

STATISTICS 6410  
Spring 2016, TR 9:10 – 11:00

COURSE INFORMATION

**Instructor:** William Notz  
Office: 319 Cockins Hall, 1958 Neil Avenue  
Phone: 292-3154  
email: [win@stat.osu.edu](mailto:win@stat.osu.edu)

**Office Hours:** M 12-1, W 12:30-1:30, Th 1-2, by appointment

**Grader:** Weiyi Xie, CH 238

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

**Room:** MQ 0160

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 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 March 3. The final exam will be Monday May 2, 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

Monday January 18 is a holiday (Martin Luther King Day). March 14-18 is Spring break.

## GRADING

Course grades will be based on the following formula

Midterm	25%
Final	30%
Homework	45%

## SOFTWARE

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).

I will tend to emphasize the use of the JMP 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. 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>

A very popular software package is R. 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. However, if you are interested in using R, you can find information about downloading the software and getting started online. Also, the authors of your textbook are working on a revision that will include R commands and I have made copies of the drafts of the new material on R available on Carmen.

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
Review (testing, confidence intervals, introduction to software)		1
General principles	1, 2	1, 2
<b>ONE-WAY ANALYSIS OF VARIANCE</b>		
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	6, 7
<b>MULTIFACTOR ANALYSIS OF VARIANCE</b>		
Model	6.1-6.3, 7.1-7.2	7
Analysis of the complete model	6.4	8
Midterm Exam March 3		
Analysis of the complete model	7.3-7.4	9
Using software	6.8, 7.7	9
Choosing sample sizes	6.6	10
Multiple Comparisons	6.3-6.4, 7.4	10
Diagnostics		11
Single replicate experiments	7.5	11
Nested and Mixed models	17.7-17.8	12, 13
<b>BLOCK DESIGNS and SPLIT PLOTS</b>		
Randomized block designs and analysis	10	13
Simple split plots designs and analysis	19.1-19.3	14
<b>FACTORIAL EXPERIMENTS</b>		
Confounding in single replicate experiments	13.1-12.6, 13.8	14
Fractional factorials	15.2, 15.6	15
Final Monday May 2, 8:00 – 9:45, MQ 0160		