

## STA 4211 Design and Analysis of Experiments Fall 2021

Class No. 17787, Sect. 183H, MWF 4th period, 10:40am–11:30am, FLO 100

Class No. 17788, Sect. 3H28, MWF 6th period, 12:50pm–1:40pm, FLO 100

**Instructor** Deborah Burr, 116C Griffin-Floyd Hall (FLO); see course website for Zoom Meeting id; Office Hours: MW 2:45pm - 3:45pm, or by appointment; Email: [burr@stat.ufl.edu](mailto:burr@stat.ufl.edu) (put “4211” in the subject line); Phone: 273-2973 (do not leave a message).

**Teaching Assistants** Saurabh Bhandari, Office Hours: TBD

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Dmitrii Nikiforov, Office Hours: Thursday 9am-11am, at <https://ufl.zoom.us/j/7772211843>

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### Required Materials

**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. 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** 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 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.

### 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                 |                        | 15% |
| ALC test                         | Friday September 10    | 5%  |
| Midterm 1:                       | Wednesday September 29 | 15% |
| Midterm 2:                       | Wednesday October 27   | 20% |
| Project 1:                       | Wednesday October 13   | 20% |
| Project 2/ALC Project for majors | Monday November 22     | 25% |

The midterms will be in-class tests. The due date for Project 2/ALC Project refers to the written paper; statistics majors will, in addition to the written paper, give their ALC Project talks during the five class days after Thanksgiving, 29 Nov - 8 Dec. The above dates are tentative and may have to be changed.

Note: The final exam period for 4th period class is Friday 17 Dec 7:30am–9:30am, and for 6th period is Thursday 16 Dec 12:30pm – 2:30pm. The final exam period will be used for make-up exams if a student has a valid academic or medically excused reason for missing the ALC test or midterms.

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; B<sup>+</sup> 87–89; B 80–86; B<sup>-</sup> 77–79; C<sup>+</sup> 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>.

**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` under Files/Homework on Canvas.

**Homework/Quizzes** Homework is a crucial part of learning the material. Homeworks on the lecture topics will be assigned weekly.

**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 second 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.

### Course Policies

**Homework** You are allowed to get help with homework problems, but your final write-up must be your own. Homework must be submitted on Canvas by the posted due date and time. 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** 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/](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.