ISYE 6413: Design and Analysis of Experiments

Fall, 2020

Time: M, Wed 12:30-1:45pm, no room assignment

Instructor: C. F. Jeff Wu, Professor and Coca Cola Chair in Engineering Statistics
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Office hours: by online appointments

TA: Zexing Song, zsong91@gatech.edu
T.A. office hour: Th 3:30-4:30

Prerequisite: Knowledge of basic statistical methods at the undergraduate level

Topics:
1. Basic principles and introduction to regression analysis (Chapter 1)
2. Experiments with a single factor, analysis of variance, random effects model (Chapter 2)
3. Experiments with more than one factor, blocking, Latin squares, analysis of variance and covariance, split-plot experiments, other analysis techniques (Chapter 3)
4. Factorial experiments at two levels, comparison with "one-factor-at-a-time" plans, analysis of location and dispersion, choice of optimal blocking schemes (Chapter 4 except sections 13 and 14)
5. Fractional factorial experiments at two levels, maximum resolution and minimum aberration for choosing optimal 2^{n-k} designs, choice of optimal blocking schemes (Chapter 5); conditional main effects (CME) analysis to de-alias aliased effects (in class notes)
6. Introduction to fractional factorial experiments at three levels (Sections 6.1-6.5, 6.8)
7. Orthogonal arrays (Sections 8.1-8.2 and part of Sections 8.3-8.5, learn to use the OA tables in Appendices 8A-8C), analysis of experiments with complex aliasing (part of Sections 9.1-9.4). brief introduction to response surface methodology (part of Sections 10.1-10.3)
8. Variation reduction, robust parameter design for product and process improvement (Chapter 11 except sections 11.8 and 11.10)

Required Text: "Experiments: Planning, Analysis and Optimization", **2nd Edition**
(by C. F. Jeff Wu and Mike Hamada), 2009, John Wiley.
All data sets in the book can be downloaded from my website
http://www.isye.gatech.edu/~jeffwu/isye6413/
Lecture notes in PPT format will be available on my site, also be available from Wiley's ftp site. These slides are a concise summary of the book materials for the given sections. They make specific reference to the section or page number in the book. So you can learn a lot more from reading both the slides and the book.

First class will be live to explain general information about the course and answer questions. After that, see the delivery mode below.

Delivery Mode: This is a fully **remote** course. All lecture materials are available in ppt slides. All slides are available on my homepage (and the video version on canvas). You should read them at your own pace, sometimes you need to refer to the book for more details. I will make *videos* to accompany the slides for each unit. Because each unit is quite long, I will make two videos for each, called 1a, 1b, --, 8a and 8b etc. You can find them under "*media gallery*" in canvas. I will send emails to the whole class regularly to remind you by when you should read which video unit. Then I will hold *online meetings* right after at the designated class times, which are M, Wed 12:30-1:45pm. I will NOT repeat the lectures on live-stream during these times. You are supposed to have read the video unit I assigned previously. In the "class", I will quickly go thru the slides you have read, take you questions and give my reply and further explanation. Each class meeting is recorded and available in "bluejeans" so that you can review them afterward or if you cannot attend it. It usually starts at 12:40 and can last for 30-60 minutes, depending on how many questions you have. You will get bluejeans meeting notice, then you click the link to join the meeting.

Grading Policy: Eight homework sets (70%), two take-home exams (15% each). Duration for each take-home is 2 days.

Many real data and experiments are included in the textbook and will be covered in the course.

SECOND EDITION

EXPERIMENTS
Planning, Analysis, and Optimization

C. F. JEFF WU AND MICHAEL S. HAMADA