

**WAYNE STATE  
UNIVERSITY**  

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**SCHOOL OF SOCIAL WORK**

**SW 9300 Applied Regression Analysis and Generalized Linear Models  
3 Credits**

**Master Syllabus**

**I. COURSE DOMAIN AND BOUNDARIES**

This is the second course in the research methods sequence for WSU doctoral students. This course provides an overview of OLS regression, logistic regression, and multinomial logit models. At the end of this course, students will be able to apply the array of regression models to analyze data obtained from social work practice settings. Students will learn to conduct these analyses using SPSS, interpret their findings, and communicate their results clearly and effectively to both scholarly and social work practice audiences. Prerequisite: SW 9100 Social Statistics and Data Analysis or equivalent.

**II. KNOWLEDGE AND SKILL OBJECTIVES**

By the end of this course, the student should be able to identify and apply:

1. choose and apply appropriate regression techniques to address research questions and hypotheses;
2. Use SPSS for regression analyses;
3. interpret findings;
4. communicate results clearly and effectively, using APA format;
5. understand statistical assumptions and how to detect and address violations;
6. recognize strengths and weaknesses in analyses and formulate constructive critiques.

**III. PERFORMANCE CRITERIA**

Students are required to complete three “take-home” exercises and three papers. The “take-home” exercise consists of critically reviewing three quantitative studies and exercises of regression models. The papers require students either to perform data analyses using SPSS, present the findings using APA journal article format, and interpret the results. They should pose a question for research, propose research hypotheses, and present analysis findings. The first paper will apply a multiple regression analysis; the second will apply a logistic regression analysis and the third will apply logit analysis. Data sets from social work practice settings will be provided in class, but students may use their own data if appropriate.

Each assignment counts as 20% of the final grade. The assignment topics are as follows:

Exercise #1	Simple Linear Regression
Exercise #2	Multiple Linear Regression
Exercise #3	Weighted Least Squares and Hierarchical Linear Regression Models
Paper #1	Research Study Using Multiple Regression Analysis
Paper #2	Research Study Using Logistic Regression Analysis
Paper #3	Research Study Using Multinational Logit Analysis

Papers will be graded according to the following scale:

- A. Excellent, exceeds expectations; superior performance
- B. Good, meets all normal expectations; consistent grasp of content and competency in meeting course objectives
- C. Fair, meets some expectations but misses others; acceptable but barely adequate; uneven grasp of course content

#### IV. REQUIRED TEXTS/REQUIRED MATERIALS

American Psychological Association (2001). *Publications manual of the American Psychological Association* (5<sup>th</sup> ed.). Washington DC: Author

Neter, J., Kutner, M.H., Nachtsheim, C.J., & Wasserman, W. (1996). *Applied linear regression models*. Homewood IL: Irwin.

#### RECOMMENDED TEXTS

Cronk, B. (1999). *How to use SPSS: A step-by-step guide to analysis and interpretation*. Los Angeles CA: Pyrczak Publishing.

#### V. COURSE OUTLINE

Date	Topic
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Session 1	<i>Introduction and Overview</i> Course overview Critical review of quantitative studies Review of basic concepts
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**Readings:** Neter et al., Ch. 1.1-1.2; Guo, S. (2000). The need to conduct quantitative research rigorously: A critique. *Social Work Research*, 24, 61-64.

- Session 2**      *Simple Linear Regression*  
 Optimization: minimization versus maximization  
 Least-squares estimator  
 Interval estimation and hypothesis (t-test)
- Readings:** Neter et al., Chs. 1.3-1,7;2  
 SPSS Lab 1: Bivariate Regression Analysis Using SPSS
- Session 3**      *Multiple Linear Regression*  
 Model specification  
 Estimate of regression coefficients  
 Inferences concerning B
- Reading:** Neter et al., Ch. 6.1-6.8
- Session 4**      **The ANOVA Table and R<sup>2</sup>**  
 Decomposition of total sum of squares, F test  
 R<sup>2</sup> and Adjusted R<sup>2</sup>  
 Application Examples
- Reading:** Neter et al., Ch. 6.9
- Session 5**      *Running Multiple Regression Analyses*  
 F test for Partial Slopes
- SPSS Lab II:** Multiple Regression Analysis Using SPSS
- Session 6**      *Properties of OLS and the Five Assumptions*  
 BLUE criterion and properties of OLS  
 The five OLS assumptions  
 Specification errors and selection of predictors
- Reading:** Neter et al., Chs. 1.8,3
- Session 7**      *Violating OLS Assumptions and Remedial Measures - 1*  
 Influential data and outliers  
 Multicollinearity
- Reading:** Neter et al., Chs. 7.6, 8.1-8.3, 9.1-9.5
- Session 8**      *Violating OLS Assumptions and Remedial Measures – 2*  
 Heteroskedasticity  
 Weighted Least Squares  
 Correcting heteroskedasticity and using WLS

**Reading:** Neter et al. Ch. 10.1

**SPSS Lab III:** Weighted Least Squares Regression  
Using SPSS

**Session 9** *Other Topics in Regression Analysis – 1*

Regression through origin  
Partial-correlation coefficient  
Standardized regression coefficient  
R<sup>2</sup> increment: Hierarchical regression analysis  
Functional form, curvilinear relationships and polynomial  
regression models

**Readings:** Neter et al: Ch. 4.4, 7.4-7.5, 7.7

**SPSS Lab IV:** Hierarchical Linear Regression Using SPSS

**Session 10** *Other Topics in Regression Analysis – 2*

Dummy variables as predictors  
Interpretation of regression coefficients  
Comparison of several regression equations  
Testing interactions:  
Mediator versus moderator  
Interaction, joint effect and moderator

**Readings:** Neter et al., Ch. 11

**Session 11** *Logistic Regression Analysis – 1*

Dummy as a dependent variable: Why logistic regression?  
Maximum likelihood estimator  
Relative risk and odds ratio

**Readings:** Neter et al., Ch. 13; 14

**SPSS Lab V:** Logistic Regression Analysis Using SPSS

**Session 12** *Logistic Regression Analysis – 2*

Linear model  
Correlation and causation  
Descriptive and inferential uses

**Session 13** *Logistic Regression Analysis – 3*

Calculation of Predicted Probabilities  
Other models: multinomial logistic regression and ordinal logistic  
regression

**SPSS Lab VI:** Multinomial Logit Analysis Using SPSS

## Supplemental Texts

Cohen, J. et.al. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences*. Mahwah, NJ: Lawrence Erlbaum Associates.

Gillespie, D.F. & Glisson, C., (Eds.) (1992). *Quantitative methods in social work: state of the art*. New York: Haworth Press.

Hair, J.F., Anderson, R.E., Tatham, R.L., & Black, W.C. (2003). *Multivariate data analysis* (5<sup>th</sup> ed.). Englewood Cliffs NJ: Prentice-Hall.

Howell, D. (1999). *Fundamental statistics for the behavioral sciences* (4<sup>th</sup> ed.). Pacific Grove, CA: Duxbury Press.

Jaccard, J. & Becker, M. (2002). *Statistics for the behavioral sciences* (4<sup>th</sup> ed.). Belmont CA: Wadworth/Thomson Learning.

Kazdin, A. (2003). *Methodological issues and strategies in clinical research* (3<sup>rd</sup> ed.). Washington DC: American Psychological Association.

Norusis, M. (2006). *SPSS 14.0: Guide to data analysis*. Upper Saddle River, NJ: Prentice-Hall.