

Course Information for STAT:7200 “Linear Models” Fall 2017

Instructor

Dale Zimmerman, a.k.a. “Dr. Z,” 217 Schaeffer Hall, Office phone 5-0818, Home phone 351-0520, E-mail dale-zimmerman@uiowa.edu

Class Hours and Location

Tuesday and Thursday, 9:30 am – 11:20 am; in 61 SH

Office Hours

1:00 – 3:00 pm Mondays and Wednesdays, or by appointment

Department Information

Department of Statistics and Actuarial Science, 241 Schaeffer Hall, Phone 335-2082

Department Executive Officer

Professor Joseph Lang, 241 Schaeffer Hall, Phone 335-0712, E-mail joseph-lang@uiowa.edu

Lecture Notes/Text

Lecture notes for the course will be provided by Dr. Z. These notes are in the process of becoming a book, and reading will be assigned from them. Because they are a work in progress, they may be added to or otherwise modified during the semester. With one exception, the notes are self-contained, i.e., there is no need to do any reading outside of them. The exception is the material on matrix algebra useful for linear models; for this, frequent reference will be made to *Matrix Algebra from a Statistician’s Perspective*, by David A. Harville (Springer). Purchasing this book is strongly recommended, but not required.

Exams

- 2 two-hour, in-class, midterm exams; the first will be given in early October and the second will be given in mid-November. Exact dates TBD.
- 1 two-hour final exam, time and place TBD.

Homework

Written assignments are an *essential* component of the course. Assignments generally consist of 5-10 problems, some of which are lengthy, and will be given at intervals of approximately 10-14 days. Assignments must be turned in by the beginning of class on the day they are due. Unless prior arrangements are made, late homework will receive a score no higher than 50%. Students may work on homework problems together, provided that no outright plagiarism occurs.

Attendance

Attendance at lectures and participation in discussions are expected. Failure to attend class regularly will adversely affect your grade, and no help will be offered on homework problems requiring material in class that you miss (unless you have a valid excuse).

Grading

- Homework, 25%
- Midterm exams, 50% (25% each)
- Final exam, 25%

A plus-minus grading system will be used. In the past, all students who have achieved a percentage of 50% or higher on exams have earned at least a B- grade, and all who have achieved a percentage of 75% or higher on exams have earned at least an A- grade.

Course Objectives

1. To provide a fairly rigorous presentation of the theory underlying statistical applications of linear models (regression, ANOVA, BLUE, multiple comparisons, BLUP, variance component estimation, etc.).
2. To equip the Ph.D. student in Statistics (or related fields) to read journal articles and begin thesis research, possibly on some topic that overlaps with linear models.

Not a Course Objective

To analyze data or become familiar with “linear models methods” for data analysis and interpretation through the use of statistical computing packages.

Topics Considered

1. Matrix preliminaries, e.g., basic results on linear spaces, linear independence, transposes, ranks, inverses, traces, determinants, nonnegative definite and positive definite matrices
2. Generalized inverses and systems of linear equations
3. Expectations, variances, and covariances of linear and quadratic forms
4. Estimability and unbiasedness
5. Ordinary least squares for classical (fixed-effects, unconstrained) linear models: orthogonal projections, reparameterizations, Gauss-Markov Theorem, algebraic and geometric structure of the analysis of variance, partitioning the ANOVA
6. Generalized least squares
7. Best linear unbiased prediction (BLUP), random and mixed linear models
8. Multivariate normal, noncentral chi-square, noncentral F and t distributions
9. Moment generating functions and distributions of linear and quadratic forms; independence of quadratic forms; Cochran’s Theorem
10. Hypothesis testing, confidence intervals and regions, simultaneous confidence intervals and multiple comparisons

11. Estimation of variance components, including maximum likelihood and restricted maximum likelihood (REML) approaches
12. Other topics as time permits

Administrative Home

The College of Liberal Arts and Sciences is the administrative home of this course and governs matters such as the add/drop deadlines, the second-grade-only option, and other related issues. Different colleges may have different policies. Questions may be addressed to 120 Schaeffer Hall or see the CLAS Student Academic Handbook

http://www.clas.uiowa.edu/students/academic_handbook/index.shtml

Electronic Communication

University policy specifies that students are responsible for all official correspondences sent to their standard University of Iowa e-mail address (@uiowa.edu). Students should check this account frequently. (Operations Manual, III.15.2. Scroll down to k.11.)

Academic Fraud

Plagiarism and any other activities when students present work that is not their own are academic fraud. Academic fraud is a serious matter and is reported to the departmental DEO and to the Associate Dean for Undergraduate Programs and Curriculum. Instructors and DEOs decide on appropriate consequences at the departmental level while the Associate Dean enforces additional consequences at the collegiate level. See the CLAS Student Academic Handbook.

Making a Suggestion or a Complaint

Students with a suggestion or complaint should first visit the instructor, then the course supervisor, and then the departmental DEO. Complaints must be made within six months of the incident. See the CLAS Student Academic Handbook.

Accommodations for Students with Disabilities

The University of Iowa is committed to providing an educational experience that is accessible to all students. A student may request academic accommodations for a disability (which include but are not limited to mental health, attention, learning, vision, and physical or health-related conditions). A student seeking academic accommodations should first register with Student Disability Services and then meet with the course instructor privately in the instructor's office to make particular arrangements. Reasonable accommodations are established through an interactive process between the student, instructor, and SDS. See <http://sds.studentlife.uiowa.edu/> for more information.

Understanding Sexual Harassment

Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community have a responsibility to uphold this mission and to contribute to a safe environment that enhances learning. Incidents of sexual harassment should be reported immediately. See the UI Comprehensive Guide on Sexual Harassment at

<http://www.uiowa.edu/~eod/policies/sexual-harassment-guide/index.html>

for assistance, definitions, and the full University policy.

Reacting Safely to Severe Weather

In severe weather, class members should seek appropriate shelter immediately, leaving the classroom if necessary. The class will continue if possible when the event is over. For more information on Hawk Alert and the siren warning system, visit the Public Safety web site, <http://www.uiowa.edu/~pubsfty/intlinks.htm>

Nondiscrimination in the Classroom

The University of Iowa is committed to making the classroom a respectful and inclusive space for all people irrespective of their gender, sexual, racial, religious or other identities. Toward this goal, students are invited to optionally share their preferred names and pronouns with their instructors and classmates. Expressions of hate and bigotry directed at individuals or identities are not acceptable. For more information, contact the Office of Equal Opportunity and Diversity, diversity@uiowa.edu or visit diversity.uiowa.edu.