**MEETING HOURS:** ST110.06 T/TR from 4:30 to 5:45 pm

**TEXT:** The Basic Practice of Statistics, W. H. Freeman; Eighth edition (December 22, 2017)

by David S. Moore and William I. Notz. (This can be the softback/custom-made text OR the hardback version.)

**MATERIAL TO BE COVERED:**

 Chapter Sections Topics

 1 Sections 1.1-1.4 Picturing Distributions

 2 Sections 2.1-2.9 Describing Distributions with Numbers

 3 Sections 3.1-3.8 The Normal Distributions

 4 Sections 4.1-4.6 Scatterplots and Correlation

 5 Sections 5.1-5.4, 5.7 Regression

**GRADING:**

|  |  |
| --- | --- |
|  Two Exams Comprehensive Final Exam |  35% (20% for higher score)  35% |
|  Homework/Quizzes  |  20% |
|  Project |  10% |
|  Total: |  100% |

**GRADE CUTOFFS:** A 93.33% 466

A- 90.00% 450

B+ 86.66% 433

B 83.33% 416

B- 80.00% 400

C+ 76.66% 383

C 70.00% 350

D+ 66.66% 333

D 60.00% 300

F < 60.00% < 300

**NOTE ON DISABILITIES:**

If you have a faculty letter from Disability Support Services (DSS) indicating that you have a disability which requires academic accommodations, please present the letter to me during my office hours as soon as possible. At that time, we can speak about the accommodations you might need in this class. If you need academic accommodations due to a disability and have not registered with DSS, please contact the Disability Support Services Office at 410-617-2062.

**HONOR CODE STATEMENT:**

The Honor Code states that all students of the Loyola Community have been equally entrusted by their peers to conduct themselves honestly on all academic assignments. The students of this College understand that having collective and individual responsibility for the ethical welfare of their peers exemplifies a commitment to the community. Students who submit materials that are the product of their own minds demonstrate a respect for themselves and the community in which they study. All outside resources or information should be clearly acknowledged. If there is any doubt or question regarding the use and documentation of outside sources for academic assignment, your instructor should be consulted. Any violation of the Honor Code will be handled by the Honor Council.

**CLASS POLICIES:**

**THE GENERAL SECTION OF CLASS POLICIES**

**Attendance:**

* Your class attendance is ***mandatory***. It is important for you to attend all classes and to be on time. If you are not in class or arrive late or leave early without permission from the instructor, then you are considered absent regardless of any reason. A letter/email or written evidence (e.g. doctor’s notes, Greyhounds coach’s memos, etc.) to certify your legitimate excuse may be required for the permission.
* Your class attendance will be checked at the end of every lecture.
* If you are considered absent for ***five*** or more classes, you will receive a final course grade of ***F***.
* If any fake or false attendance is detected, this case will be considered an honor code violation.

**Cell Phones/Texting:**

Please turn off or mute your devices! **No cell phone** usage or texting is allowed during the class period. If you have an emergency call, feel free to leave the class to do so.

***Note.*** If you miss a homework assignment, a quiz, the data analysis project, or an exam without any legitimate excuses, then you will receive a grade of ***zero*** for that one. In these cases, you should discuss the situations as soon as possible with the instructor. An official letter/document or written evidence to certify your excuse may be required.

**THE HOMEWORK SECTION OF CLASS POLICIES**

**Homework Assignments:**

* Homework sets are assigned on a regularbasis, with due dates stated in class and on the assignments.
* Problem sets and numbers will be announced in class and posted on my website. It is your responsibility to visit the website if you ever miss a class.
* Your solution and answer to each problem must include the followings:
	1. A neat and organized statement of the given information and required answer.
	2. A clear and complete solution to each problem, showing all relevant numerical steps and calculations. Do ***not*** use Excel, Minitab, and mathematical programs/apps, except ***TI-84 Plus*** or similar graphing calculators, unless a particular direction for computing tools is given.
	3. A clearly indicated final answer (e.g., underlined, boxed, or circled).

Failure to follow these criteria may result in loss of credit, regardless of the correctness of your solution and answer.

* Your homework document must meet the ***format guidelines*** below:
1. Use letter-size (8½ × 11) clear or lined papers.

***Note.*** Any ragged papers torn from notebooks are ***not*** acceptable.

1. Both handwriting and digital typing are acceptable.
2. Write your full name and the HW number on the top left corner of the first page.
3. Save (or scan if necessary) your document as a single ***pdf*** file.

***Note.*** Use a scanning app (e.g. OneDrive, Google Drive, Adobe Scan, Genius Scan, Office Lens, Clear Scan, CamScanner, etc.) to take pictures of your handwritten papers with your phone or tablet if you do not have a scanner. Most of these apps allow you to take a photo and export it as a pdf file, either to a cloud drive, or as an email attachment.

If you cannot get any of the scanner apps to work, you may take pictures directly with your phone or tablet. Please try to take clear pictures (good lighting, no shaking the camera, etc.) and crop the photos to include only the paper. Then, use *https://imagetopdf.com* to convert your images into a pdf file.

* Homework must be handed in during class on the due date stated.
* Late homework assignments will have a 10% deduction for each day late. (You must upload and email the assignment if you submit it late)

**THE EXAM SECTION OF CLASS POLICIES**

Consult the course schedule. Further information will be announced later.

**LEARNING AIMS FOR THE COURSE:**

(See “Undergraduate Educational Aims of the University” link in [*http://www.loyola.edu/admission/undergraduate/academics/learning-aims*)](http://www.loyola.edu/admission/undergraduate/academics/learning-aims%29)

**Intellectual Excellence**

Appreciation of and passion for intellectual endeavor and the life of the mind.

Appreciation of and grounding in the liberal arts and sciences.

Excellence in a discipline, including understanding of the relationship between ones discipline and other

disciplines;

understanding the interconnectedness of all knowledge.

Habits of intellectual curiosity, honesty, humility, and persistence.

**Critical Understanding: Thinking, Reading, and Analyzing**

The ability to evaluate a claim based on documentation, plausibility, and logical coherence.

The ability to analyze and solve problems using appropriate tools.

The ability to make sound judgements in complex and changing environments.

The ability to use mathematical concepts and procedures competently, and to evaluate claims made in numeric

terms.

The ability to use information technology in research and problem solving, with an appreciation of its

advantage and limitations.

**Scientific and Mathematical Methods**

Students understand the process of science - its methodology, how questions are framed, how data are

acquired, how arguments are constructed and conclusions reached.

Students learn to reason mathematically, and to think critically and analytically through statistical or mathematical methods

THINGS YOU WILL LEARN IN ST110: Intro to Statistics and Data Analysis Topics

A. Intro to Stat

1 Example of a distribution a graph and a median.

2 Terms on the syllabus

B. Graphing Data

1 Freq distributions

2 Barcharts and histograms

3 Shape and outliers of distributions

4 Proportions

5 Features of graphs

6 Determining class endpoints (The Method)

7 Stem and leaf (simple, split stem, comparative)

C. Boxplots

1 Quartiles

2 Skeletal

3 Modified with outliers

4 Shapes

D. Center

1 Median

2 Mean (pop and sample)

3 Mode

4 How shapes and outliers impact the relative

 size of the mean and median

5 Combining scores to find a new mean

6 Sample proportion

E. Spread

1 Range

2 IQR

3 Variance (pop and sample)

4 Standard Deviation (SD) (pop and sample)

5 using dotplots to explore SDs

F. Early Regression

1 Slope and Intercept

2 Delta Y over delta x = rate of change

3 Increasing relationship / decreasing relationship

4 Perfect or mathematical relationship / statistical

 relationship

5 Straight line relationship / curved relationship

6 Weak relationship / moderate relationship /

 strong relationship

7 Scatterplot

8 Y-hat = a + bx = predicted Y

9 Error = real Y - predicted Y

10 Errors seen on the scatterplot

11 SSE

12 The a and b for the “best fit” = least squares fit

13 Interpret the slope and the intercept

15 Interpret the x-intercept

16 Specify a Y-hat and find the x via math

17 Specify a Y-hat and find the x via a graphical

 Method

G. Advanced Regression

1 R-Square

2 extrapolation

3 correlation

H. Empirical Rules and the Bell Curve

1 Three empirical rules

2 Segmenting a distribution via the two rules

3 Percentiles

4 Z-scores and raw scores (formula and

 interpretation)

5 Z-tables (how to interpret and use)

6 Specify a raw score and find a proportion / area

 under the curve

7 Specify a proportion / area under the curve and

 find a raw score

I. Chi-Square Analysis

1 Independent variable and dependent variable

2 Cross tab table (Observed table)

3 Column Percent Table (does it suggest a

 relationship?)

4 Observed frequencies and expected frequencies

5 Expected frequencies table

6 Table of (O - E)\*\*2 / E

7 Chi-square value = sum of previous table

 (does it suggest a relationship?)

8 P-value and decision and interpretation

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