

**GEORGE MASON UNIVERSITY  
COLLEGE OF HEALTH AND HUMAN SERVICES  
SPRING 2008**

**GCH/NURS 805 Advanced Quantitative Data Analysis for Healthcare Research II, 3 Credits**

**INSTRUCTOR:** Heibatollah Baghi, Ph.D. Office Hours: Mon & Tues. 10 A.M. – 12 Noon  
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**TIME & PLACE:** Tuesday 4:30 – 7:10 p.m. Krug Hall, Room # 5

**PREREQUISITE:** GCH/NURS 804 or an equivalent statistics course.

**COURSE DESCRIPTION:** The course examines multivariate analysis of variance (MANOVA), multivariate analysis of covariance (MANCOVA), multiple regression (ordinary least squares) and logistic regression. Students apply mathematical calculations and utilize linear combinations of multivariate tests in healthcare research data.

**REQUIRED TEXTS:**

B. G. Tabachnick and L.S. Fidell (2007) *Using Multivariate Statistics* (Fifth Edition). Boston, Allyn and Bacon.

C. A. Mertler and R. A. Vannatta (2004). *Advanced and Multivariate Statistical Methods* (Third Edition). Los Angeles, CA: Pyczak Publishing.

Selected chapters from the following book:

E. J. Pedhazur (1997). *Multiple Regression in Behavioral Research*. (3<sup>rd</sup> Edition). New York: Holt, Rinehart & Wilson. (On reserve in the library at Johnson Center)

**COURSE OBJECTIVES:** By the end of this course, the students should be able to:

1. Explain the advantages of multivariate analysis of variance (MANOVA) and multivariate analysis of covariance (MANCOVA) versus a series of univariate analyses.
2. Analyze explained and unexplained sources of variability in MANOVA and MANCOVA.
3. Interpret computer printouts from MANOVA, MANCOVA, multiple regression (ordinary least squares) and logistic regression.
4. Determine when multiple regression (ordinary least squares) and logistic regression should be used.
5. Differentiate between predictive and explanatory functions of multiple regression.
6. Differentiate between the purposes of exploratory and confirmatory factor analysis.

**ASSIGNMENTS:**

- Attend class
- Read assigned chapters
- Participate in classroom activities and discussions
- Complete quizzes
- Submit written homework assignments
- Complete final exam
- Participate in course/faculty evaluation

**EVALUATION PROCEDURE:**

	Due Dates -----	Evaluative Weight -----
Homework assignments (8). Quizzes (3)	Refer to the attached page	70 percent 15 percent
Final exam	May 13	15 percent

  

Grading Scale	
<u>Percentage</u>	<u>Grade</u>
94 - 100	A
90 - 93	A-
87 - 89	B+
83 - 86	B
80 - 82	B-
74 - 79	C

Note: The quizzes and final exam are NOT open-book. However, some equations may be provided.

**CLASS SCHEDULE:**

<u>Week-Date</u>	<u>Topics (Readings)</u>
1. Jan. 22	Course introduction; discussion of computer-based data analysis.
2. Jan. 29	Review of univariate and bivariate statistics; overview of multivariate statistics; (Tabachnick & Fidell Chs. 1 and 3; Mertler & Vannatta Ch. 1)
3. Feb. 5	A guide to multivariate techniques; research questions and associated techniques; significance of group differences; prediction of group membership; latent structure underlying a set of variables. (Tabachnick & Fidell Ch. 2; Mertler & Vannatta Ch. 2)

4. Feb. 12 Pre-analysis data screening; Issues in data screening.  
(Tabachnick & Fidell Ch. 4; Mertler & Vannatta Ch. 3.)
5. Feb. 19 Factorial analysis of variance; experimental designs.  
(Mertler & Vannatta Ch. 4.)
6. Feb. 26 Factorial analysis of covariance; quasi-experimental designs.  
(Tabachnick & Fidell Ch. 6; Mertler & Vannatta Ch. 5.) **Quiz 1**
7. March 4 Multivariate analysis of variance (MANOVA).  
(Tabachnick & Fidell Ch. 9; Mertler & Vannatta Ch. 6, pp 119-136)
- March 11 Spring Break
8. March 18 Multivariate analysis of covariance (MANCOVA).  
(Tabachnick & Fidell Ch. 9; Mertler & Vannatta Ch. 6, pp 137-162)
9. March 25 Multiple Regression; predictive function of multiple regression; selecting  
variables for prediction; checking assumptions.  
(Pedhazur Ch. 2; Mertler & Vannatta Ch. 7) **Quiz 2**
10. April 1 Multiple regression; Fundamental equations; Major types; Theoretical and practical  
issues; Predictive and explanatory functions of multiple regression.  
(Tabachnick & Fidell Ch. 5; Pedhazur Ch. 8 pp.195-225)
11. April 8 General method of multiple regression analysis: Matrix operation.  
(Pedhazur Appendix A, Ch. 6 pp. 135-140; Tabachnick & Fidell Ch. 5 pp. 131-134)
12. April 15 Logistic regression.  
(Tabachnick & Fidell Ch. 12; Mertler & Vannatta Ch. 11) **Quiz 3**
13. April 22 Exploratory factor analysis.  
(Tabachnick & Fidell Ch. 13)
14. April 29 Exploratory factor analysis and review.  
(Mertler & Vannatta Ch. 9); Course/Faculty Evaluation.
15. May 13 Final exam

## **SPECIFIC COURSE OBJECTIVES:**

By the end of this course, the students should be able to:

1. Determine when it is appropriate to use multivariate statistics.
2. Discuss the advantages of testing for interactions.
3. List the null and alternative hypothesis generated in MANOVA.
4. Explain the assumptions of MANOVA.
5. Describe situations when using MANOVA is appropriate.
6. Run SPSS for MANOVA and interpret the computer output.
7. Discuss the advantages of MANOVA over a series of univariate ANOVAs.
8. Describe situations when MANCOVA would be preferred over MANOVA
9. List the null and alternative hypothesis generated in (MANCOVA).
10. Explain the assumptions of MANCOVA.
11. Test the assumptions of MANOVA and MONCOVA.
12. Run SPSS for MANCOVA and interpret the computer output.
13. Evaluate research reports using multiple regression
14. Identify situations in which multiple regression analysis will be used.
15. Identify the elements in the regression equation model.
16. Interpret and discuss the results of multiple regression using SPSS for Windows.
17. Distinguish between partial and semi-partial correlation.
18. Use matrix algebra in multiple regression analysis.
19. List the null and alternative hypothesis generated in multiple regression analysis.
20. Interpret the plots for checking the assumption of multiple regression.

21. Describe standard and hierarchical multiple regression.
22. Differentiate between predictive vs. explanatory functions of multiple regression.
23. Identify research situations in which logistic regression analysis would be appropriate.
24. Interpret a computer printout of a logistic regression analysis.
25. Describe the distinction between exploratory and confirmatory factor analysis.
26. Define and interpret the basic concepts of factor analysis such as factor loadings, communality, uniqueness, eigenvalues, and scree-test.
27. Describe the various uses for exploratory factor analysis.
28. Identify a research situation in which factor analysis would be appropriate.

### **HOMEWORK ASSIGNMENTS:**

Using the data set, which can be downloaded from this SPSS Web site, (<http://edhd.bgsu.edu/amm/datasets.html>), perform the following statistical analysis. Students are expected to do the assigned homework and turn it in the specified dates. The homework assignments are to be worked on independently with no help from other students. Late assignments will not be accepted without prior approval of the instructor.

Assignment 1. Chapter 2 pp 23-24 (Mertler & Vannatta, 2002). 5 points; February 12

Assignment 2. Chapter 4 pp 91-92 (Mertler & Vannatta, 2002). 5 points; February 26

Assignment 3. Chapter 5 page 118 (Mertler & Vannatta, 2002). 10 points; March 4

Assignment 4. Chapter 6 pp 162-163: Part 1 (Mertler & Vannatta, 2002). 10 points; March 18

Assignment 5. Chapter 6 pp 163-164: Parts 2 & 3 (Mertler & Vannatta, 2002). 10 points; March 25

Assignment 6. Chapter 7 pp 196-198. (Mertler & Vannatta, 2002). 10 points; April 8

Assignment 7. Chapter 11 page 330: Parts 1 & 3 (Mertler & Vannatta, 2002). 10 points; April 22

Assignment 8. Chapter 9 pp 277-279 (Mertler & Vannatta, 2002). 10 points; April 29

Note. The assignments must be typewritten and the SPSS outputs should be attached to the assignments.