BIOS 545: Principles of Experimental Analysis

Spring 2017

Lectures:	Tuesday, Thursday	12:30-1:45 pm,	McGavran – Greenberg 2306
Lab:	Wednesday	3:35-5:25 pm,	McGavran – Greenberg 1301

Instructor

Pranab Sen pksen@bios.unc.edu 919-966-7274

Office Hours: Wednesday 11:00-12:00 McGavran – Greenberg 3105E

TA: Shaina Mitchell shainam@email.unc.edu Thursday 3:00-4:00

Sean McCabe mccabes@email.unc.edu Mondays 2:30-3:30 McG 1305

Course Description

The following is the official course description from the catalog:

> 545 PRINCIPLES OF EXPERIMENTAL ANALYSIS (3). Prerequisites, BIOS 600 or equivalent; a basic familiarity with a statistical software package (preferably SAS) that has the capacity to do multiple linear regression analysis; permission of the instructor except for majors in School of Public Health. Continuation of Biostatistics 600; the analysis of experimental and observational data, including multiple regression, and analysis of variance and covariance. Spring.

This course covers the analysis of experimental and observational data, focusing on multiple regression, analysis of variance and analysis of covariance.

Prerequisites

Bios 600, Bios 500H, or permission from the instructor. It is highly recommended that you have taken Bios 511. Knowledge of algebra, and basic concepts of probability. Students are expected to know the following statistical topics:

- Sample, population, descriptive statistics
- Estimation, sampling distributions
- Normal, F, t, and chi-square distributions
- Confidence intervals
- Hypothesis testing

Computing will be required, and will be done with SAS/R. These topics will be reviewed in the lab classes.

Major Topics

- Simple & Multiple Linear Regression
- Model Checking: diagnostics, transformations, influential observations, lack-of-fit test
- Multicollinearity and associated phenomena
- Model Selection
- ANOVA, ANCOVA as special cases of multiple regression
- Situations where other types of models are used

Course Objectives

- Become familiar with statistical concepts that are important in understanding linear models, including exploratory data analysis, parameter estimation, and hypothesis testing

- Understand how the development of a statistical model is motivated by substantive research questions (and specifically, to be able to connect research ideas to a concrete multiple regression model)
- Develop the ability to use statistical concepts to help you think about how your data are related to a substantive research question
- Develop data analytical skills including familiarity with several statistical routines
- Develop skills in using SAS to conduct statistical analyses
- Develop the ability to talk about statistics in simple, short, and clear ways (proverbially: develop the ability 'to explain it to your grandmother')
- Develop writing skills needed to communicate the results of data analyses

Textbooks

Required:

- Kutner, D., Nachtsheim, C., and Neter, J. (2004). *Applied Linear Regression Models*. 4e. McGraw-Hill/Irwin. ISBN-13: 978-0073014661

Optional References:

Basic statistics:

- Moore, D. S. and McCabe, G. P. (2003). *Introduction to the Practice of Statistics*. 4ed. Freeman.

Regression:

- Kleinbaum, D.G., Kupper, L.L., Nizam, A., and Muller, K.E. (2013): *Applied Regression Analysis and Multivariable Methods, 5th Edition*. Thomson, CA. ISBN-13: 9781285051086

SAS:

- Delwiche, L. D. and Slaughter S. J. (2008). *The Little SAS Book*. 4ed. SAS Institute.

Course Requirements / Assessment

Homework:	20%
Attendance/Participation	10%
Midterm exams	
February 23rd , 2017 In Class	20%
March 23rd , 2017 In Class	20%
Final exam (12:00 pm Noon, Tuesday, May 5, 2017):	30%

All Exams will be closed book, closed note. Calculators will be allowed.

Grading:

SPH graduate students:

H: Clear excellence	92-100
P: Entirely satisfactory	80-92
L: Low passing	70-80
F: Fail	< 70

Undergraduate Students:

A :	94-100	C+:	75-80
B+:	90-94	C :	71-74
B :	85-90	C- :	65-70
B- :	81-84	D :	60-65
		F :	< 60

Attendance Policy & Late Work

The course is designed so that students should be successful with active participation and regular, punctual attendance. **Attendance is required for all lectures and labs.** Late homework and missed classes will only be allowed for students with university excused absences or circumstances which the instructor finds a reasonable cause for non-attendance (e.g., a death in the family). Late homework will receive a 15% deduction for each day after the due date. If a class is missed, it is the student's responsibility to determine what assignments were missed and what material was covered.

Drops & Incompletes:

For more detailed information, contact the registrars office or consult the instructor or TAs. Please be aware of the drop deadlines.

Honor Code:

Please review the UNC Honor Code (http://honor.unc.edu/). All students are expected to abide by the Honor Code at all times. All suspected Honor Code violations will be reported to the UNC Dean of Students, who will investigate the case. These investigations typically involve lengthy hearings of the Honor Court, and as outlined in the Instrument of Student Judicial Governance, "The usual sanction for a first academic violation is definite suspension for at least one academic semester and a grade penalty of an 'F' for the course, a portion of the course, or the assignment." The following constitute some brief guidelines specific to the course requirements:

Exams: All tests must be completed on your own; the textbook, notes, slides, the internet, cell phones, etc., may not be used.

Homeworks: You may discuss the homeworks with other students, and seek advice from the TA or the assistants at (for example) the Odum institute. None of these may do the assignment for you, nor may you copy answers or SAS/R code from any such source. In class examples will typically be very similar to the homework; you may adapt that code to use.