Salisbury University Department of Mathematical Sciences

MATH 216 : Statistical Thinking
Syllabus (Tentative)

Description: Descriptive and inferential analysis of data, emphasizing appropriate assumptions, computer use and interpretation. Parametric and non-parametric methods are compared and contrasted. Includes a weekly laboratory. 4 Hours Credit: Meets four hours per week.

Prerequisites: C or better or concurrent enrollment in MATH 160, MATH 198, MATH 201 or similar calculus experience.

Credit: Credit may only be received for one of MATH 150, MATH 155, MATH 213 and MATH 216

Intended Audience: Students majoring in mathematics or other sciences.

Objective: To introduce the concepts of descriptive and inferential statistics by way of both nonparametric and the classical parametric methods.

Textbooks: *Statistics*, by McClave & Sincich; Prentice-Hall, 13th Edition, 2017.

Technology: Statistical software such as MINITAB or other, will be used throughout the course.

Topic	Weeks
Chapters 1 & 2: Data, Data Collection, Methods for Describing Data Sets	1.5

Graphical methods, measures of central tendency, variation, and relative standing, Chebyshev's Rule, Box plots, bivariate relationships.

- Lab 1: Minitab Essentials: File management, descriptive statistics techniques, and graphing (single- and multi-variable)

- Lab 2: Data Collection Issues: Obtaining reliable data from published sources, measurement issues, and getting data into Minitab

Chapter 3: Probability	1

Probability & Conditional Probability

- Lab 3: Probability: Probability & Conditional Probability from tallies;

Chapter 4: Discrete Random Variables	1.5

Probability distribution functions, expected value, Binomial, Hypergeometric, and Poisson

- Lab 4: Discrete Random Variables: Distribution characteristics and applications, including Binomial, Geometric, Hypergeometric, and Poisson

Chapter 5: Continuous Random Variables	2

Uniform, Normal, and Exponential. Descriptive methods for assessing normality, normal approximation to the binomial

- Lab 5: Continuous Random Variables Distribution characteristics and applications, including Uniform, Exponential, and Normal

- Lab 6: Applications of Random Variables

Chapter 6: Sampling Distributions and Central Limit Theorem	1

Topic	Weeks
Estimators, unbiased, minimum variance, Central Limit Theorem	

- Lab 7: Sampling Distributions and the Central Limit Theorem: Illustration via simulation and applications

- Lab 8: Concepts and Review: A review of some of the procedures and concepts learned in the previous labs.

Chapter 7: Estimation (One Sample) — 1.5

Confidence intervals for means, proportions, sample size

- Lab 9: Estimation; Confidence intervals for means and proportions; demonstration via simulation and applications

- Lab 10: Decision Making: Applet simulations of hypothesis testing to study types of errors and probabilities of error.

Chapters 8 & 14: Tests of Hypothesis (One Sample) — 1

Tests for means, sign test, Wilcoxon signed rank test, tests for proportions, Type I and Type II error, power

- Lab 11: Hypothesis Tests (one sample): Parametric and non-parametric tests for means, medians, and proportions; demonstration via simulation and applications

Chapters 9 & 14 Confidence Intervals & Tests of Hypotheses (Two Samples: Paired & Independent) — 1.5

Paired: t, Wilcoxon signed rank, sign; Independent: z, t, Mann-Whitney (Wilcoxon Rank Sum)

- Lab 12: Hypothesis Tests (two samples): Parametric and non-parametric tests for means, medians, and proportions; demonstration via simulation and applications

Chapter 11: Simple Linear Regression — 1

Least squares, inferences about the slope, estimation and prediction

- Lab 13: Simple Linear Regression: Constructing and interpreting fitted line plots, estimation and prediction, inferences about slope.

Selected Topics — 1

Chapter 10 — One-way Analysis of Variance or Chapter 13 — Chi-Square Tests

Tests	1
Total	**14**

Evaluation

Homework and quizzes	10%
Lab attendance	5%
Lab reports and project	25%
Tests	40%
Final Exam	20%

- Free tutoring is available for this course in the Spring and Fall semesters.

- Clear descriptions of thought processes, evidence of critical thinking, and effective communication must be demonstrated in written work.

- **Writing Across the Curriculum:** Students will be expected to communicate mathematics and mathematical ideas effectively in speech and writing. At the University Writing Center, trained consultants are ready to help you at any stage of the writing process. In addition to the important writing instruction that occurs in the classroom and during professors' office hours, the Center offers another site for learning about writing. **All students are encouraged to make use of these important services.**

- **NOTE:** Once a student has received credit, including transfer credit, for a course, credit may not be received for any course with material that is equivalent to it or is a prerequisite for it.