Course Module
Stephen F. Austin State University
STAT 3346-001 Experimental Design & Analysis
Math (Bush) 213 TR 12:30-1:45PM
ZOOM: Mtg#: 952 4543 1378, PC: 016725

Instructor
Robert (Bob) Henderson
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BA in Math & History – Trinity University, San Antonio, TX (1978)
MS in Mathematical Statistics – Southern Methodist University, Dallas, TX (1980)
PhD in Mathematical Statistics – Southern Methodist University, Dallas, TX (1982)
MBA – University of Delaware, Newark, DE (1988)
Worked in industry for 27 years, 6 years with DuPont as internal consultant for a variety of businesses and staff groups, then 21 years in the semiconductor business, most with a supplier of a key enabling material for semiconductor production, and later with Samsung working primarily with engineers in process control efforts. The entire 27 years included many training delivery, as well as course development activities related to basic statistics, experimental design, and process control systems. Fall of 2009 was first semester at SFA.

Teaching Hours – MWF 9-9:50AM, MWF 11-11:50AM, TR 11:00AM-1:45PM
Office Hours – MWF 10-10:50AM, M 2-5PM, TW 2-4PM, and by appointment. Also, during these periods, you can send me an e-mail at the e-mail address above, and I will send you back a ZOOM Meeting Number and Passcode.

Course Goals
This course ideally will provide students with an introduction to and understanding of basic linear models, good experimental design practices, variance component analysis, and statistical process control.

Text
None.

Computer Access/Skills
This course is largely applied in nature; consequently, it will be helpful to have some facility in working with data using a computer. The course work will be greatly facilitated with the use of a statistical software package (JMP is one such package, which is available through MySFA, and will be utilized through much of the course). Knowledge of and ability to utilize Microsoft Office programs – Excel, Word, and Powerpoint – will also often be beneficial. Almost all workplaces expect some skills in working with these packages, and use them for reporting and/or presentation purposes. In addition, some familiarity with SAS and/or R (other more powerful statistical packages) might be helpful, but is certainly not necessary or required.

Prerequisites
STAT 3342 (Previously STA 320) or equivalent

Course Syllabus
The official course syllabus can be found at:
http://www3.sfasu.edu/math/docs/syllabi/STAT3346Syllabus.pdf
Course Overview

Week 1-2: Review of Statistical Inference & 1-way Analysis of Variance
Week 3: Development of 2-way Analysis of Variance
Week 4: Strategy of Experimentation
Week 5-6: Screening Designs (including Workshop 1)
Week 7-8: Response Surface Designs (including Workshop 2)
Week 9-10: Random and Mixed Effects Analysis of Variance (including Workshop 3)
Week 11-12: Statistical Process Control (including Workshop 4)
Week 13-14: Mixture Designs (including Workshop 5)

Grading
Grades will be determined by the following:

Homework 5%
Workshops 80%
Final Exam 15%

About Assignments
There will be 5 workshops on which students will work in small groups, and then present their results/reports to the class. The presentations will be evaluated by the instructor. In addition, students will be asked to evaluate the contribution of their fellow group members (colleague evaluations). In addition, students will be asked to evaluate the presentations of other groups (peer evaluations).

Attendance
Since a significant proportion of the evaluation is based on in-class activities, so missing a class is not desirable. Even though, the class periods will be available via ZOOM both synchronously and asynchronously, this is just a fallback for situations where missing a class is absolutely unavoidable (e.g., quarantine). If you know you are going to have to miss a specific class, please let me know via e-mail or phone prior to the class.
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

The following is an excerpt from SFA Policy 5.4:

The federal definition of a credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally established equivalency that reasonably approximates:

1. Not less than one hour of classroom or direct faculty instruction and a minimum of two hours out-of-class student work each week for approximately fifteen weeks for one semester or trimester hour of credit, or 10 to 12 weeks for one quarter hour of credit, or the equivalent amount of work over a different amount of time, or;

2. At least an equivalent amount of work as outlined in item 1 above for other academic activities as established by the institution including laboratory work, internships, practica, studio work, and other academic work leading to the award of credit hours.

To this end, all students in courses offered by the Department of Mathematics and Statistics that wish to be successful should plan to spend a minimum of two hours outside of class for every credit hour associated with this course. Expected activities to be completed in the time outside of class include reviewing notes from previous class meetings, reading assigned course resources, completing all assigned exercises and projects, and performing periodic assessment preparation.

Course Prerequisites and Corequisites: STA 320

Course outline:

- Single Factor Experiments
  - Completely Randomized Designs (CR)
  - Multiple Comparison Procedures
  - Randomized Complete Block Designs (RCB)
  - Latin Square Designs
  - Unbalanced and Incomplete Structures in Designs

- Multi-Factor Experiments
  - 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
  - Quality Control
    - Control Charts for Attributes

Approximate time spent

- Single Factor Experiments: 35%
- Multi-Factor Experiments: 35%
- Special Topics: 10%
Student Learning Outcomes (SLO): At the end of STAT 3348, 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.

Academic Integrity
Academic integrity is a responsibility of all university faculty and students. Faculty members promote academic integrity in multiple ways including instruction on the components of academic honesty, as well as abiding by university policy on penalties for cheating and plagiarism.

The penalty for a student found cheating on any part of an assignment, quiz, or exam in this class will range from a grade of zero on the work to a grade of F in the course, and may result in additional, more severe disciplinary measures. A student who allows another to copy his work and the student copying
the work are both guilty of cheating. Do your own work. Do not show your completed work to others. Do not allow others to copy your work.

Definition of Academic Dishonesty (SFA policy 4.1):
Academic dishonesty includes both cheating and plagiarism. Cheating includes, but is not limited to:
- using or attempting to use unauthorized materials on any class assignment or exam;
- falsifying or inventing of any information, including citations, on an assignment;
- helping or attempting to help other student(s) in an act of cheating or plagiarism.

Plagiarism is presenting the words or ideas of another person as if they were one’s own. Examples of plagiarism include, but are not limited to:
- submitting an assignment as one's own work when it is at least partly the work of another person;
- submitting a work that has been purchased or otherwise obtained from the Internet or another source;
- incorporating the words or ideas of an author into one's paper or presentation without giving the author credit.

Withheld Grades Semester Grades (SFA Policy 5.5)
Ordinarily, at the discretion of the instructor of record and with the approval of the academic chair/director, a grade of WH will be assigned only if the student cannot complete the course work because of unavoidable circumstances. Students must complete the work within one calendar year from the end of the semester in which they receive a WH, or the grade automatically becomes an F. If students register for the same course in future terms the WH will automatically become an F and will be counted as a repeated course for the purpose of computing the grade point average. The circumstances precipitating the request must have occurred after the last day in which a student could withdraw from a course. Students requesting a WH must be passing the course with a minimum projected grade of C.

Students with Disabilities
To obtain disability related accommodations, alternate formats and/or auxiliary aids, students with disabilities must contact the Office of Disability Services (ODS), Human Services Building, and Room 325, 468-3004 / 468-1004 (TDD) as early as possible in the semester. Once verified, ODS will notify the course instructor and outline the accommodation and/or auxiliary aids to be provided. Failure to request services in a timely manner may delay your accommodations. For additional information, go to http://www.sfasu.edu/disabilityservices.

SFASU Mental Health Statement: SFASU values students’ mental health and the role it plays in academic and overall student success. SFA provides a variety of resources to support students mental health and wellness. Many of these resources are free, and all of them are confidential.

On-campus Resources:
SFASU Counseling Services
www.sfasu.edu/counselingservices
3rd Floor Rusk Building
936-468-2401

SFASU Human Services Counseling Clinic
www.sfasu.edu/humanservices/139.asp
Human Services Room 202
936-468-1041

Crisis Resources:
Burke 24-hour crisis line 1(800) 392-8343
Suicide Prevention Lifeline 1(800) 273-TALK (8255)
Crisis Text Line: Text HELLO to 741-741

Acceptable Student Behavior
Classroom behavior should not interfere with the instructor’s ability to conduct the class or the ability of other students to learn from the instructional program (see the Student Conduct Code, policy 10.4). Unacceptable or disruptive behavior will not be tolerated. Students who disrupt the learning environment
may be asked to leave class and may be subject to judicial, academic or other penalties. This prohibition applies to all instructional forums, including electronic, classroom, labs, discussion groups, field trips, etc. The instructor shall have full discretion over what behavior is appropriate/inappropriate in the classroom. Students who do not attend class regularly or who perform poorly on class projects/exams may be referred to the Early Alert Program. This program provides students with recommendations for resources or other assistance that is available to help SFA students succeed.

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