Syllabus

Course Web Page: `http://rohan.sdsu.edu/~babailey/stat700`
and `blackboard.sdsu.edu`

Meeting Time: Lectures: MW 4:00 - 5:15 p.m. SSW 2649

Instructor: Professor Barbara Bailey
GMCS 513
email: bbailey@mail.sdsu.edu
Office Hours: M 2:00 - 3:30 p.m..; by appointment

Reference: The textbook for the course is

West, B. T., Welch, K. B., and Galecki, A. T. (2007). *Linear Mixed Models: A Practical Guide Using Statistical Software*, Chapman Hall/CRC Press.

OR

West, B. T., Welch, K. B., and Galecki, A. T. (2015). *Linear Mixed Models: A Practical Guide Using Statistical Software*, 2nd Edition. Chapman Hall/CRC Press.

Objectives: This course will provide students with basic theory and tools for advanced, computationally intensive data analysis techniques and applications. The technique areas include random and mixed effects models, repeated measures and longitudinal data analysis, generalized linear models, multilevel models, and nonlinear models.

With the explosion of computing power, data analysis methods for handling massive amounts of messy data with intricate correlation and signal patterns has become the norm. The course will equip students with the knowledge to apply and communicate statistical inference drawn from modern computational intensive data analysis techniques used in statistical practice.

Learning Outcomes:

- Summarize and carry out exploratory and descriptive analysis of data.
- Describe and conduct appropriate statistical modeling techniques for clustered, repeated measures, and longitudinal data.
- Use statistical methods, including nonparametric bootstrapping, to construct and interpret interval estimators for linear and nonlinear model parameters.
- Use R competently to model and interpret the results for the analysis of data.
- Derive the statistical properties of linear mixed models.
- Present and communicate, both orally and in written-form, the results of statistical analyses of data.

Homework: Homework assignments will be regularly available on the course web page as announced in class. The homework will contain a series of practice problems of which *selected problems* **will** be graded. The homework serves as a tool to review and practice the material covered in class. All material covered on the assignments can be questioned on the exams. Some problems may require computing and must include concise computer output with a clearly presented version of your code.

Late homework will not be accepted. You may drop your lowest percentage score.

Exams: There will be one in-class midterm Monday October 10, with a take-home portion due approximately the next week. The in-class part of the exam will be closed book. A hand calculator is necessary for all in exams. *No collaboration of any kind is allowed on the take-home part of the exam.*

No makeup exams are given - no exceptions.

The final exam will be given Monday, December 19 from 3:30 p.m. to 5:30 p.m. in SSW-2649. The final will be cumulative and comprehensive.

Project: As part of the course you will be asked to do a data analysis project. The project grade will be based in part on a brief 3-5 page written report in journal style format (i.e., 12 *pt* font, one inch margins, single-spaced, figures and tables clearly presented and labeled at the end of the abstract, page limit does not include figures, tables, nor bibliography) and a brief 5 minute presentation (depending on the size of the class) during the last full week of classes. You are required to attend *all* project presentations. Attendance at the presentations will be a part of your project grade.

The project will be done in groups or individually. You will illustrate and present data analysis concepts from the class or literature. In consultation with me, you may may choose a project of interest to you. As part of the project, expect to read the appropriate literature, write a report, and give an oral presentation to demonstrate a thorough understanding of and to illustrate the techniques/methods used in the class and article.

Grading: The grade for the class is based on a score composed of the following.

Homework	30 %
Midterm Exam	30 %
Project	10 %
Final Exam	30 %

Prerequisites: STAT 670B and STAT 510 (or equivalent)

Topics to be covered: basic outline; topics may be added and/or dropped as the semester proceeds.

1. Review Linear Models and ANOVA
   a. Matrix Theory
   b. Estimation and Projections
   c. Quadratic Forms
   d. Inference about Normal Models and Bootstrapping

2. Linear Mixed Models

    a. Fixed Effects vs. Random Effects

    b. Estimation of Parameters

    c. Computational Issues

    d. Hypotheses Testing

    e. Model Building Strategies

    f. Model Diagnostics

3. Multilevel Models

4. Models for Repeated-Measures Data

5. Models for Longitudinal Data

6. Nonlinear Models

    a. Nonlinear Least Squares

    b. Nonlinear Mixed Models

Tardiness and Early exits: The class time is from 4:00 - 5:15 p.m. As common courtesy to your fellow students, we would appreciate if you show up to class on time and leave when dismissed at 5:15. If you must leave early, please inform me and sit on the aisle near an exit so as not to disturb students listening to and trying to learn from the lectures.

Code of Academic Conduct on Examinations and Assignments: "At San Diego State University, students are invited to be active members of the educational community. As with any community, its members serve a vital role in determining acceptable standards of conduct, which includes academic conduct that reflects the highest level of honesty and integrity." The "Statement of Student Rights and Responsibilities clarifies for students their role as members of the campus community, setting forth what is expected of them in terms of behavior and contributions to the success of our university." "Inappropriate conduct by Students . . . is subject to discipline on all San Diego State University Campuses. The Center for Student Rights and Responsibilities coordinates the discipline process and establishes standards and procedures in accordance with regulations contained in Sections 41301-41304 of Title 5 of The California Code of Regulations, and procedures contained in Executive Order 628, Student Disciplinary Procedures for The California State University." See http://www.sa.sdsu.edu/srr/judicial for more info rmation.

Students with Disabilities: If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact Student Disability Services at (619) 594-6473. To avoid any delay in the receipt of your accommodations, you should contact Student Disability Services as soon as possible. Please note that accommodations are not retroactive, and that accommodations based upon disability cannot be provided until you have presented your instructor with an accommodation letter from Student Disability Services. Your cooperation is appreciated.

Other information: See course web page: http://rohan.sdsu.edu/∼babailey/stat700