STA 327–Experimental Design and Analysis
Course Syllabus

Course description: Analysis of variance, single factor completely randomized designs, blocking and Latin square designs. Multifactor experiments including factorial experiments, nested, blocked and split-plot designs, analysis of covariance. Quality control, acceptance sampling, reliability issues. SAS or other statistical software used throughout. Report writing, data driven problems and/or case studies incorporated throughout.

Credit hours: 3

Course Prerequisites and Corequisites: STA 320

Course outline: Approximate time spent

- **Single Factor Experiments** 35%
  - Completely Randomized Designs (CR)
  - Multiple Comparison Procedures
  - Randomized Complete Block Designs (RCB)
  - Latin Square Designs
  - Unbalanced and Incomplete Structures in Designs
- **Multi-Factor Experiments** 35%
  - Factorial Treatment Structure in a CR Design
    - Interaction Assessment
  - Factorial Treatment Structure in a RCB Design
    - Interaction Assessment
  - Nested Treatment Structures
  - Repeated Measures Designs
  - Split-Plot Designs
  - Covariance (Analysis of)
- **Special Topics** 10%
  - Quality Control
    - Control Charts for Attributes
    - Control Charts for Variables
  - Acceptance Sampling and General Sampling Theory
  - Reliability in Industrial Settings
- **Statistical Consulting/Report Writing*** 20%*
  - The Consultant/Client Relationship
  - Writing a Statistical Report
  - Statistical Computing and Software Usage
  - Presenting (Written and Oral) Statistical Reports

*Incorporated throughout the previous three "bullets" as opposed to a stand alone subject or unit.

Student Learning Outcomes (SLO): At the end of STA 327, a student who has studied and learned the material should be able to:

1. Distinguish between CR and RCB designs. [EEO: 1,6]
2. Plan and analyze CR, RCB and other statistical experiments. [EEO: 1, 2, 4, 5]
3. Compare and contrast popular multiple comparison techniques for experiments. [EEO: 1, 5, 6]
4. Explain the nature of factorial treatment structure and know how to properly assess interaction effects in statistical models. [EEO: 1, 2, 5]
5. Distinguish nested from crossed factors and analyze data resulting from experiments that contain each type of factor. [EEO: 1, 2, 5, 6]
6. Plan and analyze repeated measures and split-plot experiments. [EEO: 1, 2, 4, 5]
7. Distinguish analysis of variance from analysis of covariance situations in nature. [EEO: 1, 2, 4, 5, 6]
8. Recognize physical scenarios which are matched to the experiments discussed throughout the course. [EEO: 1, 7]
9. Write both statistical reports and brief summaries for client usage. [EEO: 3, 7]
10. Demonstrate a basic understanding of the client/consultant relationship during consulting meetings. [EEO: 3, 7]

There are no specific program learning outcomes for this major addressed in this course. It is a general education core curriculum course and/or a service course.

Exemplary Educational Objectives (EEO):

1. To apply arithmetic, algebraic, geometric, higher-order thinking, and statistical methods to modeling and solving real-world situations.
2. To represent and evaluate basic mathematical information verbally, numerically, graphically, and symbolically.
3. To expand mathematical reasoning skills and formal logic to develop convincing mathematical arguments.
4. To use appropriate technology to enhance mathematical thinking and understanding and to solve mathematical problems and judge the reasonableness of the results.
5. To interpret mathematical models such as formulas, graphs, tables and schematics, and draw inferences from them.
6. To recognize the limitations of mathematical and statistical models.
7. To develop the view that mathematics is an evolving discipline, interrelated with human culture, and understand its connections to other disciplines.