STA 4211 Design and Analysis of Experiments Fall 2022
Class No. 17173, Sect. 183H and Class No. 17174, Sect. 3H28
MWF 4th period, 10:40am–11:30am, FLO 100

Instructor Deborah Burr, 116C Griffin-Floyd Hall (FLO); Email: `burr@stat.ufl.edu`; Zoom `https://ufl.zoom.us/j/6862268651`; Office Hours: Monday, Wednesday 11:45am - 12:35pm, Friday 9:00am - 9:50am. Use email for administrative matters only; put "4211" in the subject line. Office hours will usually be held in person; only two students will be allowed in my office at one time. Office hour will be on zoom if many people have questions at the same time, for example, just before the midterm. It is always good to ask your short questions right after class.

Teaching Assistant Information will be provided in the first week of class

Course Web Page: The Canvas site will be used for submission of most assignments (homeworks, quizzes, and projects), and for maintaining grades. Course materials will be at a separate web site to be announced on the first day of class.

Required Materials

   Textbook Kutner, Nachtsheim, Neter, and Li, *Applied Linear Statistical Models*, 5th ed., Vol. II (Chapters 15–30, Appendix A).

   Scientific Calculator You need one which will compute the mean and standard deviation automatically. You will use it for tests. A graphing calculator is allowed.

   Statistical Software We will use the free statistical computing language R; download it in the first week of the semester from `http://www.r-project.org`. Also download Rstudio from `http://www.rstudio.com` (Desktop free license).

Prerequisite The formal prerequisite is STA 4210, Regression Analysis. However, a student who does not have familiarity with mathematical derivations of statistical concepts, will have difficulty with STA 4211.

Course Description This course is on the basic principles of experimental design (control, randomization, and blocking), and the analysis of data gathered via a number of typical designs. The course begins with the completely randomized design for experiments with a single factor, then moves on to two-way factorial experiments and randomized blocks. Together with linear regression models, the models for analysis of variance are cases of the general linear model, for which matrix notation and linear algebra are commonly used. This connection with regression models, and other connections, will be brought out throughout the course. The course includes computer programming (in R) for analysis of data from experiments. Although the main focus

is applied, this course is at a deeper mathematical level than the usual introductory statistics course.

Main Course Objectives

1. Know the basic elements of experiments (control, randomization, blocking) and how these are combined to construct several simple and complex designs.

2. For one-way analysis of variance (ANOVA), be able to state the model in the two most common formulations, and be able to correctly analyze data arising from this design, both by hand and with software, including checking of assumptions.

3. For two-way ANOVA with more than one observation per cell, know the different ways to represent the model with interaction; be familiar with different types of interaction.

4. Be able to carry out the analysis of the balanced two-way layout by hand and with software, to check assumptions using residuals, and to suggest alternative approaches if assumptions are not satisfied.

5. Be familiar with examples of the randomized blocks design, and how to analyze data arising from this design, as a special case of the two-way layout with one observation per cell.

6. For the two-way layout with unequal numbers of observations in the cells, know how to analyze the data using the regression approach.

Grading Your final course grade will depend on your course score based on the following components with their respective weights:

Homework/Quizzes	weekly	15%
ALC test (in class)	Wednesday September 7	5%
Midterm (in class)	Wednesday October 19	25%
Project 1	Wednesday October 5	20%
Project 2	Wednesday November 16	25%
Project 3	Monday December 5	10%
	Statistics majors will give a short talk as part of Project 3.	
	Talks will be given from Wed Nov 30 - Wed Dec 7.	

The due date for Project 3/ALC Project refers to the written paper; in addition, statistics majors will give talks based on this project during the four class days from November 30 through December 7. The above dates are tentative and may have to be changed.

The assignment of letter grades will be determined as follows (cutoffs will be no stricter than indicated, and may be relaxed): A 93–100; A^- 90–92; B^+ 87–89; B 80–86; B^- 77–79; C^+ 74–76; C 67–73; D 50–66; E < 50.

The calculation of your final average will be done outside of Canvas; the formula used by Canvas will not necessarily produce the final average according to the course grading scheme. Information on current UF policy for assigning grade points may be found at `https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx`.

Homework/Quizzes Homework is a crucial part of learning the material. Homeworks on the lecture topics will be assigned weekly. On homeworks, it is important to "show your work and explain your reasoning." Homework documents will be submitted on Canvas. There will also be several online quizzes (in Canvas) that will count toward your homework score. There will be a 20-point "cushion" allowed on your homework/quiz average. That is, there will be about 170 cumulative possible homework/quiz points, and your percentage score will be taken out of 150 points. (However, the maximum possible homework average is 100%.)

ALC test The ALC exam is a multiple-choice test, with 20 to 30 questions, on statistical concepts mostly from Statistics 1; this exam is a requirement for statistics majors, mandated by the Florida Board of Governors. All students in 4211 will take this test, both majors and non-majors. Topics on this exam are listed in `AppliedTopics.pdf` on the course web site.

Projects The projects will require you to use R and to produce a written report of a data analysis. If you are a statistics major, the third project (ALC Project) also requires a short oral presentation. The ALC Project fulfills the requirement for majors in any field to acquire and demonstrate proficiency in communication, both written and oral, in their major area.

Midterm There will be one midterm; a review with practice questions will be given. The midterm is closed-book, closed-notes. You are allowed to bring a crib sheet of two sides of an 8.5×11 sheet of paper.

Schedule The dates below are tentative and may have to be adjusted as we go along.

Date	Assignment
Wed 31 Aug	Homework 1
Wed 07 Sept	ALC test (in class)
Wed 14 Sept	Homework 2
Wed 21 Sept	Homework 3
Wed 05 Oct	Project 1
Wed 12 Oct	Homework 4
Wed 19 Oct	Midterm (in class)
Wed 26 Oct	Homework 5
Wed 9 Nov	Project 2
Wed 16 Nov	Homework 6
Wed 30 Nov - Wed 7 Dec	ALC talks by statistics majors
Mon 5 Dec	Project 3

Course Policies

Attendance This is an in-person class; you need to attend class to keep up in the course. Lecture notes will be posted, but these are an outline only of what we go over in class. Studying just those notes will not be enough.

Homework You are allowed to get help with homework and project problems, but your final write-up must be your own. A big component of this course is communication of statistical concepts and analysis. Showing your work in the regular weekly homeworks is important. Developing a good style of explaining what you are doing is extremely important in the projects. Homework documents must be submitted on time on Canvas. Late homework will not be accepted.

Exams Makeup exams must be approved before the time of the exam and will generally be given only in case of medical or family emergencies, which must be appropriately documented. More details regarding policy for granting a makeup exam may be found in the undergraduate catalog under Attendance Policies (`https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx`). For cases of illness, a doctor's signed note will be required.

Email Use email only for administrative matters. Email me at `burr@stat.ufl.edu`, and put the course number in the subject line. See me or a TA in person for content questions. The ideal time to ask questions is right after class.

Honor Code You may discuss homeworks and projects with other students, with the TA, or with the instructor. You are expected to demonstrate your own understanding of the questions by producing a written response in your own words; **your final write-up must be your own**

work. All work on quizzes and exams must be entirely your own. Refer to `http://www.dso.ufl.edu/sccr/process/student-conduct-honorcode/` for the UF Honor Code.

Disabilities Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, `www.dso.ufl.edu/drc/`) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Covid safety

- *Illness* If you are sick, stay home. If you are sick and need immediate care, call your primary care provider or the UF Student Health Care Center at 352-392-1161 to be evaluated.

- *Absences* As with any excused absence, you will be given a reasonable amount of time to make up missed work.

- *Masks* As of this writing, UF is recommending that we wear masks in indoor public settings. During the lectures, I will maintain a safe distance from the nearest student, or, if distancing is not possible, I will wear a mask. After lecture and in office hour, I will wear a mask. If you want to talk to me after lecture, you must wear a mask if you get within six feet from me. If you come to office hours, you must wear a mask.