Course Outline for Mathematics 43

INTRODUCTION TO PROBABILITY AND STATISTICS

- **Catalog Description:**
  MTH 43 - Introduction to Probability and Statistics 4.00 units
  Descriptive statistics, including measures of central tendency and dispersion; elements of probability; tests of statistical hypotheses (one and two populations); correlation and regression; applications in various fields. Introduction to the use of computer software package to complete both descriptive and inferential statistics problems. (May not receive credit if Mathematics 35 has been completed.)
  **Prerequisite:** MTH 54 (completed with a grade of "C" or higher) or equivalent or MTH 54L (completed with a grade of "C" or higher) or equivalent or MTH 55 (completed with a grade of "C" or higher) or equivalent or MTH 55L (completed with a grade of "C" or higher) or equivalent or MTH 55B (completed with a grade of "C" or higher) or equivalent or an appropriate skill level demonstrated through the Mathematics Assessment process.
  **Strongly Recommended:** Eligibility for ENGL 1A

<table>
<thead>
<tr>
<th>Units</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Week</td>
</tr>
<tr>
<td>Lecture</td>
<td>4.00</td>
</tr>
<tr>
<td>Laboratory</td>
<td>1.00</td>
</tr>
<tr>
<td>Clinical</td>
<td>0.00</td>
</tr>
<tr>
<td>Total</td>
<td>4.00</td>
</tr>
</tbody>
</table>

- **Prerequisite Skills:**
  Before entry into this course, the student should be able to:
  1. perform basic operations on complex numbers;
  2. solve quadratic equations by factoring, completing the square, and quadratic formula;
  3. find complex roots of a quadratic equation;
  4. sketch the graphs of functions and relations:
     a. algebraic, including polynomial and rational
     b. logarithmic
     c. exponential
     d. circles;
  5. find and sketch inverse functions;
  6. perform function composition;
  7. solve exponential and logarithmic equations;
  8. apply the concepts of logarithmic and exponential functions;
  9. solve systems of linear equations in three unknowns using elimination and substitution;
  10. apply the properties of and perform operations with radicals;
  11. apply the properties of and perform operations with rational exponents;
  12. solve equations and inequalities involving absolute values;
  13. solve equations involving radicals;
  14. graph linear inequalities in two variables;
  15. find the distance between two points;
  16. find the midpoint of a line segment.

- **Expected Outcomes for Students:**
Upon completion of this course, the student should be able to:

1. take raw data and compile a frequency table from which frequency histograms and relative frequency histograms can be drawn;
2. calculate the mean, median, mode, variance and standard deviation of a distribution;
3. describe the fundamental concepts of probability and be able to calculate probabilities of various independent or dependent events;
4. describe the nature of the binomial distribution and normal distribution, as well as properties of the normal probability curve;
5. use tables of standard or z values and student's t distribution;
6. describe the differences between samples and populations;
7. demonstrate a knowledge of experimental design;
8. calculate confidence intervals;
9. apply tests of statistical hypotheses;
10. describe the differences between samples and populations, understanding of experimental design, and be able to calculate confidence intervals and apply tests of statistical hypotheses;
11. describe the procedure and uses of correlation and regression;
12. discuss the nature of the Chi-square distribution and its use for goodness of fit and independence test;
13. demonstrate a knowledge of the use of computer software packages as they pertain to histograms, regression analysis, confidence interval constructions, and hypothesis tests.

**Course Content:**

1. Mathematical fundamentals, including summation notation
2. Analysis of data
   A. Frequency distributions
   B. Frequency histograms
   C. Measures of central tendency
      a. Mean
      b. Median
      c. Mode
   D. Measures of dispersion
      a. Range
      b. Variance
      c. Standard Deviation
   E. Percentiles
   F. Empirical rule
   G. Types of data
3. Introduction to correlation and regression
4. Probability
   A. Introduction
   B. Probability laws
5. Probability distributions
   A. Uniform
   B. Binomial
   C. Normal
   D. Chi-square
6. Sampling distributions
7. Estimation and hypothesis testing for one and two populations
   A. Basic concepts
   B. Experimental design
   C. Applications to the normal distribution
   D. Introduction to student's t test
8. Chi-square procedures
   A. Goodness-of-fit test
   B. Independence test

**Methods of Presentation**

1. Lecture/Discussion
2. Problem solving
3. Student participation
4. Class and group discussions
5. Videos

- **Assignments and Methods of Evaluating Student Progress**

1. Typical Assignments
   A. Determine the range and sample standard deviation of the tornado occurrence data in Exercise 3.43. Discuss one major drawback to the standard deviation as a measure of variation.
   B. Enter the data on test scores into a Minitab worksheet. Create a histogram, stem-and-leaf diagram, and boxplot of the data. Calculate the mean, standard deviation, and five-number summary. Write a brief analysis of the data based on these graphical and numerical summaries.

2. Methods of Evaluating Student Progress
   A. Quizzes
   B. Home Work
   C. Midterm Examination
   D. Final Examination

- **Textbook (Typical):**

- **Special Student Materials**
  1. Graphing Statistical calculator