

Course Syllabus

Title:	Multivariate Statistics - PSYC 775: Section 015
Term:	Fall 2007 (Fridays – 2-5pm)
Location:	South Dakota Union – Room 410 (Computer Lab)
Credit Hours:	3
Instructor:	Jon Elhai, Ph.D. (605) 677-6575 (office) Jon.Elhai@usd.edu (e-mail) www.usd.edu/dmhi/je (website)
Office Hours:	Fridays: 11:00am-12:00pm (South Dakota Union – Office 114)

Course Description:

This course is a survey of multivariate statistical methods. It includes a review of relevant material from PSYC 771 and PSYC 772. Representative topics include: MANOVA, Factor Analysis, Advanced Linear Modeling, Contingency Tables, Path Analysis, and LISREL. The instructor will select from these and other topics, based on the needs of the students. Prerequisite: PSYC 772–Research Design and Statistics II or permission of the instructor.

Specifically, after briefly reviewing ANOVA and regression, and data screening methods, this course will focus on MANCOVA, Discriminant Function Analysis, Logistic Regression, Canonical Correlation, Exploratory Factor Analysis, Confirmatory Factor Analysis and Path Analysis (Structural Equation Modeling). Popular statistical software packages will be used, including SPSS and Mplus.

Course Outcomes:

Students should understand the theory, assumptions, and application of MANCOVA, Discriminant Function Analysis, Logistic Regression, Canonical Correlation, Exploratory Factor Analysis, Confirmatory Factor and Path Analysis (Structural Equation Modeling).

South Dakota System Board of Regents General Education Requirement - GOAL #3:

Students will understand the organization, potential, and diversity of the human community through study of the social sciences.

Student Learning Outcomes: As a result of taking courses meeting this goal, students will:

1. Identify and explain basic concepts, terminology and theories of the selected social science disciplines from different spatial, temporal, cultural and/or institutional contexts.
 - a. Assessment 1: Demonstrate the acquired knowledge of key concepts in multivariate statistics, evaluated by homework, midterm and final exam grades.
2. Apply selected social science concepts and theories to contemporary issues
 - a. Assessment 1: Apply the use of multivariate statistics to modern research questions, evaluated by homework, midterm and final exam grades.

Required Software:

- 1) First Half of Semester: SPSS-Base, and Regression Add-On Module. SPSS is available in some computer labs on campus. For students preferring to use SPSS at home, a 4-year license for SPSS' graduate pack (exactly like the Base + Regression version and includes AMOS; but with a 4-year limit) can be purchased for about \$200, through: www.spss.com/gradpack. SPSS' "Student" version is NOT sufficient for this course, because it has substantially reduced functionality.
- 2) Second Half of Semester: Mplus. The Mplus Base Program (offers regression, factor analysis, confirmatory factor analysis, path analysis and SEM), is available to verified students for \$195 (add-on modules for mixture modeling and/or multilevel modeling are available, but not relevant to this course). The Mplus Demo version is available at no charge from www.statmodel.com. The Demo version has all of the full Mplus version's capability, but is limited to 6 dependent variables and 2 independent variables (which will be sufficient for this course).

Required Reading: Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.). Boston, Massachusetts: Allyn and Bacon.

Mplus Web Tutorial: http://www.ats.ucla.edu/stat/mplus/seminars/IntroMplus_CFA

Suggested Reference Material for Learning This Course's Statistical Software:

SPSS Reference

George, D., & Mallery, P. (2005). *SPSS for Windows step-by-step: A simple guide and reference, 13.0 update* (6th ed.). Boston, Massachusetts: Allyn & Bacon.

Mplus 4.1 User's Guide

Muthén, L. K., & Muthén, B. O. (1998-2006). *Mplus user's guide* (4th ed.). Los Angeles, California: Muthén & Muthén. (downloadable from <http://statmodel.com/ugexcerpts.shtml>)

Recommended Texts (for further information on related content, but not required for this course):

Missing Data Estimation

Graham, J. W., Cumsille, P. E., & Elek-Fisk, E. (2003). Methods for handling missing data. In J. A. Schinka, I. B. Weiner & W. F. Velicer (Eds.), *Handbook of psychology. Research methods in psychology* (Vol. 2, pp. 87-114). New York, New York: John Wiley & Sons.

Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods*, 7, 147-177.

Effect Size and Power

Cohen, J. (1992). A power primer. *Psychological Bulletin*, 112, 155-159.

Regression Interactions

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. London, England: Sage Publications.

Frazier, P. A., Tix, A. P., & Barron, K. E. (2004). Testing moderator and mediator effects in counseling psychology research. *Journal of Counseling Psychology*, 51, 115-134. (for a brief overview)

Logistic Regression

Hosmer, D. W., & Lemeshow, S. (2000). *Applied logistic regression* (2nd ed.). New York City: John Wiley & Sons.

Confirmatory Factor Analysis/Path Analysis/SEM

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6, 1-55.

Kline, R. B. (2004). *Principles and practice of structural equation modeling* (2nd ed.). New York, New York: Guilford Press. (for a basic to intermediate understanding)

Bollen, K. A. (1989). *Structural equations with latent variables*. New York City: John Wiley & Sons. (for an advanced understanding)

Exploratory Factor Analysis/Principal Components Analysis

Fabrigar, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods*, 4, 272-399.

Multiple Regression for Nonlinear Dependent Variables

Long, J. S. (1997). *Regression models for categorical and limited dependent variables*. Thousand Oaks, California: Sage Publications.

Course Policies and Procedures

1. Attendance: It is the responsibility of each student to attend all classes, take all exams, and turn in all assignments on time. Students who stop attending class will be in jeopardy of involuntary withdrawal from the class roll by the instructor. Class attendance is worth 10% of the final course grade. **Please do not arrive late to class.**

2. Exams: There will be one midterm exam, and a non-cumulative final exam, consisting of multiple choice questions. Exam material will be taken from the textbooks, articles and lectures. Each exam is worth 35% of the final course grade. **No makeup exams will be given.** If an exam must be missed due to extremely extenuating circumstances, let the instructor know as soon as possible.

3. Homework: Several homework assignments will be required. These exercises will help consolidate the material in small chunks of information, and will demonstrate competence regarding multivariate statistics. Homework exercises will be due on the subsequent Tuesday after class by 4pm (*via e-mail*). See the course instructor’s website listed on the first page of this syllabus, and then click “Courses” to download homework exercises.

4. Grading:

Grade Composition		Grading scale
Midterm Exam	35%	A 90-100
Final Exam	35%	B 80-89
Homework	20%	C 70-79
Class Attendance	10%	D 60-69
<u>Total</u>	<u>100%</u>	F 59 and below

5. Academic Dishonesty: The College of Arts and Sciences considers plagiarism, cheating, and other forms of academic dishonesty inimical to the objectives of higher education. The College supports the imposition of penalties on students who engage in academic dishonesty, as defined in the “Conduct” section of the University of South Dakota Student Handbook. No credit can be given for a dishonest assignment. At the discretion of the instructor, a student caught engaging in any form of academic dishonesty may be: a) Given a zero for that assignment, b) Allowed to rewrite and resubmit the assignment for credit, c) Assigned a reduced grade for the course, d) Dropped from the course, e) Failed in the course. However, this instructor most typically fails the student on the assignment and/or course.

6. Class Cancellations: Occasionally, the instructor may be called without advanced warning to travel on a disaster response. In this event, if a substitute instructor cannot be arranged to teach a given lecture, the class will be e-mailed as soon as possible to let you know that class will be cancelled that day.

Additionally, in case of a snow or ice storm, please use your best judgment about whether to attend class. The instructor lives out of town, and will cancel class by e-mail as soon as possible if necessary. However, if you don’t feel safe driving to class, don’t risk it.

7. Additional Ground Rules: 1) Please turn off cell phones/pagers during class. 2) Please do **not** arrive late to class. 3) Lecture notes will **not** be provided to students by the instructor, even after an excused absence. 4) Grade disputes must be submitted in writing in order to be considered. 5) Grievances about the course and/or instructor should be brought up with the instructor first in order to resolve the matter, prior to discussing the matter with the department/university’s administration.

8. Use of the Computer Lab: Use of the lab is contingent upon a few rules: 1) No software may be loaded onto the computers; 2) The Java runtime engine must be maintained at version 1.4.2 (as opposed to more current updates, because of conflicts on the computers with Java 1.5); 3) No food or drink is allowed in the lab; 4) The lab must be kept “tidy,” and all displays, keyboards, chairs, etc., returned to their standard locations for the lab at the end of class; 5) Student access to the lab will only be allowed during formal class hours (i.e., it is NOT an open facility for general purpose access, homework, etc.).

Any student who feels s/he may need academic accommodations or access accommodations based on the impact of a documented disability should contact and register with Disability Services during the first week of class. Disability Services is the official office to assist students through the process of disability verification and coordination of appropriate and reasonable accommodations. Students currently registered with Disability Services must obtain a new accommodation memo each semester.

Schedule of Classes and Readings: (The assigned chapter should be read **before** each class)

Date	Required Reading	Lecture Topic
Fr 9/7	(none)	Introduction to Multivariate Stats
Fr 9/14	Chapter 4 Appendix A	Data Screening Matrix Algebra
*Fr 9/21	Chapter 5 Chapter 6	Linear Regression ANOVA/ANCOVA
*Fr 9/28	Chapters 17 Chapter 10	GLM Logistic Regression
Fr 10/5	Chapter 7 Chapter 8	MANOVA/MANCOVA Profile Analysis/Repeated Measures MANCOVA
*Fr 10/12	Chapter 9 Chapter 12	Discriminant Function Analysis Canonical Correlation
Fr 10/19	(none)	MIDTERM EXAM
*Fr 10/26	Chapter 13	Exploratory Factor Analysis/Principal Components Analysis
Fr 11/2	Chapter 14 Mplus Web Tutorial (note: the data used in the web tutorial can be downloaded from the Tutorial's website, to help you practice using Mplus)	Introduction to SEM Introduction to Mplus
*Fr 11/9	Chapter 15	Path Analysis
Fr 11/16		NO CLASS (ISTSS Conference)
Fr 11/23		NO CLASS (Thanksgiving)
*Fr 11/30	Chapter 15	Confirmatory Factor Analysis
Fr 12/7	Chapter 15	Structural Equation Modeling
Fr 12/14	(none)	Additional Statistical Methods
Fr 12/21		FINAL EXAM: 2-5PM

Note: This syllabus may be appended by the instructor if necessary. Students are responsible for any changes made. Attempts will be made to have guest expert speakers present material relevant to the course, remotely by speaker phone.

*=Homework from this section is due on the following Tuesday by 4pm