

Advanced Statistical Methods

Supplemental Reading List

Course Text

As mentioned in the course syllabus, given the nature of this course, there are no required textbooks. Notes or references to course material will be given throughout the semester. For reference, the following are some standard textbooks that cover various parts of the course. Rice University is generally not able to provide copies of these texts for your use. Electronic copies of some of these books or important monographs are available on the WWW or in our Canvas files.

Of particular interest

Statistics for Experiments, 2nd ed., is freely available online as a pdf. It is a very good reference for design of experiments (DOE); not so good for linear models.

Experiments: Planning, Analysis, and Optimization, 2nd ed., covers much of the material on DOE and linear models that we will cover. This is one of two books we would recommend buying if you want a book. Many of the class notes on DOE and linear models are from these two books.

Rory Allen, *Statistics and Experimental Design for Psychologists: A Model Comparison Approach*, New Jersey: World Scientific, 2018. This is the other book we would recommend your buying; it gives a different perspective on the meaning of statistics and DOE.

Paul Ellis, *The Essential Guide to Effect Sizes*, Cambridge University Press, 2010. Explicates statistical power, meta-analysis and the interpretation of research results.

Applied Statistics

Freedman, Pisani, and Purves (2007), *Statistics, 4th ed.*, Norton. This outstanding book is on the nature of statistics and that teaches you how to think like a statistician. Any edition will do. The first part of book discusses basic study design, including both experiments and observational studies. The book also has a nice chapter on surveys. The discussions on hypothesis testing are outstanding. This book should be read by everyone wanting to analyze data.

Alan Agresti, *Categorical Data Analysis*, New York: John Wiley and Sons, 1990. Classic treatment of categorical analysis, small and large sample fundamentals.

Study and Experimental Design and Analysis

John Lawson, *Design and Analysis of Experiments with R*, CRC Press: Boca Raton, FL, 2015. Leaves hand calculations to other reference texts and instead focuses on experimental design and implementation in the R language (companion text uses SAS).

Howard Seltman, *Experimental Design and Analysis* (11/11/2018), Carnegie Mellon University. Introductory ED and analysis techniques. Provides insight into interpretation of analysis coefficients valid design. Text is available on Canvas.

R. Sokal and J. Rohlf, *Biometry, 3rd Ed.*, New York: W.H. Freeman and Company, 1995. 3rd edition of Sokal's 1969 classic encyclopedic reference.

Box, Hunter and Hunter (2005), *Statistics for Experiments, 2nd ed.*, Wiley. A classic on the practice of data analysis and experimental design. Unlike other books, this one uses an analysis of variance (ANOVA) decomposition and not linear models per se for the analysis

of designed experiments. The ANOVA decomposition is associated with a geometric interpretation based on vector space projections. A lot of practical advice is given with some emphasis on alternative methods of analysis to the usual Gaussian/Normal approaches. The second edition is freely available online as a pdf document. Both versions discuss randomization (permutation) tests.

C. Patrick Doncaster and Andrew Davey, *Analysis of Variance and Covariance*, Cambridge University Press, 2007. Excellent treatment of the ANOVA/ANCOVA in most experimental designs, with examples in R.

Kutner, Nachtsheim and Neter (2004), *Applied Linear Regression Models, Fourth Edition*, McGraw-Hill Irwin (ISBN: 978-0-07-301344-2). This is the text Dr. Guerra likes for STAT 410. Chapter 5 is a good self-contained presentation of the linear algebra you are expected to know for STAT 411/616.

Kutner, Nachtsheim, Neter, and Li (2005), *Applied Linear Statistical Models, Fifth Edition*, McGraw-Hill Irwin (ISBN-13: 978-0073108742). The first half of this book is in effect the authors' text on regression (above). The second half covers a wider class of models, as well as applications in experimental design. As far as I know, this text is out of print but many editions are available online.

Wu and Hamada (2009), *Experiments: Planning, Analysis, and Optimization, Second Edition*, Wiley (ISBN-13: 978-0471699460). An excellent text that emphasizes experimental design from a relatively modern viewpoint. The coverage of the models used to analyze DOE data is excellent.

R.N. Cardinal, *ANOVA in Practice and Complex ANOVA Designs*, Behavioural and Clinical Neuroscience Institute, Department of Psychiatry, University of Cambridge (5/1/2004). Text is available on Canvas.

Mason, Gunst, and Hess, *Statistical Design and Analysis of Experiments, 2nd Ed.*, Wiley, 2003. An interesting presentation of the material. The first half covers design and the second covers analysis. Emphasis is on concepts and applications with many examples and exercises from engineering.

Generalized Linear Models

Dobson and Barnette (2008), *An Introduction to Generalized Linear Models, 3rd ed.* The first edition of this text was introduced in 1990 as a very good introduction to GLM for readers more interested in applications than theory. Any edition is a good reference.

Henrik Madsen and Thyregod, P. (2011), *Introduction to General and Generalized Linear Models*, New York: CRC Press. Almost a handbook, this volume is a clear explication, and it has applications in R.

McCullagh and Nelder (1989), *Generalized Linear Models, 2nd ed.* The bible of GLMs. This text was the first on GLMs and covers both comprehensive theory, methods and has many case studies.

Bootstrap

Efron and Tibshirani, *An Introduction to the Bootstrap*, 1994, Chapman & Hall/CRC. Efron is thought by most to be the inventor of the bootstrap, although Julian Simon was really the first to use/advocate statistical resampling. Efron and Tibshirani emphasizes concepts, technique and application.

Nonparametrics

Bonnini, Corain, et al., *Nonparametric Hypothesis Testing: Rank and Permutation Methods with Applications in R*, West Sussex: John Wiley & Sons, 2014.

Lehmann, E.L. and D'Abbrera, H.J.M, *Nonparametrics*, San Francisco:Holden-Day, Inc., 1975.

Siegel and Castellan, *Nonparametric Statistics for the Behavioral Sciences*, 2nd Ed. New York: McGraw-Hill, 1988. 1988 update of Siegel's 1956 classic.

Wasserman, Larry, *All of Nonparametric Statistics*, New York: Springer, 2006.

Other Recommended Titles

S.S. Rao, *Advanced Statistical Inference* (4/26/2017), Texas A&M University. Text is available on Canvas

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