

STT 646 Syllabus, Fall 2005

Textbook: Kutner, Nachtsheim, Neter and Li. *Applied Linear Statistical Models*¹, Fifth Edition. Chicago: McGraw-Hill/Irwin, 2005.

Chapter	Sections/Topics (optional)	Problems ¹
0	Review	
1	Linear Regression with One Predictor Variable Topics: Simple linear regression model, least squares estimation (LSE), $\hat{\sigma}^2$.	22, 26
2	Inferences in Regression Analysis Topics: Inferences for slope and mean response; prediction of a new observation; ANOVA; general linear test; coefficient of determination, coefficient of correlation. (r^2 , r). Omit sections 6 and 11.	7ab(c), 16ab; 26ab(d)
3	Diagnostics and Remedial Measures Topics: 3.2 Residuals; 3.3 'Residual plots'; 3.4 Overview of tests involving residuals; 3.5 Correlation test for normality; 3.7 F test for LOF; 3.8 Overview of remedial measures; 3.9 Transformations ² . Omit sections 1, 6, 10, 11.	Diagnostics: 6bc, 14ac, 15 (as in book); Remedial measures: 16 ³ def, 15b ⁴
5	5.9 Simple linear regression model in matrix terms 5.10 Least squares estimation of regression parameters TEST	
6	Multiple Regression I Note: We will go easy on the use of matrices! Topics: 6.1 Multiple regression, polynomial regression; 6.2 Matrix model; 6.3 LSE in matrix terms; 6.4 Fitted values and residuals; 6.5 ANOVA for model, R^2 ; 6.6 Inferences for β_k ; 6.7 Estimation of mean response and prediction of a new observation; 6.8 Residual plots, test for LOF, Box-Cox transformations ² ; 6.9 An example.	5bdf, 6ab, 7a, 8
7	Multiple Regression II Topics: 7.1–3 Extra sums of squares and related tests; 7.6 Multicollinearity. Omit sections 4, 5, 9.	3, 24
8	Regression Models for Quantitative Predictors 8.1 Polynomial Regression Models 8.2 Interaction Regression Models TEST	6abdef (also check model assumptions)
15	An Overview of Standard Experimental Designs	
16	Single-Factor ANOVA Model and Tests Omit sections 8, 9.	8 ⁹ , 9 ⁹ , 10 ⁹ (was 11, 12, 13)
17	Analysis of Factor Level Effects Topics: Linear combinations of effects; contrasts; multiple comparison procedures of Tukey, Scheffe, Bonferroni. Omit sections 2, 9.	11b–f, 16 (was 12b–f, 17)
18	ANOVA Diagnostics and Remedial Measures Topics: 18.1 Residual plots; 18.2 Hartley test; 18.3 Overview of remedial measures; 18.5 Box-Cox transformations ² ; 18.6 Effects of departures from model; Satterthwaite approximation ⁵ . Omit sections 4, 7, 8. FINAL EXAM	5a ⁶ bc, 6a ⁶ bc, 13a, 15 ⁷ 8, 16ab

¹Data, while not always complete in book tables, is available on the CD provided with the book. Homework problems are subject to change.

²Include a supplementary lecture on Box-Cox transformations given replication.

³Determine an appropriate Box-Cox transformation using the method presented in class.

⁴Redo 15 using the Box-Cox transformation you found in 16.

⁵Supplementary lecture on the Satterthwaite approximation, which will be relevant to evaluation of repeated measures designs in the presence of interactions.

⁶For part (a), plot $e * \hat{y}$ and $e * A$ rather than what's requested.

⁷For part (c), use Hartley's test instead of the Modified Levene test, and $\alpha = .05$ rather than $\alpha = .10$.

⁸In place of parts (d) and (e), determine an appropriate Box-Cox transformation using the method presented in class. Does $q = 1$ appear to be reasonable?

⁹In part a, instead of aligned dotplots, plot the observations versus the factor level. Then just do the ANOVA and discuss the results.