Course Prefix and Number: <u>MTH 246</u>   Credits: <u>3</u>

Course Title: <u>Statistics II</u>

Course Description

Continues the study of estimation and hypothesis testing with emphasis on advanced regression topics, experimental design, analysis of variance, chi-square tests, and non-parametric methods. Lecture 3 hours. Total 3 hours per week. 3 credits.

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
Upon completing the course, the student will be able to:

Review of Hypothesis Testing
- Conduct hypothesis tests for population means and proportions.
- 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.
- Conduct a hypothesis test for the presence of correlation**.**

Experimental Design
- Define and apply the basic principles of design, including randomization, replication, and treatment/control groups.
- Explain single and double blinding.
- Describe the placebo and experimenter effects and describe how they can be countered using blinding.
- Design experiments using the following methods:
    - Completely randomized.
    - Randomized block.
    - Matched pairs.
- Explain the concept of confounding.

Correlation and Regression
- Construct and interpret the residual plot related to a simple least-squares regression model.
- Conduct hypothesis tests related to the coefficients of a simple least-squares regression model.
- Construct and Apply a logistic regression model.
- 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

- 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)
- 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.
- Conduct a multiple comparison test, such as Tukey's HSD, to determine which of the three or more population means differs from the others.
- Conduct two-way ANOVA on sample data categorized with two fixed factors.

Technology Application
- Construct statistical tables, charts, and graphs using appropriate technology.
- Perform statistical calculations using an appropriate statistical software package.
- 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

- Hypothesis Testing
- Experimental Design
- Correlation and Regression
- Categorical Data Analysis
- Analysis of Variance
- Nonparametric Methods

Effective Date/Updated: August 1, 2022