STATISTICS 6910
Autumn 2016, TR 8:30 – 10:20

COURSE INFORMATION

Instructor: William Notz
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Office Hours: M 11-12, W 12:00-1:00, Th 1-2, by appointment

Grader: Hengri Luo, CH 420

Text: *Design and Analysis of Experiments* by Angela Dean and Daniel Voss

Room: EA 285

LEARNING OBJECTIVES

• Be able to perform basic statistical inference (one- and two-sample, randomization methods, two-way
tables)._
• Understand basic principles of good design (randomization, replication, blocking).
• Understand and correctly interpret models for factorial experiments (main effects, interactions).
• Be able to analyze data from factorial experiments, including diagnostics, methods to address model inadequacy, and multiple comparisons.
• Understand the issues involved in determining the sample size for factorial experiments and be able to compute the needed sample size for balanced factorial experiments.
• Understand the difference between fixed and random effects, and be able to analyze mixed models.
• Be able to recognize and analyze data from experiments with some special types of randomization (blocking)
• Understand the concept of aliasing.
• Be able to design and analyze some basic two-level fractional factorial experiments.
• Be able to use software to design and analyze experimental data.

HOMEWORK and EXAMS

Approximately ten homework assignments will be given during the term. These will be graded by the course grader (a statistics graduate student) and only selected problems graded. If you have questions about how a problem has been graded or if you do not understand a problem, please speak to me. Also, I plan to post solutions on Carmen. Homework will usually be collected on Tuesdays.

There will be one midterm exam and a final. All will be in class. The midterm exam will (tentatively) be Thursday October 20. The final exam will be Tuesday December 13, 8:00-9:45. Problems will be similar to the homework questions you have had, so if you understand the homework, you should be able to do well on the exams.

HOLIDAY

October 13, 14 Autumn break. November 23--25 Thanksgiving break.

GRADING

Course grades will be based on the following formula

Midterm	25%
Final	30%
Homework	45%

SOFTWARE

I will tend to emphasize the use of two packages: R and the JMP software package. R is available for free for Unix, Windows, or Macintosh operating systems. Use Google to find the download site. R is not menu driven and so takes some effort to learn. One of the weakest features of R is, unfortunately, using it to design and analyze designed experiments. The authors of your textbook have provided drafts of material on using R and I will post these on Carmen.

JMP is menu driven and has several nice features for the design and analysis of experiments. It is produced by SAS. One advantage for OSU users is that you can get a Windows or Macintosh version for free from the Office of Information Technology (see below).

Your textbook emphasizes the use of SAS for analyzing data. SAS is a very comprehensive statistical package, although it is nontrivial to learn to use. It is very popular in business and industry, so that learning to use SAS is worthwhile (in fact, some employers look favorably on applicants who are familiar with SAS). SAS is available to Windows users from the Office of Information Technology (see below).

Another popular software package is Minitab. Minitab has a menu driven interface and is a bit easier to use than JMP. Unfortunately, Minitab runs only on Windows machines and is only available to faculty and regular staff through OSU. A 30 day free trial version of Minitab can be downloaded at http://www.minitab.com/en-us/academic/

For information about site-licensed software, see the OIT web site at https://ocio.osu.edu/software

Thompson Library has computers available for public use. I suspect that these have SAS, Minitab, and JMP on them, but check with the library.

TENTATIVE SYLLABUS

Topic	Chapters in the text	Week
One and two-sample problems, introduction to software		1
Randomization-based inference, goodness-of-fit tests, two-way tables		2
ONE-WAY ANALYSIS OF VARIANCE		
Completely randomized designs		2
One Way Analysis of Variance	3.1-3.5	3
Choosing sample size and power	3.6	4
Tests and confidence intervals for contrasts	4.1-4.3	4,5
Multiple comparisons	4.4	5
Choosing sample sizes from confidence intervals	3.5, 4.5	6
Checking model assumptions	5	7
MULTIFACTOR ANALYSIS OF VARIANCE		
Model	6.1-6.3, 7.1-7.2	8
Analysis of the complete model	6.4	8, 9
Midterm Exam October 20		
Analysis of the complete model	7.3-7.4	10
Using software	6.8, 7.7	10
Choosing sample sizes	6.6	11
Multiple Comparisons	6.3-6.4, 7.4	11
Diagnostics		12
Single replicate experiments	7.5	12
Nested and Mixed models	17.7-17.8	13, 14
BLOCK DESIGNS		
Randomized block designs and analysis	10	14
FACTORIAL EXPERIMENTS		
Confounding in single replicate experiments	13.1-12.6, 13.8	14
Fractional factorials	15.2, 15.6	15

Final Tuesday December 13, 8:00 – 9:45, EA 285