

# **STA 4211 Design and Analysis of Experiments Spring 2021**

**Class No. 18940, Section 2A23, MWF 4th period, 10:40am–11:30am**

**Asynchronous lectures.**

**Instructor** Deborah Burr, 116C Griffin-Floyd Hall (FLO); Office Hours: Mon, Wed, Fri 12 noon - 1pm, or by appointment, held via Zoom (see course website for Zoom Personal Meeting ID); Email: [burr@stat.ufl.edu](mailto:burr@stat.ufl.edu) (put “STA 4211” in the subject line).

**Teaching Assistants** Saeyoung Park; Office Hours: TBA, Email: [saeyoung.park@ufl.edu](mailto:saeyoung.park@ufl.edu)

**Online Course Site:** [elearning.ufl.edu](http://elearning.ufl.edu)

**Contact Hours** There are three contact hours per week; these will mainly occur in prerecorded lectures which will be available before each scheduled class time (asynchronous lectures). There will also be office hours each Monday, Wednesday, and Friday from 11:45am to 12:35pm.

## **Course Communication**

Online discussion forum for questions about course content

Zoom office hours for questions about course content (Instructor hrs are MWF 11:45am - 12:35pm.)

E-mail for administrative matters only (Put “STA 4211” in the Subject line)

## **Required Materials**

**Course Notes** On Canvas. Unit 1 is available now. The course notes are an outline of what I will go over in lecture and are *not* a substitute for watching the video lectures.

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

**Scientific Calculator** You need one which will compute the mean and standard deviation automatically. This is for carrying out short computations to illustrate statistical methods which are covered in the text and in lecture. (You can choose to use a spreadsheet, or R, for this purpose instead.)

**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** STA 4210, Regression Analysis.

**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 randomized blocks and two-way factorial experiments. 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. The practical usefulness of the matrix approach to analysis will be seen in the unbalanced two-way model. This connection with regression models will be brought out throughout the 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:

Weekly Homework or Quizzes		60%
Project 1:	One-way ANOVA	12%
Project 2:	Two-way ANOVA	14%
Project 3:	Advanced topic	14%

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<sup>−</sup> 90–92.9; B<sup>+</sup> 87–89.9; B 82–86.9; B<sup>−</sup> 79–81.9; C<sup>+</sup> 76–78.9; C 70–75.9; C<sup>−</sup> 67–69.9; D<sup>+</sup> 64–66.9; D 60–63.9; D<sup>−</sup> 55–59.9; F < 55

**Homework** There will be weekly homeworks on lecture topics, every week except when a project is due, which together count 60% of your grade. Homework must be turned in on time each week. Homework will be automatically submitted on Canvas when it is due. Late homework will not be accepted. Show your work clearly on homeworks; to get credit for an answer, it is not sufficient to simply report a numerical answer.

One of the homeworks will consist of the Academic Learning Compact (ALC) test questions, revised to fit into a homework format. This test is required for Statistics majors; it is mostly on conceptual questions in applied statistics at the level of Statistics I. The revised set of ALC-type

test questions will be given as an early homework this semester, after completion of the review material in the course.

There are three projects, each of which requires you to carry out a data analysis in R and write a report of the data analysis. The analysis will be guided by questions in the assignment; however, student creativity in carrying out additional analysis steps is invited. Each project submission should consist of a single computer document which is uploaded on Canvas. Project 3 will require some initiative in supplying certain steps of the analysis. For majors in Statistics, Project 3 satisfies an Academic Learning Compact (ALC) requirement (see **Project** below).

**Project 3** If you are a statistics major, for Project 3 you will be required to present your design and analysis orally as well as in a written report. Oral presentations will be given on zoom in the last two weeks of the semester; presentation days will be assigned at random. This project fulfills the requirement for majors in any field to acquire and demonstrate proficiency in communication, both written and oral, in their major area.

**Course Policies Netiquette** You are expected to follow rules of common courtesy in all class discussions, email messages, threaded discussions, and chats. See <https://stat.ufl.edu/files/NetiquetteGuideforOnlineCourses-LLC.pdf>.

**Privacy of zoom classes** Our class sessions may be audio-visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate verbally are agreeing to have their voices recorded.

If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared.

**Honor Code** You may discuss homeworks and projects with other students, with the TA, or with the instructor. You are expected to fully understand the solution or answer, and to show that with a written response in your own words; **your final write-up must be your own work**. Refer to the UF Honor Code at <http://www.dso.ufl.edu/sccr/process/student-conduct-honorcode/>.

**Disabilities** Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, [www.dso.ufl.edu/drc/](http://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.

**Course 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

<http://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens (usually near the end of the semester), and can complete evaluations through the email they receive from GatorEvals, or in their Canvas course menu under GatorEvals. Summaries of course evaluation results are available to students at <http://gatorevals.aa.ufl.edu/public-results/>.