ST.210.05. Introduction to Statistics

**Spring 2023**

**M/W 4:30 pm – 5:45 pm,**

**Knott Hall, Room 009**

**Instructor:** Anthony J, Calise

Office: Virtual Office Hours Phone: (410) 307-9595

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| **Class Time:** | M/W | 4:30 pm – 5:45 am (*In-Person*) |
| **Office Hours:** | M/W | 3:30 pm – 4:30 pm |
|  | Virtual Meets | by appointment only |

**Prerequisites:** MA109 or a score of 48 or better on Part II of the Math Placement Test or a score of 65 or higher on ALEKS or one year of high school calculus.

**Course Description:** A non-calculus-based course covering descriptive statistics; regression model fitting; probability; normal, binomial, and sampling distributions; estimation; & hypothesis testing.

***Note 1.*** Degree credit will not be given for more than one of EG381 or ST210 or ST265 or ST381.

***Note 2.*** Closed to students who have taken EC220 or EG381 or PY292 or ST265 or ST381.

***Note 3.* Business/Economics Students:** ST210 does not fulfill the requirement for EC220. Candidates for the BBA and the BA in Economics will be allowed to substitute ST210 for EC220 ***if and only if*** the student also completes MA252 or EC420.

**Textbook:** Peck, R., & Devore, J. L. (2012), ***Statistics – The Exploration & Analysis of Data*** (7th ed.), Brooks/Cole: Cengage Learning (ISBN-13: 9780840058010).

**Topics:** Selected from

Ch.1. 1–4. Role of Statistics & Data Analysis Process Ch.2. 1–3. Collecting Data Sensibly

Ch.3. 1–5. Graphical Methods for Describing Data Ch.4. 1–5. Numerical Methods for Describing Data Ch.5. 1–3. Summarizing Bivariate Data

Ch.6. 1–2. Basic Probability Appendix A. Binomial Distribution Ch.7. 1–4. Population Distributions Ch.8. 1–3. Sampling Distributions

Ch.9. 1–4. Interval Estimation: Single Sample Ch.10. 1–6. Hypothesis Testing: Single Sample Ch.11. 1–4. Two Sample Inference

***Note.*** You are responsible for the material covered in class. Some material in the book may be omitted and extra material may be included. Thus, it is very important that you attend class. After each class it is essential that you review the material covered before the next class and work on the assigned problems that relate to the material already covered. This will help you follow what is being done in class and help you to avoid having too much homework to complete the night before the homework is due.

**Online Lectures: [*Emergency Only*]** If in-person lectures cannot be delivered due to emergency situations (e.g., a new wave of COVID-19, inclement weather, etc.), alternative online lectures will be scheduled. The online lectures will be ***synchronous*** via Zoom, and the access links and further information will be placed on Moodle.

**Calculator: *TI-84 Plus*** or similar graphing calculators

Storing text or formulae on a calculator or other device for use during a test is an honor code violation.

**Statistical Software: *Minitab 19***

You can remotely access Minitab 19 through ***Loyola Workspace*** on your PC or Mac. If you experience technical problems, please contact the ***Student Technology Center*** (walk- in: Knott Hall 003, phone: 410-617-5555, email: ots@loyola.edu).

# Grading:

|  |  |
| --- | --- |
| Two ExamsComprehensive Final Exam | 35% (20% for higher score) 35% |
| Homework/Quizzes | 15% |
| Project | 15% |
| Total: |  100% |
|  |  |

**Final Grade Determination:**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *A* | *A*— | *B*+ | *B* | *B*— | *C*+ | *C* | *C*— | *D*+ | *D* | *F* |
| [92,100] | [90,92) | [87,90) | [83,87) | [80,83) | [77,80) | [73,77) | [70,73) | [67,70) | [60,67) | [0,60) |

**Catalog Description of Grades:**

A: ***Excellent***. Denotes outstanding achievement that is truly distinctive. The grade of A is earned by that student whose performance is highly accomplished-that is, who, grounded in the discipline, consistently shows superior mastery of course concepts and skills, offers leadership in class discussion and activities, and reliably takes the initiative in seeking knowledge beyond the formal confines of the course.

B: ***Good***. Denotes achievement well above acceptable standards and is a mark of distinction. The grade of B is earned by a student who surpasses the standard performance with work that, in its rigor, originality, and creativity, is evidence of a firm command of course material within the framework of the discipline and of active engagement in learning in and out of class.

C: ***Satisfactory***. Denotes an acceptable level of achievement in the course and is the standard for graduation from the University. The grade of C is earned by a student who successfully completes the requirements for the course laid out in the syllabus. The C student learns the course material, understands the nature of the discipline, develops requisite abilities and skills, and improves facility of expression through productive engagement in class and sufficient study outside of class.

C-: ***Unsatisfactory***. Denotes academic performance below the standards for the course. The grade of C- earns academic credit but with a QPA value of 1.67.

D: ***Inadequate***. Denotes work of inferior quality that barely meets the objectives for the course. The grade of D is the lowest passing grade and a mark of inadequate performance.

F: ***Failure***. Denotes work below minimal standards of competence required to pass the course. A failing grade earns no academic credit and a QPA value of 0.000; the course does not satisfy prerequisite or degree requirements.

# 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)

# Quizzes and Exams:

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

# Project:

* You will be submitting one project in this course which will be a culmination of many topics we discuss. Details will be discussed in class and posted on my website. The same lateness policy for homework applies for the project as well. (10% deduction each day late)

***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.

# 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, 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 of missing a graded assignment.
* 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.

# Students with Disabilities:

To request academic accommodations due to a disability, please contact Disability Support Services (DSS), Newman Towers West 107, at DSS@loyola.edu or call (410) 617-2750/2062. If you already registered with DSS and requested an accommodations letter (and DSS has sent the letter to Prof. Lee via email), please schedule a brief meeting with Prof. Lee to discuss the accommodations you might need in this class.

# Honor Code:

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 and tests. Loyola students have a collective and individual responsibility for the ethical welfare of their academic community. All outside resources or information used should be clearly acknowledged. If there is any doubt or question regarding the use and documentation of outside sources for academic assignments, your instructor should be consulted. Please refer to the Honor Code for more information and further clarification of the standards, types of violations, adjudication process, and sanctions that may be imposed for violations.

***Note.*** The academic ***penalties*** for an honor code violation must be:

1. Final course grade *F* imposed by the instructor &
2. Additional sanctions decided by the Honor Council.

# 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.

# OBJECTIVES:

The main goal in an introductory statistics course is to teach students “statistical thinking.” To provide a vehicle to develop this statistical thinking, various statistical topics will be covered. By the end of the semester, students should be able to

1. Use appropriate graphical and numerical descriptive techniques to summarize a sample of data.
2. Develop and check models for bivariate numerical data.
3. Apply basic probability rules.
4. Identify the binomial distribution and calculate probabilities.
5. Calculate probabilities for the normal distribution.
6. Understand and apply the ideas of sampling variability and sampling distributions. Be able to state and apply the Central Limit Theorem.
7. Compute and interpret appropriate confidence intervals for means and proportions in one or two samples.
8. Apply the correct hypothesis test for means and proportions in one or two samples.
9. Acquire hands-on experience analyzing data using computer technology.

Guidelines for Assessment and Instruction in Statistics Education (GAISE) for Undergraduates:

1. Emphasize statistical literacy and develop statistical thinking.
2. Use real data.
3. Stress conceptual understanding rather than mere knowledge of procedures.
4. Foster active learning in the classroom.
5. Use technology for developing concepts and analyzing data.
6. Use assessments to improve and evaluate student learning.

**The learning aims for ST210 as they relate to Loyola University’s learning aims:** (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 one’s discipline and other disciplines; understanding the interconnected ness 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.

# Core Learning Aims for courses in Natural and Mathematical Sciences:

* 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.

# ST.210.01: Tentative Course Schedule (Updated on Thursday, 8/26/21)

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| --- | --- | --- | --- |
| **Week** | **Date** | **Topics** | **Notes** |
| 1 | 01/16 |  ***College Closed for MLK Day*** |  |
| 01/18 | Orientation & Ch.1 Statistics & Data Analysis |  |
|  |  |  |
| 2 | 01/23 | Sec.2.1–2. Statistical Studies & Sampling Methods |  |
| 01/25 | Sec.3.3. Histograms & Data Distributions |  |
|  |  |  |
| 3 | 01/30 | Sec.4.1. Central Tendency |  |
| 02/01 | Sec.4.2. Variability ***Quiz #1*** |  |
|  |  |  |
| 4 | 02/06 | Sec.4.3. Boxplots & Data Distributions |  |
| 02/08 | Sec.4.4. Empirical Rule & z-Scores |  |
|  |  |  |
| 5 | 02/13 | Sec.6.1–2. Probability Theory |  |
| 02/15 | ***Review & Quiz #2*** |  |
|  |  |  |
| 6 | 02/20 | Review |  |
| 02/22 | ***Exam I*** |  |
|  |  |  |
| 7 | 02/27 | Appx.A. Binomial Distribution |  |
| 03/01 | Sec.7.1–3. Normal Distribution: Bell-Shaped Curves |  |
|  | ***SPRING BREAK*** |  |
| 8 | 03/13 | Sec.7.3. Normal Distribution: Standard Normal |  |
| 03/15 | ***Review & Quiz #3*** |  |
|  |  |  |
| 9 | 03/20 | Sec.8.1. Sampling Distributions |  |
| 03/22 | Sec.9.1–3. Point Estimation & Interval Estimation |  |
|  |  |  |
| 10 | 03/27 | Sec.5.1. Covariance & Correlation |  |
| 03/29 | ***Quiz #4 &*** Sec.5.2–3. Linear Regression |  |
|  |  |  |
| 11 | 04/03 | Review |  |
| 04/05 | ***Exam II*** |  |
|  | ***EASTER BREAK*** |  |
| 12 | 04/10 | College Closed |  |
| 04/12 | Introduction to Hypothesis Testing |  |
|  |  |  |
| 13 | 04/17 | Sec.10.4–5. Hypothesis Tests: One-Sample *t*-Test |  |
| 04/19 | Sec.11.1. Hypothesis Tests: Two-Sample *t*-Test |  |
|  |  |  |
| 14 | 04/24 | ***Project Due & Quiz #5 & Review*** |  |
| 04/26 | Review for Final Exam |  |
| 05/01 | Review for Final Exam |  |
| ***Final Exam: Wednesday, May 3rd (1:00 pm through 3:00pm)*** |