LAGUARDIA COMMUNITY COLLEGE

CITY UNIVERSITY OF NEW YORK

DEPARTMENT OF MATHEMATICS, ENGINEERING, AND COMPUTER SCIENCE

MAT 12O – ELEMENTARY STATISTICS I

3 Lecture Hours, 1 Lab Hour, 3 Credits

Pre -Requisite: MAT 096 or Waiver

Catalog Description:

This course presents the fundamental concepts and computational techniques of elementary statistics. Topics studied include statistical graphs, measures of central tendency, standard deviation, percentiles, probability, binomial and normal distributions, confidence intervals, hypothesis testing, and linear correlation/regression. Students will use a statistical software package to obtain basic sample statistics and graphs for data analysis; a calculator may be used for routine computations.

Purposes and Goals:

Upon the completion of this course, students should be able to:

1. Perform basic statistical analyses of real-life data sets. They should be able to use standard statistical software on these data.
2. Transfer to four-year colleges and universities and pursue upper division courses and academic programs.
3. Review statistical analyses that involve the statistical procedures and methods presented in this course.
4. Communicate statistical ideas and analyses to audiences who may have little or no knowledge of statistics.

Instructional Objectives:

The instructor is expected to:

1. Explain the meaning of statistics to students and introduce them to basic procedures for selecting sample data.
2. Familiarize students with how data sets can be constructed and summarized through the use of tables, graphical displays and descriptive measures (Inquiry and Problem Solving).
3. Introduce the basic concepts of probability and the rules that apply in calculating the probability of both simple and compound events.
4. Introduce the binomial, normal, and Student's t distributions and explain how they can be applied to estimate population parameters; in particular introduce students to the concept of statistical test via the sampling distribution of the mean and the Central Limit Theorem.
5. Enable students to use a statistical computer software package (such as R) to organize, analyze and summarize data sets in applied settings (Written Communication Ability).
6. Introduce the concepts of linear correlation and regression and explain how to use them to study bivariate data. (Inquiry and problem solving).
7. Enable students to complete data analysis projects using statistical methods and a software package such as R (Inquiry and Problem Solving/Written Communication Ability).

Performance Objectives:

As a result of successful completion of this course, students should be able to:

1. Compare and contrast descriptive versus inferential statistics; distinguish between populations and samples in the latter case, compare different sampling methods and describe possible sample biases.
2. Construct and interpret frequency distributions and other graphs using data sets, classify (random) variables as either qualitative or quantitative, discrete or continuous; also compute descriptive measures of univariate data for both samples and populations (Inquiry and Problem Solving).
3. Apply the basic computational rules of probability.
4. Determine the sampling distribution of the mean for a normally distributed variable for both small and large sample cases; state and apply the Central Limit Theorem and use these (smooth) distributions to conduct hypothesis test for estimating population mean.
5. Use a statistical software package to construct and analyze data sets and their descriptive measures; furthermore, simulate probabilistic experiments, simulate the sampling distribution of the mean, obtain a one-sample t-confidence interval and perform a one-sample t-test on a population parameter (Written Communication Ability).

6. Use a statistical software package to obtain the linear regression equation (use it to make predictions) and the correlation coefficient (measuring "strength" of correlation) for bivariate data (Inquiry and problem solving).
7. Use statistical methods and software package such as R to analyze and interpret data related to real world problem (Inquiry and Problem Solving/Written Communication Ability).

Course Materials:

Online access is required for tutorials, homework and quizzes. The online learning platform MyOpenMath will be used for all the coursework including tests and homework. MyOpenMath is free to all the students, however one must create and account and register into the specific course using a **course id** and an **enrollment key** provided by the instructor.

MyOpenMath Learning website: https://myopenmath.com

Textbook: *Introductory Statistics*

Barbara Illowsky, Susan Dean, Introductory Statistics. OpenStax CNX. Sep 28, 2016 https://openstax.org/details/introductory-statistics?Book%20details

Technical Requirements:

Access to a computer with text-editing, spreadsheet capabilities, and an internet connection.

Access to a software package with Statistical functions and features, e.g., R (available on Campus and can also be downloaded for free on home computers).

Access to a scientific calculator for in-class work, quizzes, exams, and homework.

Course Organization:

The course content is administered using MyOpenMath management platform and is divided into weekly units aligned with the textbook chapters (see course outline below for topics and textbook references).

- Each weekly unit contains Homework problems and tutorial videos.
- The R handbook, located in the Weekly Computer Lab folder, guides students to learn R through examples from textbooks.
- Weekly Computer Labs folder also contains lab lessons in R and application problems for practice.
- Quizzes (online or on paper), Data Analyses Labs (at least 5) and Projects (at least 3 mini or one long) will be assigned by the instructor.

- One Project, designed to assess Inquiry and Problem Solving Core Competency, is to be deposited in the Assessment Area of ePortfolio.

Exams:

- The course will have 3 Instructor Tests and one Cumulative Departmental Final Exam. Final Review Problem Set is provided with the online course materials.
- MEC Department Testing Policy: For all courses regardless of modality, the Final Exam will be administered on paper in a classroom on the LaGuardia Community College campus.

Course Grading:

HW Assignments, Quizzes	10%
Data Analyses Projects	10%
Data Analyses Labs	5%
3 Instructor Exams	45%
Departmental Final	30%

Course Outline: (Topic/ Textbook Reading/Weekly Lab Activity)

Lesson	Topics/Textbook chapters/Labs	Suggested Homework on MyOpenMath
Lesson 1 – 4 Week 1	Sampling Methods: Ch 1.1 – 1.2 (Definition of statistics, Probability, and Key terms, Data, Sampling, and Variation in Data and Sampling) • Weekly Computer Labs: intro to software, Random Samples	1. Homework 1 2. Critical Thinking Homework week 1 3. Weekly Computer Labs: Application Week 1
Lesson 5 – 8 Week 2	Organizing Data: Ch 1.3 – 1.4 and Ch 2.1-2.3 (Frequency Tables, Experimental Design and Ethics, Descriptive Statistics, Stem-and-Leaf plot, Bar graph, Histograms, Measure of Location) • Weekly Computer Labs: Plots and Charts, Textbook pp. 40-44	1. Homework 2 2. Critical Thinking Homework week 2 3. Weekly Computer Labs: Application Week 2
Lesson 9 – 12 Week 3	Summary Statistics: Ch 2.4 – 2.7 (Box Plots, Measure of Center, Skewness and Mean, Median, and Mode, Measure of Spread) • Weekly Computer Labs: Descriptive Statistics, Textbook pp. 121-122	1. Homework 3 2. Critical Thinking Homework week 3 3. Weekly Computer Labs: Application Week 3
Lesson 13 – 16 Week 4	Linear Correlation and Regression Ch 12.1 – 12.5 (Linear Equations, Scatter Plots, The Regression Equation, Testing Significance of Correlation Coefficient, Prediction) • Weekly Computer Labs: Correlation, Textbook pp. 705-710	1. Homework 4 2. Critical Thinking Homework week 4 3. Weekly Computer Labs: Application Week 4
Lesson 17 – 20 Week 5	Probability Topics Ch 3.1 – 3.4 (Terminology, Independent and Mutually Exclusive Events, Two	1. Homework 5

	Basic Rules of Probability, Contingency Tables) • Weekly Computer Labs: Two-way tables, Textbook pp. 210-212	
Lesson 21 – 24 Week 6	Discrete Probability Distributions and the Binomial Distribution: Ch 4.1 – 4.3 (Probability Distribution Function for a Discrete Random Variable, Expected value and Standard Deviation, Binomial Distribution) • Weekly Computer Labs: Binomial Probabilities, Textbook pp. 272-277	1. Homework 6 2. Weekly Computer Labs: Application Week 6 – Part 1 3. Weekly Computer Labs: Application Week 6 – Part 2
Lesson 25 – 28 Week 7	Continuous Probability Distributions and the Normal Distribution: Ch 5.1 - 5.2 and 6.1-6.2 (Continuous Probability Functions, Uniform Distribution, Standard Normal Distribution, Using the Normal Distribution) • Weekly Computer Labs: Normal Distribution, Textbook pp. 380-383	1. Homework 7 2. Critical Thinking Homework week 7 3. Weekly Computer Labs: Application Week 7
Lesson 29 – 32 Week 8	The Central Limit Theorem: Ch 7.1 and Ch 7.3 (The Central Limit Theorem for Sample Means, Using the Central Limit Theorem) • Lab: Textbook pp. 418-424	1. Homework 8 2. Critical Thinking Homework week 8 3. Weekly Computer Labs: Application Week 8
Lesson 33 – 36 Week 9	Confidence intervals for the Mean: Ch 8.1 – 8.2 (A Single Population Mean Using the Normal Distribution, A Single Population Mean Using the Student t Distribution) • Weekly Computer Labs: Confidence Intervals, Textbook pp. 468-473	1. Homework 9 2. Weekly Computer Labs: Application Week 9

Lesson 37 – 40 Week 10	Hypothesis testing (Part 1): Ch 9.1 – 9.5 (Null and Alternative Hypotheses, Type I and Type II errors, Distribution Needed for Hypothesis Testing, Rare Events, Decision and Conclusion, Full Hypothesis Test Examples) • Weekly Computer Labs: Hypothesis Testing, Textbook pp. 531-533	1. Homework 10 2. Weekly Computer Labs: Application Week 10
Lesson 41 – 44 Week 11	Hypothesis testing (Part 2)	1. Homework 11 2. Weekly Computer Labs: Application Week 10 (Continue)
Lesson 45 – 48 Week 12	Final Review	Departmental Final Exam Review

Instructor Exams should be scheduled near week 3, week 6 and week 9. The specific timeframe (order of topics, scheduling of assignments) is subject to adjustments by the course instructor.

Note on Data Analysis Labs and Projects:

One designated hour each week is to be spent in computer lab mastering data analyses software, such as R. The instructor will assign and evaluate at least 5 lab activities and at least 3 mini-projects (or one course-long master project.) Students should prepare a project report for each project assigned. The report must include the method(s) used for the data analysis and the interpretations of the numerical results.
Sample Lab activities/mini projects are included at the end of each chapter in the textbook. A sample master project is available on the MEC Department Website.

Note on Inquiry and Problem Solving Core Competency Assessment:

In this course students are required to complete and deposit on ePortfolio an assignment designed to assess Inquiry and Problem Solving Core Competency. Instructions for depositing and sample assignments are available on MyOpenMath course page as well as on the MEC Department website.

Attendance/Lateness Policy:

Students are expected to attend all class meetings. Students are responsible for all information, material, and assignments covered in class regardless of class attendance. As per college policy, students who have more than 8 hours of unexcused absences don't meet the attendance requirement for passing the course. Students who miss more than 50% of the class period might be marked absent. Students who miss more than 15 minutes of the class period, might be marked late. Three lateness marks count as one unexcused absence. Students should consult the college catalog to find out the terms and conditions under which a WU, and incomplete, or an F grade may be given by an instructor.