STA 4211 (16762, STA majors)

Fall 2023

Design of Experiments

MWF: 09:35-10:25 in FLO 100

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Course Website: e-Learning

Lectures: In-person.

Course Material: Material will be provided in course website.

- Notes.
- Slides (abbreviated from class notes).

Course Communication:

- Discussion forum (Microsoft Teams).
- Office hours (posted under "Pages" in Canvas).
- E-mail for questions regarding course policies. (Ensure that **STA 4211** is in the subject line. Failure to do so may result in a non-response.)

Required Text(s): *Applied Linear Statistical Models*, 5$^{\text{th}}$ Edition (Chapters 15-30)
Author(s): M. Kutner, C. Nachtsheim, J. Neter and W. Li, **ISBN-13:** 9780073108742

Course Description: This course provides an introduction to the design and analysis of statistical experiments. Experimental design techniques are used in a wide variety of academic, industrial, and scientific areas. We will cover widely used designs, and discuss practical and computational issues regarding their analysis.

Since this course is a capstone course for statistics majors there will be two additional other components that will contribute to your grade.

1. On the **second week of classes** a 20 point Academic Learning Compact (ALC) Exam with 20 multiple choice questions, testing knowledge of fundamental concepts in applied statistics. Students are required to score at least 15 to pursue the STA major.

2. Near the end of the semester, there will be a data analysis project and presentation. Each student will design and conduct their own experiment, using data they collect or readily available data from various sources, and then analyze the data addressing an issue of interest to them. Each student will submit a written report, describing their experiment and results, as well as giving an oral presentation to the class. Communication and format/structure are worth about 75% of the grade.

These will comprise the three (3) Student Learning Outcomes (SLO) required for majors. More on these later in the course (which will also be posted on the class website).

Prerequisite(s): STA 4210
Credit Hours: 3

Software: We will be using the statistical software `R`.

Purpose of Course: Investigate the purposes, methods, designs and applications of statistical experimental design techniques. Emphasis is on what to apply and why it works.

Course Goals and Objectives:

1. Access, manipulate and analyse data using statistical software.
2. Acquaint students with Least Square methods and concept of linear regression, correlation, and its applications.
3. To approach the material with matrices algebra.
4. Develop the ability to identify different experimental designs and properly analyze the data for each design.
5. Acquaint students with transformations, qualitative variable in the model which broaden the use of linear model theory.

Course Policies

The instructor reserves the right to update any parts of this syllabus as necessary.
Students will promptly be notified of any changes.

Demeanor

All members of the class are expected to follow rules of common courtesy in all classroom discussions, email messages, threaded discussion and chats. Please refer to expected class netiquette online and during class.

Electronic devices

During class time, only laptops and tablets are allowed. Cell phones, smartphones, and phablets are not permissible unless otherwise specified by the instructor. A student found using said device or permissable device used for non-classroom related activities during class time will be asked to leave the classroom which may result in missing any remaining assignments administered during class time.

Assignments

- All **deadlines (excluding exams) are at 23:59** of the due/end date. These are ***hard* deadlines** meaning that any open or ongoing assignments will automatically be submitted at the deadline. No late assignments will be accepted under any circumstances.
- Students are expected to work independently, unless otherwise specified in writing. **Offering** and **accepting** solutions - even from textbook - is an act of **plagiarism**, which is a serious offense and **all involved parties will be penalized according to the UF Student Honor and Conduct Code**. Discussion amongst students is encouraged, but when in doubt, direct your questions to the instructor.
- Students are expected to **show and explain their work**.
- All electronically **submitted work must be as one merged file**. In Canvas, all uploaded files automatically get a grade of 0, until the teaching assistant grades them.
- Feedback will provided within two business days from the assignment deadline.

Homeworks/Quizzes

Under each module in e-Learning,

- **Homework** that are based on (primarily) textbook exercises.
- **Quizzes** that are *closed notes and timed* and range from conceptual to applied.

All deadlines are posted on e-learning. **Assignments are automatically submitted at deadline even if in progress.**

Exams

There will be three (3) in-class exams that may comprise of multiple choice questions and/or open-ended questions (usually open-ended). Exams will emphasise more on conceptual questions while HW/Quizzes will be more computational (not always).

Allowed material:

- Provided formula sheet. Sheet will be provided ahead of time with practise set.
- Scientific/Graphing Calculator. No cell phones.

Important dates

(Subject to change)

ALC Exam ..... September 1 (in-class)
Exam #1 ..... September 29 (in-class)
Project proposal ..... October 29
Exam #2 ..... November 9 (in-class)
Project deadline ..... December 4
Project presentation ..... December 5, 7
Exam #3 ..... December 13, at 10:00

Grading

Grade distribution:

Exams 1, 2 and 3	60% (15% lowest, 20% second best, 25% best)
Homework	12%
Quizzes	12% (lowest 1 dropped)
ALC Exam (SLO1)	5%
Project proposal	1%
Project (SLO2 and SLO3)	10%
Extra Credit	extra 0-1% (discussion forum and class participation)

$$\begin{aligned}\text{Final} =& 0.15(\text{worst exam}) + 0.20(\text{second best exam}) + 0.25(\text{best exam}) \\ &+ 0.12\left(\frac{\sum \text{HW}}{10(\#\text{ of HW})} \times 100\right) \\ &+ 0.12\left(\frac{\sum \text{quizzes} - \text{lowest}}{10(\#\text{ of quizzes} - \#\text{ of drops})} \times 100\right) \\ &+ 0.05\left(\frac{\text{SLO1}}{20} \times 100\right) \\ &+ 0.01\left(\frac{\text{Project proposal}}{10} \times 100\right) \\ &+ 0.10\left(\frac{\text{SLO2} + \text{SLO3}}{40} \times 100\right) \\ &+ \text{Extra}\end{aligned}$$

Letter grade assignment:

There will be *no rounding up* of scores.

		A	91 to 100	A-	88 to $<$ 91
B+	84 to $<$ 88	B	80 to $<$ 84	B-	77 to $<$ 80
C+	74 to $<$ 77	C	70 to $<$ 74	C-	67 to $<$ 70
D+	64 to $<$ 67	D	60 to $<$ 64	D-	55 to $<$ 60
E	$<$ 55				

To view the result of the letter grades to your GPA please visit the UF Grade and Grading Policies. **Final grades shown on Canvas are not accurate because they do not account for the conditional weighing of exams and quizzes.**

Make-up

Requirements for class attendance and make-up exams, assignments, and other work in this course as well as policies regarding absences, religious holidays, illness and student athletes are consistent with UF Attendance Policies.

Additional make-up policy requirements

- Every effort should be made to complete the assignment/exam during the open period. Only extreme situations will warrant a makeup. Contact the instructor prior to the exam - as soon as you realize you will be unable to take the assignment/exam at the scheduled time. Each case will be reviewed individually. Valid and detailed documentation is a prerequisite for scheduling a makeup under such extenuating circumstances.
- If you have an emergency on the day of the assignment/exam, the instructor must be contacted by midnight of the day of the assignment/exam.
- Make-ups need to be scheduled within a week from the assignment deadline. Student is responsible for scheduling.
- Additional Note: Being on vacation or booking a trip prior to the completion of the semester is not a valid reason to request a makeup. Please reference the most recent Academic Calendar.

Addressing Issues

Technical difficulties

Please contact the UF Help desk via e-Learning "Help" tab. Any requests for make-ups due to technical issues must be accompanied with appropriate documentation/proof including screenshots and communication with the help desk. You MUST contact your instructor within 24 hours of the technical difficulty if you wish to request a make-up.

Grievances/Commendations

Should you have any grievances or commendations with your experience in this course you can always address them to the instructor (anonymously) or to the Department of Statistics. For issues that are not satisfactorily resolved at the department level or which seem to be broader than one department, students are referred to the Office of the Ombuds.

UF and CLAS Policies

Dropping, Withdrawing and Incomplete

Dropping and Withdraw

For late course drops and course withdrawals check the catalog.

Incomplete

An incomplete grade may be assigned at the discretion of the instructor as an interim grade for a course in which the student has completed a major portion of the course with a passing grade, been unable to complete course requirements before the end of the term because of extenuating circumstances, and obtained agreement from the instructor and arranged for resolution of the incomplete grade in the next term. Instructors are not required to assign incomplete grades. For complete details please visit CLAS incomplete grade policy and contract.

Accommodating Students with Disabilities

Students requesting accommodation for disabilities must first register with the Disability Resource Center (DRC). The DRC will provide documentation to the students who must then provide this documentation to the instructor when requesting information. You must submit this documentation prior to submitting any assignments for which you are requesting accommodation.

U Matter, We Care

U Matter, We Care, through the Dean of Student's Office, offers care related resources and programs focused on health, safety, and holistic well-being.

Academic Misconduct

Students are held accountable to the UF Student Honor and Conduct Code.

Evaluations

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

Tentative Course Outline

Chapter	**Content**	**Textbook**	HW/Quiz
1	Introduction to Design	15	1
2	Single Factor Studies	16.1-16.11	2
3	Analysis of Treatment Means	17.1-17.8	3
4	Residual Analysis for ANOVA Models	18.1-18.7	4
Exam 1			
5	Two Factor Studies, equal sample size	19.1-19.10	5
6	Two Factor Studies, 1 case and unequal sizes	20.1-20.2, 23.1-23.3	6
7	Multi Factor Studies	24.1-24.5	7
8	Randomized Complete Block/Repeated Measures	27.1-27.2	8
9	Latin Square	28.3-28.5	9
Exam 2			
10	Random and Mixed Effects Models	25.1-25.4	10
11	Analysis of Covariance	22.1-22.4	11
12	Nested Models	26.1-26.5	12
13	Split Plot Designs	27.6	13
*	AB Testing*	*	*
Exam 3			

* Time Permitting.