STATISTICS 6410
Spring 2020, TR 9:05 – 10:55 AM
McPherson Lab 1040

COURSE INFORMATION

Instructor 1: William Notz
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Instructor 2: Shili Lin
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Grader: Mr. Chenggong Han; email: han.1071@osu.edu

Text: *Design and Analysis of Experiments, 2nd Ed.* by Angela Dean, Daniel Voss, and Danel Draguljic.

LEARNING OBJECTIVES

• 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, split plots)
• 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 ask the instructors. Also, solutions will be posted on Carmen. Homework will usually be collected on Thursdays.

There will be one midterm exam and a final. All will be in class. The midterm exam will (tentatively) be Thursday February 27. The final exam will be Monday April 27, 8:00 - 9:45 AM. 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.

HOLIDAYS

Monday January 20 is a holiday (Martin Luther King Day). March 9-13 is Spring break.

GRADING

Course grades will be based on the following formula

Midterm	30%
Final	50%
Homework	20%

SOFTWARE

Your textbook emphasizes the use of SAS or R 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 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).

R is also a popular software tool, especially in academia, and now in industry as well. R is available for free for Unix, Windows, or Macintosh operating systems. Your book discusses how to use R; additional information as well as demos and scripts will be given in class.

JMP is another software package. It 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).

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. Minitab can be rented for a nominal fee – for information see http://www.minitab.com/en-us/academic/.

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

The Thompson Library may have computers available for public use. Check with the library to see whether SAS, Minitab, and JMP have been installed in them.

TENTATIVE SYLLABUS

Topic	Chapters in the text	Week
Review (testing, confidence intervals, introduction to software		1
General principles	1, 2	1
ONE-WAY ANALYSIS OF VARIANCE		
Completely randomized designs		2
One Way Analysis of Variance	3.1-3.5	2,3
Choosing sample size and power	3.6	3
Tests and confidence intervals for contrasts	4.1-4.3	4
Multiple comparisons	4.4	5
Checking model assumptions	5	6
MULTIFACTOR ANALYSIS OF VARIANCE		
Model	6.1-6.3, 7.1-7.2	7
Analysis of the complete model	6.4	8
Midterm Exam February 27		
Analysis of the complete model	7.3-7.4	9
Using software	6.8, 6.9, 7.6, 7.7	9
SPRING BREAK		10
Choosing sample sizes	6.6	11
Multiple Comparisons	6.3-6.4, 7.3-7.4	11
Diagnostics	6.2.3	12
Single replicate experiments	6.7, 7.5	12
Nested and Mixed models	17, 18	13
BLOCK DESIGNS and SPLIT PLOTs		
Randomized block designs and analysis	10	14
FACTORIAL EXPERIMENTS		
Confounding in single replicate experiments	13.1-13.6, 13.8	14
Fractional factorials	15.2	15

Final Monday April 27, 8:00 – 9:45 AM, McPherson Lab 1040