EPE 679  
Multiple Measures in Education & Evaluation  
Fall 1999 Tuesday, 4:00 - 6:30 PM TEB 140  

Required Text:

General Description

This course is designed to provide techniques for analyzing educational and evaluation studies where there are multiple measurements. These measurements come in various forms and require different techniques. Most assessment devices contain multiple items to which persons respond. An understanding of these measurements includes notions of reliability analysis which are based on variance components or internal consistencies analysis. A second type of study might involve the need to reduce the multiple measures from a large dimensional hyperspace to a more visualizable Euclidean space using factor analysis. A third type of study might involve analysis of group differences on correlated multiple measures which fall under the guise of multivariate analysis; or a classification of a set of related multiple measures into functional forms that predict group membership; i.e., so-called discriminant analysis.

Although the above represent different types of designs, they are similar in that they do not result necessarily from having experimental control over the independent variables and the multiple measures usually lack statistical independence. We tend to think that these issues and designs represent separate kinds of problems, but there is, in fact, a
common thread among them. This course is intended to explore the various forms of multiple measurements but emphasize the common problems associated with them.

**EXPECTATIONS**

This course is primarily computer-application based. The expectations are that students will

1. grasp the underlying concepts of reliability, factor analysis, and multivariate analysis.
2. be able to analyze multivariate data through the use of SPSS software using the methods listed above.
3. be able to interpret results from such analyses.

The following topics are targeted for coverage in the order in which they are listed here:

**RELIABILITY ANALYSIS**

- Problems in measurement
- Types of Reliability Coefficients - Procedures for Estimation
  - Test-retest/stability coefficient
  - Internal consistency coefficients

**FACTOR ANALYSIS**

- Exploratory versus confirmatory
- Three factor extraction methods
  - Principal components
  - Principal axes
  - Maximum likelihood

- Rotation methods
• Orthogonal
• Oblique

• Goodness-of-Fit Indicators
  • Exploratory
    • Measures of sampling adequacy
    • Communality estimates
    • Factor loadings
    • Amount of variance explained

MULTIVARIATE ANALYSIS OF VARIANCE (MANOVA)
• Multivariate test statistics
  • Wilk’s Lambda
  • Pillai’s Trace
  • Hotelling-Lawley Trace
  • Roy’s Greatest Root

• Evaluation of Assumptions
  • Bartlett’s test for correlation
  • Box’s $M$ test for homogeneity of dispersion matrices
  • Homogeneity (Stepdown analysis)

GRADING POLICY
You will be required to demonstrate achievement in four ways:
1. Homework assignments
2. Midterm examination
3. Term project to be presented orally in class and in written paper form to me
4. Participation in class (i.e., questions & answers) is highly encouraged
Points Distribution

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Points</th>
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<tbody>
<tr>
<td>Four Homework Assignments</td>
<td>20</td>
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<tr>
<td>Midterm Examination</td>
<td>25</td>
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<tr>
<td>Project: Oral Presentation</td>
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<tr>
<td>Written</td>
<td>40</td>
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Grade Equivalence

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<tr>
<th>Grade</th>
<th>Percentage</th>
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<tr>
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<td>B</td>
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<tr>
<td>C</td>
<td>70 - 80</td>
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<td>E</td>
<td>0 - 69</td>
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TENTATIVE SCHEDULE

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Assignment</th>
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<tbody>
<tr>
<td>8/31</td>
<td>Introduction</td>
<td>Read TF ch 1; Notes (HN) ch. 6</td>
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<tr>
<td>9/7-28</td>
<td>Reliability Analysis</td>
<td>HW #1; Read HN ch. 7</td>
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<td><strong>HW #2,</strong> Read HN ch. 8</td>
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<td>HW #3; Read HN ch. 8</td>
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<td><strong>HW #4,</strong> Read TF 12</td>
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<tr>
<td>10/5-12</td>
<td>Factor Analysis</td>
<td>HW #5, #6, #7; Read TF 12</td>
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<td><strong>10/19</strong></td>
<td>MIDTERM EXAMINATION</td>
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<td>10/26-11/2</td>
<td>Factor Analysis</td>
<td>HW #8, #9, #10 Read TF 3 &amp; 9</td>
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<tr>
<td>11/9-30</td>
<td>Multivariate Analysis of Variance</td>
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12/7 Class Presentations
**PROJECT**

The project for this course is intended to give you a chance to apply all the analytical methods covered in class, i.e., reliability, factor analysis, and MANOVA, to a real research situation.

You may choose one of the following options:

- Use your own empirical data for the project. These may be either
  - primary data; i.e., data actually collected by you, or
  - secondary data, i.e., historical data from some other source.

- Note: You must design your research such that the data analysis will require the application of all the methods covered in this course.

**Report Format**

The report to be presented in class must be concise enough for a total of 30 minutes per student. The first 20 minutes will be presentation, and the last 10 minutes will be discussion of the presentation.

The final report to be turned in must be in the form of a written report not less than 10 pages and **not exceeding 20 pages**. It must have references and be of APA format. The following elements must be present:

- Introduction
  - a problem statement
  - a theoretical framework
  - statement(s) of hypotheses
  - limitations of the study
• Methodology
  • Data Sampling (or Source)
  • Subjects: Size and demographics
  • Instrumentation: Variables/Questionnaire
  • Procedure: How data was collected and/or transformed
  • Analyses - brief summary of methods of analysis

• Results & Interpretations.
  (Include Tables and Figures wherever appropriate)
• Discussion and Conclusions

Note about APA style:
APA style usually requires the author to include tables and figures on separate sheets and to indicate where in the text they are to be inserted. Your report should appear more like a finished product, with tables and figures actually embedded in the appropriate parts of the text, not as separate sheets.