

**STAT 419 - Applied Multivariate Statistics**

**Fall 2003**

**1. Catalog Description**

**STAT 419 Applied Multivariate Statistics (4 units)**

Continuous multivariate statistics. Multivariate linear model, principal components and factor analysis, discriminant analysis, clustering, and canonical correlation. Use of statistical software throughout the course. Prerequisite: Two courses in statistics and MATH 206, or consent of instructor.

**2. Required Background and/or Experience**

Two courses in statistics and MATH 206 or the consent of the instructor.

**3. Expected Outcomes**

The student should:

- a. understand the difference between univariate and multivariate statistics;
- b. be able to perform multivariate estimation and hypothesis tests;
- c. understand and be able to solve classification problems;
- d. be able to investigate relationships between variables through canonical correlation;
- e. be able to use and understand variable reduction techniques such as principal components and factor analysis; and
- f. be able to achieve a depth of understanding of multivariate statistics which will allow for flexibility in the use of different computer packages.

**4. Text and References**

**Text:** Rencher, Alvin, *Methods of Multivariate Analysis*, 2<sup>nd</sup> ed., Wiley, 2002.

**5. Minimum Student Materials**

None.

**6. Minimum University Facilities**

Chalkboards for classroom use, overhead projectors, computer facilities for student use in preparing assignments.

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

<b><u>CONTENT</u></b>	<b><u>LECTURE HOURS</u></b>
<b>A. REVIEW OF UNIVARIATE STATISTICS</b>	4
1. random variables	
2. sampling	
3. estimation and hypothesis testing	
4. software applications	
<b>B. MATRIX ALGEBRA</b>	3
1. review of matrix operations and properties	
2. software applications	
<b>C. MULTIVARIATE DENSITY FUNCTIONS</b>	3
1. joint densities	
2. multivariate normal density	
3. conditional and marginal densities	
<b>D. HOTELLINGS <math>T^2</math></b>	7
1. one sample and two sample	
2. software applications	
3. repeated measures	
4. two-sample profile analysis	
5. SAS: repeated option, 2 group	
<b>E. MULTIVARIATE ANALYSIS OF VARIANCE</b>	5
1. the model and hypothesis	
2. the test statistics	
3. multiple comparisons	
4. software applications	
<b>F. TESTS ON COVARIANCE MATRICES</b>	3
<b>G. DISCRIMINANT ANALYSIS</b>	5
1. general discriminant function	
2. linear and quadratic discriminant functions	
3. multiple group classification	
4. error rates	
5. software applications	
<b>H. CANONICAL CORRELATION</b>	2
1. review of simple correlation	
2. definition of canonical correlation	
3. uses of canonical correlation	
<b>I. VARIABLE REDUCTION AND UNDERLYING FACTORS</b>	6
1. principal components (definition and geometric explanation, interpretation, distribution)	
2. factor analysis (definition and comparison with principal components, rotation of factors)	
<b>J. CLUSTER ANALYSIS</b>	2
1. purpose	
2. criteria	
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<b>TOTAL:</b>	40

**METHOD**

Material will be presented in a lecture format. Students will be required to use available computer resources.

8. **Method of Evaluating Outcome**

By oral presentations, team and individual projects.