

## Zoology 632, Advanced Biometry — Spring 2014

Instructor: Andy Taylor

taylor@hawaii.edu

Edmondson 409, 956-4706

office hours: MWF 10:30-11:20 and by appointment

TA: Thomas Smith

tahsmith@hawaii.edu

Course web site: <http://www2.hawaii.edu/~taylor/zool632.htm>.

Course email list: [zool632-1@lists.hawaii.edu](mailto:zool632-1@lists.hawaii.edu)

Text: Kutner, Nachtsheim, Neter & Li, *Applied Linear Statistical Models* 5th ed.

A version of this text containing only the chapters we will use is available in print from the UH bookstore (\$126.05) and as an ebook (\$65.39) at <http://create.mcgraw-hill.com/shop/>; the ISBN for the ebook is 9781121992931 and the title is 'Advanced Biometry.'

### Prerequisites:

Zoology 631 or equivalent: solid understanding of the fundamental concepts of statistical inference (confidence intervals and hypothesis tests) and of simple linear regression and one-way ANOVA, including assessment of assumptions and use of follow-up analyses (predictions, contrasts, multiple comparison, etc.).

### Grading:

- Homework - **20%**: Weekly assignments, mostly exercises from the text.
- Discussions - **20%**: Students are expected to come to class having already analyzed the data sets; write-ups of discussion assignments will be due the Monday following the discussion. Grading will be based on write-ups and participation in class.
- Midterm - **30%**: Take-home exam covering multiple regression (Ch. 6-11 + 14) – mid March.
- Final - **30%**: Take-home exam covering multiway ANOVA (Ch. 19-27) – exam week.

### Computing:

You will need access to a computer with statistics software, and I assume that you already are familiar with some standard statistics program.

- Minitab can do most of the analyses covered this semester, but not the mixed models analyses. Minitab can be purchased inexpensively online (<http://www.onthehub.com/minitab/>).
- JMP can do most, probably all, of the analyses covered this semester. It can be purchased inexpensively online (<http://www.onthehub.com/JMP>).
- SAS can do all the analyses covered this semester. SAS can be purchased through the ITS site license (<http://www.hawaii.edu/sitelic/sas/sas.html>) or can be used for free online through "SAS On Demand," about which I can give information to anyone interested in this.
- R can do all the analyses covered this semester, but has a steep learning curve. It is free. Thomas will give some instruction in R.

If you already know well how to use some other statistical program, you are free to use it, but we may not be able to provide much help. Be sure your software provides the methods to be used this semester, in particular: multiple regression model selection using AIC or Mallows's  $C_p$  in an "all subsets" algorithm; quantitative measures of influence in regression (the "Hat matrix," Cook's D, "dfits"); logistic regression; and mixed-model ANOVA, preferably by likelihood methods.

## Tentative schedule

		topic	reading	handout
Jan	13	course introduction	6.1, 9.1	
	15	<b>MULTIPLE</b>	6.1-2	1A
	17	<b>REGRESSION</b>	8.2	"
	20	MODEL AND <i>no class (ML King Day)</i>		
	22	INFERENCE	6.3-7	"
	24	extra SS (partial/sequential)	7.1-4	"
	27	"	"	"
	29	"	"	"
	31	confounding (multicollinearity)	7.6	2, 5
Feb	3	lack-of-fit test	3.7	1B
	5	polynomial regression	8.1	"
	7	qualitative predictors	8.3-7	3
	10	"	"	"
	12	MODEL BUILD-	9.3-4	4
	14	ING	"	"
	17	<i>no class (Presidents Day)</i>		
	19	model validation	9.6	"
	21	DIAGNOSTICS,	10; 11	1-5
	24	REMEDIES	"	"
	26	"	"	"
	28	<b>LOGISTIC</b>		
Mar	3	<b>REGRESSION</b>		
	5	generalized linear model; logistic regress.	14	11?
	7	logistic regression	"	
	10	logistic regression diagnostics	"	
	12	<b>MULTIFACTOR</b>	19	6
	14	<b>ANOVA</b>	"	"
	17	FIXED-EFFECTS	"	"
	19	ANOVA	23	6
	21	"	"	"
	24-28	<i>no class (spring break)</i>		
	31	Analysis of Covariance	22	8
Apr	2	multifactor ANOVA	24	9
	4	<b>MIXED-MODEL</b>	25	6B?
	7	<b>ANOVA</b>	"	"
	9	randomized block designs	20, 21, 25.5	7
	11	"	"	"
	14	nested ANOVA: subsampling	26	10
	16	<b>LINEAR</b>	not in text	?
	18	<b>MIXED</b>		
	21	<b>MODELS</b>		
	23	maximum likelihood and REML	"	
	25	covariance structures	"	
	28	"	"	
	30	model building and hypothesis testing	"	
	30	block designs	"	7B?
May	2	nested designs	"	10B?
	5	repeated-measures designs	"	12B?
	7	"	"	