NOVA COLLEGE-WIDE COURSE CONTENT SUMMARY
MTH 246 – STATISTICS II (3 CR.)

Course Description

Presents an overview of statistics, including descriptive statistics, elementary probability, probability distributions, estimation, hypothesis testing, correlation, and linear regression. Part II. Lecture 3 hours. Total 3 hours per week.

General Course Purpose

To serve as a second course in statistics that focuses on multivariate and nonparametric techniques useful to business, science, and social science majors.

Course Prerequisites/Corequisites

Prerequisite: Completion of MTH 245 or equivalent with a grade of C or better.

Course Objectives

- Review of Hypothesis Testing
  o Conduct hypothesis tests for population means and proportions.
  o Conduct a hypothesis test for the equality of two population means where:
    ▪ The samples are independent and the population variances are assumed unequal.
    ▪ The data consists of matched pairs.
  o Conduct a hypothesis test for the presence of correlation.
- Experimental Design
  o Define and apply the basic principles of design, including randomization, replication, and treatment/control groups.
  o Explain single and double blinding.
  o Describe the placebo and experimenter effects and describe how they can be countered using blinding.
  o Design experiments using the following methods:
    ▪ Completely randomized.
    ▪ Randomized block.
    ▪ Matched pairs.
  o Explain the concept of confounding.
- Correlation and Regression
  o Construct and interpret the residual plot related to a simple least-squares regression model.
  o Conduct hypothesis tests related to the coefficients of a simple least-squares regression model.
  o Construct and Apply a logistic regression model.
  o Calculate the coefficient of determination, the adjusted coefficient of determination, and overall P-value for a multiple regression model and use them to construct a best-fit multiple regression equation.
- Categorical Data Analysis
  o Conduct chi-squared tests for:
    ▪ Goodness of fit.
    ▪ Independence between rows and columns of a two-way contingency table.
    ▪ Homogeneity of population proportions.
- Analysis of Variance (ANOVA)
  o Conduct one-way ANOVA to test the equality of two or more population means for both equal and unequal sample sizes and recognize its relationship to the pooled two sample t-test.
  o Conduct a multiple comparison test, such as Tukey's HSD, to determine which of the three or more population means differs from the others.
  o Conduct two-way ANOVA on sample data categorized with two fixed factors.
• Nonparametric Methods
  o Determine the rank of each element of a sorted data set.
  o Identify the relationship between a nonparametric test and its corresponding parametric technique.
  o Conduct a Wilcoxon signed-ranks test for a single sample.
  o Conduct a Wilcoxon signed-ranks test for matched pairs.

• Technology Application
  o Construct statistical tables, charts, and graphs using appropriate technology.
  o Perform statistical calculations using an appropriate statistical software package.
  o Complete statistical project. Students are required to complete some form of semester project in their course that is worth a significant portion of the student’s grade. This could be either an individual or group effort, and could be completed in stages through the semester or as a single, stand-alone exercise. As a minimum, the project should require students to manipulate and draw statistical inferences from a large, realistic data set using a statistical software package.

**Major Topics to be Included**

a) Hypothesis Testing  
b) Experimental Design  
c) Correlation and Regression  
d) Categorical Data Analysis  
e) Analysis of Variance  
f) Nonparametric Methods