Carthage Mathematics Department
Course Summary for Math 3050 Theory of Statistics

1. Credits: 4 credits
2. Semesters Offered: Spring
3. Text(s): Statistical Techniques in Business and Economics, 15th Edition, by Lind, Marchal, and Wathen, McGraw-Hill Irwin, 2012
4. Topics Covered:
    a. Statistics- basic terms, population and samples, sampling methods, types of data, experimental design, comparison of probability and statistics, and the art of statistical deception.
    b. Single-variable data descriptive analysis, dot plot, stem and leaf, frequency distributions, and graphic presentations of data, descriptive statistics central tendency (mean, median, mode), dispersion measures (range, standard deviation), and measures of position (quartiles).
    c. Probability theory including types of probability, sample space including mutually exclusive events and the addition rule, independence, the multiplication rule, and conditional probability.
    d. Discrete variables probability distributions including random variables, mean and variances of discrete distributions, the binomial and poisson distributions.
    e. Normal probability distribution, applications of normal distribution (z scores, interquartile range and midquartile range), normal distribution approximation of binomial.
    f. Sample variability including sampling distributions of sample means, the central limit theorem, estimating a population mean and proportion.
    g. Statistical inference, hypothesis testing using a probability –value approach, the classical approach, inferences involving one population, inferences involving two populations with both dependent and independent samples. The z test and t test, depending on sample size is used to test hypotheses.
    h. Analysis of variance (ANOVA) with single and multi-factor ANOVA.
    i. Linear correlation and regression analysis and multi-regression analysis.
    j. Chi-Square analysis and goodness of fit tests.
    k. Nonparametric statistics including Sign test, Mann-Whitney U test, the Runs test and Rank Order Correlation.
5. Skills Enhanced:
    a. Technical writing: A 10 or more page five-section statistical research project with at least five references, testing two or more hypotheses is required. Two, three page analysis of statistical research studies are required. Three, one page analysis of statistical abuse examples are required. All papers are to be written in third person using complete sentences and correct notation.
    b. Computer skills
    c. Excel Data Analysis Tool Pack is used for the statistical analysis in this course.
    d. Oral Presentations. A 10 minute oral presentation using power point and or other graphics is required for the research study. A two-minute oral summary is required for all other written papers.

6. Course Goals:

   By the end of the course, students will be able to demonstrate the following:

   a. Use technical writing and apply descriptive and inferential statistical applications In a 15-25 page research project written in APA style including five chapters testing a minimum of two hypotheses using the five step hypothesis testing process.
      Assessment: Presentation of a 10 minute summary report using appropriate technology summarizing the five chapter study and submission of the study which will be analyzed and assessed using an eight item rubric using a five point Likert Scale. Three of the items relate to the written paper and five relate to the content of the paper
   b. Use of Excel or Mathematica Statistic package for data analysis of various data sets studied in the course.
      Assessment: The cumulative final examination will include various questions which require the application of theses statistical programs.
   c. The use and application of probability theory in solving real life and academic mathematical problems involving the normal probability distribution, student t distribution, binomial distribution, poison distribution, and hyper-geometric distribution.
      Assessment: The cumulative final examination will involve real life and mathematical problems which require the application of these probability concepts in solving the problems.
   d. Application of statistical inference strategies in hypothesis testing involving population and multi-population samples using both the z and t tests.
      Assessment: The cumulative final examination will include real life problems which require using the t and z tests to analyze the data applying the five step hypothesis testing process.
   e. Application of the one or two way analysis of variance (ANOVA) to solve real life problems involving more than two samples of data.
      Assessment: The cumulative final examination will involve problems which require the student to demonstrate the application and interpretation of using the ANOVA tests to compare multi samples of data.
   f. Application and use of correlation, linear regression, and multiple regression programs to solve real life problems and mathematical data sets.
      Assessment: The cumulative final examination will include real life problems requiring the student to apply and interpret correlation and regression analysis results from provided data sets.
   g. Application and use of appropriate non-parametric statistical analysis tests for real life data sets.
      Assessment: The cumulative final examination will provide real life problems with data sets which require the selection, application, and interpretation of non-parametric statistical tests.
   h. Application of time series forecasting, linear time series modeling, and using various indexing models with provided data sets to solve real life problems.
      Assessment: The cumulative final examination will include problems and data sets which require the student to select and apply the appropriate analysis strategy and apply it to the data presented.

7. Sample Syllabus:
    a. Chapter 1
    b. Chapter 2
    c. Chapter 4
    d. Chapter 5
    e. Chapter 6
    f. Chapter 7
    g. Chapter 8
    h. Chapter 9
    i. Chapter 10
    j. Chapter 11
    k. Chapter 12
    l. Chapter 3 and 13
    m. Chapter 14
8. Miscellanea
    a. This course carries VEE credit.