

MIDDLESEX COUNTY COLLEGE  
EDISON, NJ  
MASTER SYLLABUS

**Course ID and Name:** MAT 123, Statistics I

**Department:** Mathematics

**Prerequisites:** Mat-013 or appropriate score on the College placement test

**Co-requisites:** Mat-090

**Co-requisite Exemption:** Proficiency at the Level of Algebra II

**Course Description:** Familiarizes students with mathematical models that occur in more advanced courses and in the areas of business, science and the social sciences using exploratory data analysis and statistical methods. Topics include descriptive statistics linear regression, probability and probability distribution, confidence intervals, and an introduction to hypothesis testing.

**General Education Status:** GE MST

**Credits:** 3

**Lecture Hours:** 3

**Lab Hours:** 0

**Textbook(s) and Other Course Materials:**

Book:

Authors: Barbara Illowsky and Susan Dean

Title: Introductory Statistics

Publisher: OpenStax

Link: <https://openstax.org/details/books/introductory-statistics>

Software: MyOpenMath

Calculator: : TI-83/84 calculator required

**Core Learning Outcomes:**

Upon successful completion of the course, students will be able to:

1. Use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.
  - a. Translate quantifiable problems into mathematical terms and solve these problems using mathematical or statistical operations.
  - b. Construct graphs and charts, interpret them, and draw appropriate conclusions.
2. Communicate accurate mathematical terminology and notation to explain strategies to solve problems and interpret solutions.
3. Use technology correctly to solve mathematical problems.
4. Utilize various reasoning, problem-solving, and critical thinking techniques to solve applications among the laws of probability, the normal curve, and confidence interval inferences.
5. Apply the language and concepts of statistics as well as the formal mathematical definitions that accompany them.

Content Strand	Students will be able to...
<b>1. Apply Basic Terminology of Statistics (CLO 1, 2, 5)</b>	<ol style="list-style-type: none"><li>a) Distinguish populations and samples</li><li>b) Distinguish parameters and statistics</li><li>c) Classify data into categories of categorical, quantitative, discrete, continuous</li><li>d) Differentiate data by levels of measurement</li><li>e) Distinguish different types of sampling</li></ol>

<p><b>2. Compute Measures of Descriptive Statistics</b> (CLO 1, 2, 3, 5)</p>	<ul style="list-style-type: none"> <li>a) Construct frequency, relative frequency tables, and cumulative relative frequency tables manually and with software</li> <li>b) Distinguish explanatory, response, and treatments variables</li> <li>c) Discuss lurking variables, placebo, and control groups</li> <li>d) Construct Stem &amp; Leaf displays manually</li> <li>e) Use software to create data displays (bar charts, histograms, ogive, boxplot) for categorical and quantitative data)</li> <li>f) Interpret data displays and look for patterns</li> <li>g) Use software to calculate and interpret measures of center, dispersion, and relative standing</li> <li>h) Use IQR to identify outliers</li> <li>i) Apply algorithm to find percentiles</li> <li>j) Apply the Empirical Rule and Chebyshev's Inequality to data</li> <li>k) Use ogive to estimate percentiles</li> <li>l) Distinguish notations for population and sample statistics</li> <li>m) Discuss symmetry and skewness in data</li> <li>n) Calculate and interpret z-scores</li> </ul>
<p><b>3. Analyze Bivariate Data Through Linear Correlation and Regression Analysis</b> (CLO 1, 2, 3, 5)</p>	<ul style="list-style-type: none"> <li>a) Graph and interpret linear equations</li> <li>b) Construct scatter plots</li> <li>c) Discuss the meaning of the correlation coefficient</li> <li>d) Use software to calculate regression statistics <i>Lab 3</i></li> <li>e) Interpret the meaning of the regression slope and intercept in the context of applied problems</li> <li>f) Assess the suitability of a linear relationship for paired data using regression analysis, and use regression equation for interpolation, if appropriate</li> </ul>
<p><b>4. Apply Basic Rules of Probability</b> (CLO 1, 2, 3, 4, 5)</p>	<ul style="list-style-type: none"> <li>a) Use software to demonstrate the Law of Large Numbers</li> <li>b) Discuss terminology and axioms of probability</li> <li>c) Apply axioms of probability and the logical connectives AND, and OR to solve probability problems</li> <li>d) Distinguish between mutually exclusive and independent events</li> <li>e) Solve problems involving conditional probability</li> <li>f) Implement use of the complement to solve probability problems</li> <li>g) Construct two-way tables for multivariate data</li> <li>h) Use contingency tables to find conditional and marginal probabilities</li> </ul> <p>Create tree and Venn diagrams to represent a sample space and aid to find probabilities</p>
<p><b>5. Solve Problems Involving Probability Distributions for Discrete Random Variables</b> (CLO 1, 2, 3, 4, 5)</p>	<ul style="list-style-type: none"> <li>a) Identify the characteristics of a discrete pdf</li> <li>b) Distinguish between discrete and continuous random variables</li> <li>c) Calculate the expected value (mean), variance and standard deviation for discrete random variables and make decisions based on the results</li> <li>d) Identify the characteristics of binomial experiment</li> <li>e) Use the Binomial distribution to solve probability problems</li> <li>f) Use software to construct a bar chart for the probabilities of a Binomial random variable</li> </ul>
<p><b>6. Solve Problems Involving Probability Distributions for Continuous Random Variables</b> (CLO 1, 2, 3, 4, 5)</p>	<ul style="list-style-type: none"> <li>a) Identify properties of continuous probability distributions</li> <li>b) Discuss characteristics of a uniformly distributed random variable</li> <li>c) Solve applications involving the uniform distribution</li> <li>d) Identify properties of the Normal Distribution</li> <li>e) Define and interpret z-scores</li> <li>f) Apply the Empirical Rule</li> </ul>

	<ul style="list-style-type: none"> <li>g) Use technology to solve applied problems using the Normal Distribution</li> <li>h) Use technology to assess normality using normal probability plots, box plot, histogram</li> </ul>
<b>7. Solve Problems Involving Sampling Distributions (CLO 1, 2, 3, 4, 5)</b>	<ul style="list-style-type: none"> <li>a) Describe a sampling distribution for the mean</li> <li>b) Discuss the Central Limit Theorem</li> <li>c) Use software to construct a simulation for a sampling distribution for a sample mean</li> <li>d) Apply the Central Limit Theorem to solve problems</li> </ul>
<b>8. Formulate Conclusions Through Inference Using Confidence Intervals (CLO 1, 2, 3, 4, 5)</b>	<ul style="list-style-type: none"> <li>a) Recognize point estimates for population parameters</li> <li>b) Describe what a confidence interval is for a population parameter</li> <li>c) Calculate and interpret confidence interval estimates for mean</li> <li>d) Discuss width of CI and confidence level</li> <li>e) Calculate sample size needed for CI with a particular error tolerance</li> </ul>
<b>9. Formulate Conclusions Through Inference Using Hypothesis Testing (CLO 1, 2, 3, 4, 5)</b>	<ul style="list-style-type: none"> <li>a) Identify the parts of a hypothesis test</li> <li>b) Formulate and execute a test of hypothesis to answer a question concerning a population mean using the Z-Test</li> <li>c) Calculate p-values</li> <li>d) Interpret the HT decision and formulate a conclusion</li> </ul>

**Policies:**

Disability Support

Students with disabilities, whether physical, learning or psychological, who believe that they may need accommodations in this class, are encouraged to contact Disability Services as soon as possible to ensure that the accommodations are implemented. Please meet with the Disability Services staff in Edison Hall, Room 100, (732) 906-2546.

Code of Student Conduct

To foster a productive learning environment, the College requires that all students adhere to the Code of Student Conduct which is published in the college catalog and website.