STAT 4v97.501 Undergraduate Topics in Statistics
(*surrogate for* **STAT 4352.501 Mathematical Statistics**)
Spring 2006

General Information and Syllabus

Instructor:
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Prerequisite (mandatory): *STAT 4351 or equivalent.* (This covers basic probability concepts, random variables and their probability distributions, conditioning, expectation, special distributions, transformations of random variables, and the central limit theorem.)

General Goal: While *probability* builds models for random phenomena and characterizes the properties of data generated under a given model, *statistics* interprets a given data set with the aim of inferring which model generated it. This course introduces basic statistical concepts, theory, and methods. Key topics are distributions of sample statistics such as the sample mean and variance, decision theory, estimation, hypothesis testing, regression models, design of experiments, analysis of variance, and nonparametric methods.

Primary Text: Miller, I. and Miller, M., *John E. Freund's Mathematical Statistics with Applications*, 7th edition. Pearson Prentice Hall, 2004.

Use of Computers: For statistical computations with probabilities, distributions, and data, the computer is strongly recommended. Many excellent statistical software packages are available at reasonable (or no) cost, and various possibilities will be mentioned in class. This course requires no background and imposes no specific requirements, however, leaving it for each student to explore statistical computing according to his or her own interests.

Homework, Quizzes, Midterm Tests and Final Exam: Specific homework problems will be recommended but not graded. Six closed-book 15-minute Quizzes and three closed-book Midterm Tests will be given, each based on all course content (text, class lectures, and recommended homework) up to and including the previous class session.

The closed-book quizzes, tests and final exam are not intended to strain your memory. As a practical matter, we do need to be able to call forth from memory at least some basic information and details, in order to be able to conduct a discussion or carry out a procedure without continual interruption to refer to notes. Thus, for example, I would *not* ask a student to state complicated formulas from memory, but I would require selecting the correct one from several given possibilities.

Grading: Recommended homework will not be graded. The six closed-book quizzes will be worth 50 points each, with the lowest grade dropped, for a maximum of 250 points possible. The three midterm tests will be worth 300 points each, with the lowest grade dropped, for a maximum of 600 points possible. The final exam will be worth 400 points. The course grade will be based on the total points acquired from the 5 best quizzes, the 2 best tests, and the Final Exam, with a maximum of 1250 points possible. Assigned letter grades will be A for 880 points or higher, B for 750–879 points, and C for 600–749.

Policy on Missed Quizzes or Tests: If a quiz or test is missed, it will count as the dropped quiz or test, respectively. If a second quiz or second test is missed, then the Final Exam grade will be used for the missing grade.

Schedule: The lecture topics, quizzes, tests, and final exam are scheduled as follows.

Lec.	*Day, Date*	*Sections & Topics*
1	Tu Jan 10	Introductory Discussion
		§§8.1-8.3 The Central Limit Theorem
2	Th Jan 12	§§8.4-8.6 The χ^2, t, and F Distributions
3	Tu Jan 17	§8.7 The Sample Order Statistics
		§§9.1-9.2 Introduction to Decision Theory & Game Theory
4	Th Jan 19	§§9.2-9.4 Game Theory; Statistical Games; Decision Criteria
5	Tu Jan 24	*Quiz 1*
		§§9.5-9.7 Minimax and Bayes Decisions
6	Th Jan 26	§§10.1-10.3 Point Estimation: Unbiasedness; Efficiency
7	Tu Jan 31	*Quiz 2*
		§§10.4-10.5 Point Estimation: Consistency; Sufficiency
8	Th Feb 2	§§10.6-10.8 Point Estimation: Robustness; Method of Moments; Method of Maximum Likelihood
9	**Tu Feb 7**	**Test 1**
10	Th Feb 9	§§10.9-10.10 Point Estimation: Bayesian Approach; Sample Size
11	Tu Feb 14 ♡	§§11.1-11.3 Interval Estimation: for Mean; for Difference of Two Means
12	Th Feb 16	§§11.4-11.8 Interval Estimation: for Proportion; for Difference of Two Proportions; for Variance; for Ratio of Two Variances
13	Tu Feb 21	*Quiz 3*
		§§12.2-12.3 Hypothesis Testing: Basic Ideas
14	Th Feb 23	§§12.4-12.5 Hypothesis Testing: Neyman-Pearson Lemma; Power Function
15	Tu Feb 28	*Quiz 4*
		§12.2 Hypothesis Testing: Likelihood Ratio Tests
16	Th Mar 2	§§13.1-13.3 Hypothesis Testing: for Mean; for Difference of Two Means
		Spring Break
17	Tu Mar 14	§§13.4-13.5 Hypothesis Testing: for Variance; for Proportion
18	**Th Mar 16**	**Test 2**
19	Tu Mar 21	§13.6 Hypothesis Testing: for Differences Among k Proportions
20	Th Mar 23	§§13.7-13.10 Hypothesis Testing: for $r \times c$ Contingency Table; for Goodness of Fit
21	Tu Mar 28	*Quiz 5*
		§§14.1-14.2 Regression: Basic Ideas; Linear Regression
22	Th Mar 30	§§14.3-14.4 Regression: Least Squares Method; Normal Regression Analysis
23	Tu Apr 4	*Quiz 6*
		§14.5 Regression: Normal Correlation Analysis
24	Th Apr 6	§§14.6-14.8 Regression: Multiple Linear Regression
25	**Tu Apr 11**	**Test 3**
26	Th Apr 13	§§15.1-15.2 One-Way Analysis of Variance
27	Tu Apr 18	§15.3 Two-Way Analysis of Variance
		§§16.1-16.2 Nonparametric Methods: The Sign Test
28	Th Apr 20	§§16.3-16.5 Nonparametric Methods: The Signed-Rank Test; the Wilcoxon Rank-Sum Test; the Kruskal-Wallis Test
	Th Apr 27	**Final Examination**: **5:00 – 7:00 p.m.**
	NOTE:	Date and start time is set by (and subject to change by) the Registrar