MATH 153
Introduction to Statistical Methods
4 Credits

Community College of Baltimore County
Common Course Outline

Description

MATH 153 – Introduction to Statistical Methods is a course that develops students' statistical reasoning skills by exploring principles and procedures for collecting, displaying, analyzing data and drawing inferences. Topics include descriptive statistics, introduction to probability, normal and binomial distribution, hypothesis testing, confidence intervals, regression and correlation, chi-square distribution, and ANOVA. A statistical computer package is introduced as a computational tool. Its use is integrated throughout the course.

Pre-requisites: MATH 082 or sufficient MATH placement, and ACLT 053 or (ESOL 052 and ESOL 054)

Overall Course Objectives

Upon completion of this course, students will be able to:

1. select appropriate technology to manage data, explore data, perform inference, and check conditions;
2. describe data with appropriate measures of central tendency and variability;
3. generate statistical graphs;
4. analyze bivariate data using linear regression;
5. summarize data in a contingency table;
6. identify association among qualitative variables using conditional distribution;
7. construct probability models for discrete random variables;
8. solve a normal probability distribution application;
9. apply the fundamentals of probability;
10. make inferences about parameters using confidence intervals and/or hypothesis testing;
11. perform a test of independence using the chi-square distribution;
12. solve problems involving one-way analysis of variance;
13. interpret the results of a statistical analysis, including but not limited to, graphs, probability models, and confidence intervals;
14. construct a solution to real world problems using appropriate statistical methods individually and in teams;
15. examine the mathematical/statistical contributions made by people from diverse cultures locally, and globally, throughout history;
16. evaluate the ethical issues at stake in individual and collective decisions relative to the practice of statistics;
17. effectively communicate the results of a statistical analysis;
18. demonstrate statistical reasoning in everyday life using real world data;
19. apply statistical methods and reasoning using real world data from diverse cultural and global populations; and

20. find, evaluate, use, and cite appropriate academic resources when completing written assignments.

Major Topics

I. Collecting Data
II. Organizing and Displaying Data with Tables and Graphs
III. Numerical Summaries for Quantitative Data
IV. Probability
    a. Fundamentals and basic concepts
    b. Addition rule
    c. Multiplication rule
    d. Conditional probability
V. Discrete Random Variables
    a. Probability distributions
    b. Expected value and standard deviation
    c. Use and interpret binomial probabilities
    d. Mean and standard deviation of a binomial random variable
VI. Normal Distribution
    a. Characteristics of the normal distribution
    b. Use and interpret normal probability
VII. Sampling Distributions
    a. Central Limit Theorem (CLT)
    b. Mean and standard error
    c. Apply CLT in application
VIII. Estimates and Confidence Intervals
    a. Introduction to the t-distribution
    b. Confidence interval for a population mean
    c. Confidence interval for a population proportion
IX. Hypothesis Testing
    a. Purpose of a hypothesis test
    b. Hypothesis test of a population mean
    c. Hypothesis test of a population proportion
    d. Hypothesis testing for two population proportions and means
X. Regression and Correlation
    a. Scatter plot
    b. Use and interpret the correlation coefficient
    c. Use and interpret the linear regression
    d. Contingency tables and association
XI. Chi-Square Distribution: Test of Independence
XII. Comparing Three or More Means: One-Way Analysis of Variance (ANOVA)

Course Requirements

Grading will be determined by the individual faculty member, but shall include the following, at minimum:

- 60% of the course grade must be proctored and completed without the use of notes or a textbook. This minimum of 60% consists of a comprehensive final exam that should count between 20% and 30%, and at least two tests.
- one written project (such as a research project, technology project, globally oriented project, or analysis of a real-world problem) which must count between 10% and 15% of the overall course grade.
- No more than 15% of the overall course grade should be allocated for homework.

Written assignments and research projects: Students are required to use appropriate academic resources in their research and cite sources according to the style selected by their professor.

Other Course Information

This course is an approved 4–credit General Education course in Mathematics.
One or more assignments will infuse CCBC General Education Program outcomes and will account for a minimum of 10% of the total course grade. The assignment(s) will allow students to demonstrate at least 5 of the 7 General Education program outcomes.

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