

STSCI 7170 THEORY of LINEAR MODELS – FALL 2017

TIME: Tuesday, Thursday: 2:55-4:10pm, 112 Ives Hall

PREREQUISITES: BRTY 4090,6020, Matrix Algebra or equivalents

INSTRUCTOR: Jim Booth, Professor
Biological Statistics and Computational Biology
and Department of Statistical Science
1172 Comstock Hall
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OFFICE HOURS: TBA

COURSE DESCRIPTION: Theory for the analysis of linear models. Properties of the multivariate normal distribution. Distribution theory for quadratic forms. Properties of least squares and maximum likelihood estimates. Methods for fixed effect models of less than full rank. Analysis of balanced and unbalanced mixed effects models. Restricted maximum likelihood estimation. Other potential topics if time permits include: generalized inverses, linear discriminant analysis, canonical correlation, semi-parametric regression.

GRADING POLICY: Homework will be assigned periodically. Homework assignments may involve data analysis and computation requiring students to use the R package. In addition, if the enrollment permits it, students may be required to give a 15-minute presentation at the end of the semester.

TEXT: I will generally follow the material in the book "**Linear Models -- A Mean Model Approach**" by **Barry Kurt Moser, 1996**: Academic Press. ISBN 0-12-508465-X. Some material may be taken from other sources. Note that the book is available online through the Cornell Library system, and so there is no need for students to purchase it.

RELATED REFERENCES:

Arnold, Steven (1981) "The Theory of Linear Models and Multivariate Analysis", Wiley. ISBN 0471050652

Bates, D.M. (2010) "lme4: Mixed-Effects Modeling with R", <http://lme4.r-forge.r-project.org/book/front.pdf>

Christensen (2011) "Plane Answers to Complex Questions: The Theory of Linear Models", 4th Ed. Springer. **

Draper and Smith (1998). "Applied Regression Analysis", 3rd Ed. Wiley.

Graybill (1976) "Theory and Application of the Linear Model", Wadsworth & Brooks/Cole. ISBN 0878721088

Harville (1997) "Matrix Algebra from a Statistician's Perspective", Springer, ISBN 0-387-94978-X **

Khuri (2010). "Linear Model Methodology". Chapman and Hall/CRC. ISBN 9781584884811 **

Searle (1971) "Linear Models", Wiley: New York. ISBN 0471769509

Searle (1982) "Matrix Algebra Useful For Statistics", Wiley. ISBN: 0271-6356

Searle, Casella and McCulloch (1992). "Variance Components", Wiley. ISBN 0-471-62162-5.

Rao, C.R. (1973) "Linear Statistical Inference and Its Applications", 2nd Ed., Wiley: New York. ISBN 047170732

Verbeke and Molenberghs (2000). "Linear Mixed Models for Longitudinal Data". Springer. ISBN 0-387-95027-3.

**Available online through the Cornell University Library system

Links

BSCB home. <http://www.bscb.cornell.edu/>

My website. <http://faculty.bscb.cornell.edu/~booth/>

The R Project for Statistical Computing. <http://www.r-project.org/>

RStudio download site: <http://www.rstudio.com/>

Swirl: online R/RStudio courses: <http://swirlstats.com/students.html>

Academic Integrity

As per university policy, all syllabi should contain some reference to the **Cornell Academic Integrity Code**. Violations are dealt with seriously, so please read it:

<http://www.cuinfo.cornell.edu/Academic/AIC.html>

Accommodations for Students with Disabilities:

In compliance with Cornell University policy and equal access laws, Professor Booth is available to discuss appropriate academic accommodations that may be required for students with documented disabilities. Except for unusual circumstances, requests for academic accommodations should be made during the first three weeks of the semester. Students are strongly encouraged to register with Student Disability Services to verify their eligibility for appropriate accommodations.