Time and Place: Tuesday and Thursday from 10 am to 12 am in Sequoia 200

Instructor:
Johannes Ledolter
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Office Hours: Tuesday and Thursday from 9 am to 10 am and by appointment

Prerequisites: as specified on Departmental website


The Montgomery text is a standard for a course of this type. It is a good reference book, but not necessarily a good text for learning the main ideas. I will follow my own books (the two books under additional readings) and I will make pdf copies available. Please don’t circulate and do not put the notes on the web.

Additional Readings (made available in electronic form):


Another great book (recommended, but not required):


Software: Minitab (mostly), JMP, R
Course Objectives:

This course emphasizes the practical aspects of experimental design and analysis. At the end of the course, you should understand the models and assumptions commonly used for experimental data, and be comfortable planning and analyzing an experiment. Also, you will learn how to use computer software to randomize experiments, fit fixed-effects and mixed-effects models, perform multiple comparisons and other follow-up analyses, and determine the required sample size.

All scientific investigations involve experimentation. One needs to understand how to carry out the experiments in an efficient manner and how to analyze the resulting data. The topics we discuss are important in the physical sciences and in medicine. For example, one needs to learn which drugs work best and one needs to learn about this as fast as possible and with the least number of subjects. But experimental techniques are also important in business, economics, and the social sciences. Testing or experimentation in the business world is commonplace. In the increasingly competitive global economy, firms are constantly under pressure to reduce costs, increase productivity, and improve quality. The course will discuss real cases based on the actual implementation of experimental design methods. Mother Jones magazine, for example, had extensive experience in direct mail testing aimed at increasing their subscription rates. Their protocol was to test only one change, such as the color of the envelope, in each mailing to potential subscribers. Using experimental design methods, the firm was able to test seven factors simultaneously in a single mailing. Moreover the sample size required (the number of people receiving the mailing) was the same as that needed to test just a single factor. The results showed a more than 25 percent increase in the subscription rate and demonstrated to management the value of this multi-variable approach.

Topics: We will cover primarily textbook chapters 1-8, 11, and 13/14 (time permitting). Supplements will be provided via handouts.

1 Introduction
2 Simple Comparative Experiments
3 Experiments with a Single Factor: The Analysis of Variance
4 Randomized Blocks, Latin Squares, and Related Designs
5 Introduction to Factorial Designs
6 The 2k Factorial Design
7 Blocking and Confounding in the 2k Factorial Design
8 Two-Level Fractional Factorial Designs
11 Response Surface Methods and Designs
14 Nested and Split-Plot Designs

Course Work: There will be two brief (most likely, take-home) exams (a midterm and a final), weekly home works, and a project. The home works and the project should be done in groups of 2 or 3. Organize groups as soon as possible. Your study group will carry out a project where you design and carry-out an experiment to study a topic of interest to your group.

Grading: Two exams (25 percent each), project (30 percent) and HW (20 percent)
Late Work and Absences: If you must miss class due to an illness or family emergency, please inform me immediately if at all possible and get caught up as quickly as possible. Don't ever get more than a week behind, as it becomes very hard to catch up. If there is a pattern of excessive absences from the lecture, I will warn you; if the pattern continues, I will drop you from the course.

Accommodations for Disabilities: Please contact me during the first week if you seek academic accommodations for a disability.