MATHEMATICS 260

INTERMEDIATE APPLIED STATISTICS

I. Introduction

A. Catalog Description

The course uses cases to understand statistical methods as collection, assessment, and reporting of evidence regarding questions posed by scientists, researchers, lawyers, engineers, and managers. The course also exposes the students to many of the more advanced statistical methods. Students who have received credit for MATH 272 may not receive credit for MATH 260. *Prerequisite: MATH 160, PYSC 201, Advanced Placement statistics, or equivalent.* Satisfies the Mathematical Approaches core requirement.

B. Objectives

The course will teach the students more statistical methods, but more importantly, how to approach statistical analysis and how to evaluate statistical evidence. A significant emphasis will be placed on effectively presenting and communicating findings based on statistical evidence.

C. Prerequisites

Math 160, Psyc 201, AP statistics, or equivalent

II. Components

A. Unifying themes

1. The case method and communication of statistical results

- Question of interest
- Display of the data
- Communication of findings
- Scope of Inference

2. Inferential issues

- Observational studies versus planned experiments
- Enumerative versus inductive arguments
- Informal logic of significance testing
- Generalizability of findings

3. General issues

- Use and abuse of statistics
- Model assumptions
- Assessing model assumptions
- Robustness and resistance
- Efficiency and power

B. Topics

1. One and two sample tests

- t-tests
- matched pairs
- non-parametric tests
- randomization tests
- log transformations

2. One-way analysis of variance

- residuals analysis
- non-parametric alternatives
- ANOVA tables
- Augmented ANOVA tables
- Multiple comparisons

Topic 3 or 4

3. Simple regression

- least squares regression
- ANOVA tables
- residuals and diagnostics
- hypothesis tests
- prediction intervals
- log transformations
- lack of fit test
- quadratic model

4. Two-way analysis of variance

- Advantages of two-way models
- ANOVA table
- interaction
- residuals
- general linear model
- imbalance
- random and fixed effects
- randomized block design

III.   Bibliography

      Introduction to the Practice of Statistics, Moore & McCabe (Freeman)

      Introduction to Statistical Reasoning, Gary Smith (McGraw-Hill)

      The Statistical Sleuth, Ramsey & Schafer (Duxbury)

      A Second Course in Statistics, Mendenhall & Sinich (Prentice Hall)

      Statistics: A Guide to the Unknown, Tanur etal, (Duxbury)