STATISTICS 706 SYLLABUS
Fall 2016

John M. Grego
MW 8:05-9:20 WMBB 409
Office Hrs: WF 10-11:30

216A Leconte
777-5070
grego@stat.sc.edu

Text Lecture Notes and *Practical Data Analysis for Designed Experiments* by Brian S. Yandell

Disabilities If you qualify for accommodations because of a disability, please submit a letter to me from the Office of Student Disability Services the first week of class so that your needs may be addressed. The Office of Student Disability Services determines accommodations based on documented disabilities. Contact: 777-6142, LeConte 112A; *http://www.sa.sc.edu/sds*.

Learning Outcomes Students should be able to

- translate an experimental description into a statistical model, including identifying model restrictions and assumptions.
- develop appropriate hypothesis tests and statistical comparisons for non-standard designs; assess the appropriateness of computer packages' tests for non-standard designs.
- communicate experimental designs to a technical audience.
- evaluate and plan a sound experimental design, including randomization and power analysis.
- analyze experiments in the presence of common difficulties, including missing and unbalanced data.

Grading Grades will be weighted in the following way:

Take-home Mid-term exam	100 points
Homework/Classwork	100 points
Project	100 points
Take-home Final Exam	100 points
Total	400 points

The project can be undertaken with a partner (or partners) and will consist of a proposal, rough draft, polished final draft and (possibly) oral presentation. The project should be an experimental study, rather than an observational study, so that students have the opportunity to use appropriate experimental design techniques in practice. If there are compelling reasons for conducting an observational study, students must nonetheless include a proposal for an experimental study. I use the project to enhance (or reinforce) several skills you will need in your future (or current) career: written and oral communication, practical problem-solving and teamwork. The oral presentation could provide useful practice for academic as well as professional presentations.

You are encouraged to discuss homework and class assignments with your classmates and me, but all such assignments must be written independently. Do not copy any part of another

student's work or computer code. You are not allowed to discuss take-home exams with your classmates–please consult me if you have any questions. Incidences of cheating and academic dishonesty will be punished to the full extent allowed under university regulations.

Though we will discuss analysis and model diagnostics from time to time, the emphasis in this class will be on recognizing, constructing and planning designs and deriving appropriate hypothesis tests from designs. Our current text concentrates on design rather than analysis; for supplemental help with analysis, I have a "concordance" on the course web page that links material in this text to material in your STAT 704/705 text.

We will have some "in-class" activities that will help in your development as a statistics professional. Since design recognition is an integral skill for this course and the linear fashion in which we learn designs does not help develop this skill, we will have a "design of the week" posted on the Web page. The design will typically be too difficult for you to solve in its entirety but will have some familiar elements; I'd like you to be able to understand and articulate when complexities occur. Before class, you will upload a write-up of your ideas. I will discuss the design in the following class, including insights I have received from students. Grades will be based on preparation and participation.

For portions of the course in which the text is exemplary, we will have lectures that emphasize active learning. Before the scheduled lecture, you will have thoroughly read the day's material, and have prepared and uploaded a write-up for an on-line assessment of the material. I will discuss the material in class, and discuss students' insights in the following class. Grades will be based on preparation and participation.

Computers I will maintain a class web page that will be used to post lecture notes, homeworks, tests, and other course-related materials. The URL for the class web page is $http://www.stat.sc.edu/\sim grego/courses/stat706$. All assignments will be posted on Blackboard (though assignment materials will be on the website). Grading will be entirely electronic and handled through Blackboard.

We will be using two computer packages throughout the course. I tend to like to use the best available package for the job at hand and thus SAS and Minitab will be used appropriately, though SAS will be used much more frequently. Within this framework, I will always try to provide supplemental material on appropriate SAS code since familiarity with SAS is a course objective. Brian Yandell used R and Splus extensively in his course; I use R intermittently for classroom presentations.

Course Delivery Technology For J706: Course viewing information is available on Blackboard. The course can be watched live via Breeze/Adobe Connect (enter as a guest), or streamed/downloaded within 24 hours. Instructions for login are posted under Announcements in Blackboard. New this year, links will automatically be posted to Blackboard. I will use the computer extensively in class for demonstrations and introduction of computer software; all computing done by me in class will also be posted on the webpage. SAS is available on the PCs in Gambrell's basement (use your Blackboard login userid and password), as well as 5 computers (Computers 1-5) in the Cooper Technology Lounge on Level 5 of Thomas Cooper Library. But students should strongly consider copies for laptop use, since limited access to labs can affect course success. SAS licenses are available for student use for $60 from USC (accessed via the Purchase Computer Software tab in Self Service Carolina). Minitab can be rented (see webpage for the URL) and is also available on 10 computers in Gambrell 003 (the computers are in the front of the PC classroom and should have a Minitab sticker on them).

Date	Topic	Reading Assignment	Graded Work
8/22	Design Principles	1-3	
8/24	Design Principles	1-3	
8/29	CRD	5	CE 1
8/31	Power	5	DQ 1
9/5	Labor Day (no classes)		
9/7	Power	5	
9/12	No class (CE 2)	5	DQ 2
9/14	Estimability	7	HW 1
9/19	Two-level Design	8	DQ 3
9/21	Unbalanced (Estimability)	9	CE 3
9/26	Unbalanced (Inference)	10, 11	HW 2, DQ 4
9/28	Unbalanced (Inference)	10, 11	CE 4, CE 5
10/3	Latin Squares	11	
10/5	Fractional Factorial Design	11	HW 3, CE 6
10/10	Bayes Model Selection	11	Midterm distributed
10/12	One-way RE	19	
10/17	Two-way RE	20	
10/19	Two-way ME, RCBD	21	DQ 5
10/24	BIBD	22	CE 7
10/26	Nested Design	22	HW 4, Proposal due
10/31	Split Plot	23	CE 8
11/2	Split Plot with Covariates	24	DQ 6
11/7	Repeated Measures	25	DQ 7
11/9	REML	12	HW 5
11/14	Replicated LS	27	
11/16	Replicated LS	27	DQ 8
11/21	Multiple Imputation		Project Due
11/23	Thanksgiving–no classes		
11/28	Strip Plot	24	
11/30		Oral presentations	

The final exam will be due Friday, December 9.