

## STAT 427 – Mathematical Statistics

Winter 2007

### 1. Catalog Description

#### STAT 427 Mathematical Statistics (4)

Continuation of STAT 426. The theory of hypothesis testing and its applications. Power and uniformly most powerful tests. Categorical data and nonparametric methods. Other selected topics.

### 2. Required Background and/or Experience

STAT 426

### 3. Expected Outcomes

The student should:

- a. gain thorough knowledge of the mathematical theory of statistical inference;
- b. understand the relationship between the mathematical theory of statistics and applied statistical methods;
- c. be able to recognize and analyze statistical problems in a variety of settings; and
- d. use statistical methods for problem solving.

### 4. Text and References

**Text:** DeGroot, M.H. and Schervish, *Probability and Statistics*, 3<sup>rd</sup> ed., Addison Wesley, 2002.

**References:** Larsen and Marx, *An Introduction to Mathematical Statistics and its Applications*, 3<sup>rd</sup> ed., Prentice Hall, 2001.

Hogg, McKean, and Craig, *Introduction to Mathematical Statistics*, 6<sup>th</sup> ed., Macmillan, 2004.

### 5. Minimum Student Materials

None.

### 6. Minimum University Facilities

Chalkboards for class use. Overhead projectors.

**7. Expanded Description of Content and Method**

<i>Content:</i>	<i>Number of Lectures</i>
<b>A. Hypothesis Testing</b>	<b>12</b>
1. Simple Hypotheses and the Neyman-Pearson Lemma	
2. Uniformly Most Powerful Tests	
3. Single Sample Test Procedures	
4. Two Sample Test Procedures	
5. The <i>F</i> Distribution	
6. Bayesian Test Procedures	
<b>B. Categorical and Nonparametric Methods</b>	<b>12</b>
1. Contingency Tables	
2. Test of Homogeneity	
3. Goodness of Fit Tests	
4. Inferences about Quantiles	
5. Robust Estimation	
6. Paired Observations	
7. Ranks for Two Samples	
<i>Selected topics from among:</i>	<b>12</b>
<b>C. Linear Statistical Models</b>	
1. Method of Least Squares	
2. Simple Linear and Multiple Regression	
3. Analysis of Variance	
4. The General Linear Model	
5. Full-rank versus Constrained Models	
6. Tests of Linear Hypotheses	
<b>D. Simulation</b>	
1. Random Number Generators	
2. Probability Integral Transform	
3. Simulating Specific Distributions	
4. Accept-Reject Schemes	
5. Importance Sampling	
6. Bootstrap Methods	
7. Markov Chain Monte Carlo	
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<b>Total</b>	<b>36</b>

*Method:*

Largely lecture with blackboard illustrations of the discussion along with supervised work and individual conferences.

**8. Method of Evaluating Outcome**

Problem assignments, scheduled tests, and final examination.