

Advanced Statistical Regression Analysis

- Text:** *Applied Linear Regression Models*, 4th Edition, by M.H. Kutner, C.J. Nachtsheim & J. Neter (McGraw-Hill Irwin, 2004).
- Course Web Site:** <http://math.arizona.edu/~piegorsch/571A/STAT571A.Fall18.html>
- Instructor:** Professor Walter Piegorsch, office: 314 ENR2; phone: 621-2357.
Office Hours: Tues. 11:30 – 12:15 pm
 and in every scheduled class session on Tuesdays: 12:30 - 1:45 pm. Also by appointment. For distance students, replies to emails will be made within 2 weekdays while classes are in session.
- Teaching Assistant:** Mr. Meng Lu, office: Shantz 519. Email: menglu@email.arizona.edu
Office Hours: T 9:00 – 12:00 noon
 Th 9:00 – 12:00 noon
- Attendance:** Students are expected to attend class. If important circumstances prevent this, it is the student's responsibility to find out what was covered in class, what was assigned for reading or homework, and what special announcements (if any) were made.
- Grading:**
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|-----------------------------|------------------------------------|------------|
| Mid-Term Exam: | Tuesday, October 16 | 100 points |
| Homework: | As assigned | 100 points |
| Final Exam (Comprehensive): | Friday, Dec. 7 (1:00 pm – 3:00 pm) | 100 points |
| Total | | 300 points |
- A = 270–300
 B = 240–269
 C = 210–239
 D = 195–209
 E = 0–194
- Homework:** Required. Due when assigned. No exceptions.
- Make-Up Exams:** Considered only for Mid-Term Exam: given only in dire circumstances, only if identified *in advance*, and only during the week following the scheduled exam.

Disabled students must register with Disability Resources and be identified to the course instructor through the University's online process in order to use reasonable accommodations.

The regulations in the Student Code of Conduct and Code of Academic Integrity prohibit all forms of student academic dishonesty, including but not limited to cheating, fabrication, and plagiarism. Violations can result in serious penalties, including expulsion from the University. Students should turn off all electronic devices during class unless prior arrangements are made with the instructor. This includes, but is not limited to cell phones, recording devices, mp3 players, PDAs, and computers.

Information on these Codes is available at <http://deanofstudents.arizona.edu/policies-and-codes/code-academic-integrity> and <http://policy.web.arizona.edu/threatening-behavior-students>. It is assumed that all students are familiar with and will abide by these Codes. **Note: the Student Code of Conduct (5-308.F.11) dictates that no person or organization may interfere with University-sponsored classroom activities. This policy will be enforced as necessary.**

- GENERAL ADVICE:**
- *Read* the textbook and *view* online videos to be covered prior to the class session.
 - *Attend* class regularly. *Arrive* on time.
 - *Ask* questions if you don't understand an issue. (See me after class if time is short.)
 - *Attempt* to do all assigned homework. (Come to Office Hours if encountering difficulty.)

Course Syllabus for STAT 571A/MATH 571A

August 2018

Description: **Advanced Statistical Regression Analysis** (3 units) – Regression analysis including simple linear regression and multiple linear regression. Matrix formulation and analysis of variance for regression models. Residual analysis, transformations, regression diagnostics, multicollinearity, variable selection techniques, and response surfaces. Students will be expected to utilize standard statistical software packages for computational purposes.

Prerequisite(s): MATH 363, or equivalent; and MATH 310 or MATH 313, or equivalent.

Purpose of Course: To provide graduate students in statistics, biostatistics, mathematics, and related disciplines with an in-depth course of study in regression models and associated data analyses. To explore advanced regression topics, including regression diagnostics and simultaneous inferences. To instruct students in statistical computing packages such as **R**, and to cover other miscellaneous topics in regression analysis.

Current Textbook: Kutner, M.H., Nachtsheim, C.J., and Neter, J. (2004). *Applied Linear Regression Models*, 4th Edn. Boston: McGraw-Hill Irwin. ISBN: 978-0-07-301344-2.

Topics:	Book Sections	Time
Review of Probability and Statistics		2 weeks
Probability rules; random variables; expectation; joint & marginal distributions; covariance & correlation; independence; central limit theorem.	A.1-A.3	
Normal, chi-square, t , & F distributions.	A.4,	
Inference on means & variances.	A.6-A.8	
Simple Linear Regression (SLR)		5.5 weeks
SLR model; parameter interpretation; method of least squares; normal error model; point estimation.	1.1-1.8	
Inferences; prediction; analysis of variance (ANOVA); correlation and R^2 .	2.1-2.11	
Fitted values & residual diagnostics; outliers; heterogeneous variance; lack of fit; nonlinearity; transformations.	3.1-3.9	
Simultaneous inferences.	4.1-4.2,	
Regression through the origin; inverse prediction; predictor variable selection.	4.4, 4.6-4.7	
Matrix formulation of SLR model.	5.1-5.13	
Multiple Linear Regression (MLR)		3 weeks
MLR model; matrix formulation; parameter interpretation; normal error model; point estimation; pointwise & simultaneous inferences; prediction.	6.1-6.7	
Regression diagnostics; R^2 ; extra sums of squares.	6.8, 7.1-7.4	
Model Extensions and Model Adequacy		4 weeks
Multicollinearity; polynomial regression models; interaction models; qualitative predictor variables.	7.6, 8.1-8.3,	
Model selection procedures.	8.5-8.7,	
Leverage; influence measures; diagnostics. Weighted	9.1, 9.3-9.4,	
least squares; ridge regression; loess regression;	10.1-10.5,	
bootstrapping.	11.1-11.2, 3.10,	
	11.4-11.5	
Introduction to Logistic Regression		1 week
Regression with binary and proportion data; hypothesis tests; confidence intervals; diagnostics. Generalized linear models.	14.1, 14.3-14.5,	
	14.8, 14.14	
		15+ weeks