

**EXS 511 ADVANCED STATISTICAL APPLICATIONS IN EXERCISE SCIENCE**  
**SUNY Cortland**  
**Kinesiology Department**

Course Information

Credit Hours: 3.0

Semester/Year: Spring 2011

Class Location: Moffett 127 (PRST 1135)

Texts Required:

Thomas, J. R., Nelson, J.K., & Silverman, S. J. (2005). *Research methods in physical activity* (5<sup>th</sup> ed.). Champaign, IL: Human Kinetics.

Brace, N., Kemp, R., & Snelgar, R. (2009). *SPSS for psychologists* (4<sup>th</sup> ed.). Mahwah, NJ: Lawrence Erlbaum Associates.

Text – Recommended

American Psychological Association. (2009). *Publication manual of the American Psychological Association* (6<sup>th</sup> ed.). Washington, DC: Author.

Professor Information

Instructor: Joy L. Hendrick, Ph.D.

Phone: (607) 753-5707

Office Location: PRST 1154

Office Hours: M 3:00 – 5:00 pm,  
F 8:30 - 10:00 am;

Others by appointment please

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School of Professional Studies Dean's Office:

John Cottone, Interim Dean; Eileen Gravani,  
Asso. Dean; Professional Studies Bldg 1175;  
phone: 607-753-2701(2)

**COURSE DESCRIPTION:**

(C) This is an advanced course in statistics with applications in exercise science. Content includes a review of basic descriptive and inferential statistics, plus coverage of multiple-factor and repeated measures ANOVA, post-hoc tests, multivariate analysis of variance, analysis of covariance, multiple regression, canonical analysis and factor analysis. Computerized statistical analyses are imbedded throughout the course. Prerequisites: EXS 201 or MAT 201 or PSY 201 or COM 230 or ECO 221 or HLH 299 or PED 434 or equivalent. (3 cr. hr.)

**COURSE ATTENDANCE POLICY:**

Class attendance is required, however, students will not be penalized for having one unexcused absence. Afterwards, there will be up to a letter-grade deduction on the final grade for each additional absence. Illness, travel, appointments, coaching obligations and court appearances are some examples of **unexcused** absences. Hospitalization, death in the immediate family, away SUNY Cortland athletic contests are examples of excused absences. No handouts, notes or assistance will be given for material distributed or covered during an unexcused absence (or an excused absence without prior, written notification). *Students are 100 percent responsible for all work missed, regardless of the type of absence.* In the event of extreme winter weather, students should refer to the college home page ([www.cortland.edu](http://www.cortland.edu)) in the mid afternoon to see if cancellation notices are posted. Otherwise, students should assume the classes will be held.

**EVALUATION OF STUDENT PERFORMANCE:**

**Requirements and Evaluation:**

I.	Examinations (5 quizzes at 12% each; 20% final exam)	67%
II.	Assignments (5-7)	<u>33%</u>
Total		100%

**ASSIGNMENTS:** No assignments/handouts will be given out after the class session in which they were distributed, unless previous arrangements had been made. All written work will be collected at the beginning of class on the day it is due (or by another specified date and time) . No late work will be graded for credit. All work due on the day of an excused absence is still expected to be turned in on time, unless previous arrangements have been made. Each student is expected to submit his/her own work, including calculations and computer assignments (refer to the section in the *College Handbook* on Academic Dishonesty). Minimum requirements for passing course include: completion of 80% of all written work, and passing grades on at least two-thirds of the exams (including the final exam).

**EXPECTATIONS:** For student success, expectations include: coming prepared to all classes, staying up-to-date by studying all assignments and practicing with SPSS on campus (this equates to **at least 5-6 hours of out-of-class time between each class session, with additional time for studying before each exam**), turning in all assignments on-time, and seeking help and asking questions as soon as problems arise. SPSS practice involves creating data files, redoing class analyses and those in the text and experimenting with other options. Unfortunately, SPSS is only available on-campus.

**TECHNOLOGY:** There is a computer component to this course. Students will be learning and using statistical software (SPSS) to organize and analyze data. Specific computer assignments will be required throughout the semester. Support will be provided for instruction on running the associated software. Students are encouraged to use computers (either in one of the campus computer labs or one's personal computer) to enhance the quality of their written assignments. Students are also encouraged to obtain on-campus email accounts and to frequently check their email. Announcements and reminders may be distributed via email to the class at various times throughout the semester. Occasionally in class, references to web sites will be made. Therefore, students should be familiar with how to use the Internet. Class notes and handouts will be uploaded in a timely fashion on the class web site: <http://web.cortland.edu/hendrick/exs511.htm> Students will need to supply a flash drive (recommended, however U: drive space is available as well) and bring SUNY Cortland ID to class in order to print in the computer lab.

**ACADEMIC INTEGRITY:** The College is an academic community, which values academic integrity and takes seriously its responsibility for upholding academic honesty. All members of the academic community have an obligation to uphold high intellectual and ethical standards. For more information on academic integrity and how academic dishonesty can occur, please refer to the *College Handbook*, the *College Catalog*, the *Code of Student Conduct and Related Policies*, the following web site <http://www.cortland.edu/copyright/> or ask your instructor. All work submitted for this class must be each student's own work. Any work submitted (in part or whole) that is not unique will be considered plagiarized and will be treated as such per academic policy. This includes, but is not limited to, material retrieved from references; therefore proper documentation of cited material (using quotation marks with associated page numbers) in APA is a must!

**STUDENTS WITH DISABILITIES:** SUNY Cortland is committed to upholding and maintaining all aspects of the federal Americans with Disabilities Act of 1990 (ADA) and Section 504 of the Rehabilitation Act of 1973. If you are a student with a disability and wish to request accommodations, please contact the Office of Disability Services located in Van Hoesen Hall or call (607)753-2066 for an appointment. Any information regarding your disability will remain confidential. Because many accommodations require early planning, requests for accommodations should be made as early as possible.

## **OBJECTIVES OF THE COURSE:**

The student will be able to:

1. exhibit an understanding of statistical concepts and techniques that are consistent with contemporary and valid research in the field of exercise science.
2. effectively organize data and accurately calculate appropriate statistics for specific research applications.
3. build on past knowledge of statistics to enhance understanding and ability to make applications of various statistical techniques.
4. exhibit knowledge of how to analyze and interpret data using current appropriate technology.
5. understand the difference between planned and post-hoc comparisons and to conduct each analysis effectively to arrive at accurate conclusions.
6. develop a working knowledge of statistics to effectively interpret literature in exercise science.
7. interpret performance data in order to make appropriate and relevant conclusions.

## **COURSE OUTLINE:**

- I. Review of Basic Descriptive Statistics
  - A. Organizing Data
  - B. Central Tendency
  - C. Variability
  - D. Correlation
- II. Comparing Means
  - A. T-tests
  - B. Factorial ANOVA
  - C. Repeated Measures ANOVA
  - D. Mixed ANOVA
  - E. Post-hoc and planned comparisons
  - F. Omega-squared
- III. Relationships among Variables
  - A. Regression
  - B. Multiple Regression
  - C. Canonical Analysis
- IV. Advanced Techniques
  - A. Analysis of Covariance
  - B. Multivariate Analysis of Variance
  - C. Discriminant Analysis
  - D. Factor Analysis
- V. Research-related Measurement Issues
  - A. Reliability
  - B. Validity
  - C. Other

## Tentative Course Outline

<u>Date</u>	<u>Topic(s)</u>	<u>Assigned Readings/Assignments*</u>
Jan. 25	Introduction	TN&S – Chapters 1 & 6 SPSS – Chapter 1
Feb. 1	Review of descriptive Statistics Probability Theory, T-tests	TN&S – Chapters 7 & 9 (pp 147 - 157) SPSS – Chapters 2, 3 & 5
Feb. 8	Effect Size, Correlation	TN&S – Chapter 8 (pp. 125-138) SPSS – Chapter 6
Feb. 15	Quiz 1; ANOVA	TN&S – Chapter 9 (pp. 157-167) SPSS – Chapter 8 (pp. 201-221)
Feb. 22	Repeated measures ANOVA	TN&S – Chapter 9 (pp. 168-170) SPSS – Chapter 8 (pp. 222-237)
Mar. 1	Quiz 2; Mixed ANOVA	SPSS – Chapter 8 (pp. 238-255)
Mar 8	Multiple Regression	TN&S – Chapter 8 (pp. 139-141) SPSS – Chapter 9
Mar 22	Quiz 3; Multiple regression cont.	“
Mar. 29	Nonparametrics	TN&S – Chapter 10 SPSS – Chapter 4 & 7
Apr. 5	MANOVA	TN&S – Chapter 9 (pp. 174-178) SPSS – Chapter 10 (pp. 296-306)
Apr. 12	Quiz 4; Covariance	TN&S – Chapter 9 (pp. 171-172) SPSS – Chapter 10 (pp. 283-295)
Apr. 19	Discriminant and Factor Analyses	TN&S – Chapter 9 (pp. 173-174), p. 142 SPSS – Chapter 11, 12
Apr. 26	Quiz 5	
May 3	Power Analysis	SPSS- pp. 10-11; G*Power
May 10	Issues of Reliability and Validity	TN&S – Chapter 11 (pp. 193-204) SPSS – pp. 368-373
May 17	Final Exam	

\*TN&S refers to Thomas, Nelson & Silverman (2005); SPSS refers to Brace, Kemp & Snelgar (2009)  
Additional readings and articles may also be assigned

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## EXS 511 Supplemental References

- American Psychological Association (2001). *Publication manual of the American Psychological Association* (5th ed.). Washington, DC: Author.
- Atkinson, G., & Nevill, A. M. (2001). Selected issues in the design and analysis of sport performance research. *Journal of Sports Sciences, 19*, 811-827.
- Baumgartner, T. A., (2000). Estimating the stability reliability of a score. *Measurement in Physical Education and Exercise Science, 4*, 175-178.
- Baumgartner, T. A., Jackson, A. S., Mahar, M. T., & Rowe, D. A. (2003). *Measurement for evaluation* (7<sup>th</sup> ed.). Boston: McGraw-Hill.
- Baumgartner, T.A., & Hensley, L.D. (2006). *Conducting and reading research in health and human performance* (4<sup>th</sup> ed.). New York: McGraw-Hill.
- Biddle, S.J.H., Markland, D., Gilborne, D., Chatzisarantis, N.L.D., & Sparkes, A.C. (2001). Research methods in sport and exercise psychology: Quantitative and qualitative issues. *Journal of Sports Sciences, 19*, 777-809.
- Blackwell, E., Mendes de Leon, C. F., & Miller, G. E. (2006). Applying mixed regression models to the analysis of repeated-measures data in psychosomatic medicine, *Psychosomatic Medicine, 68*, 870-878.
- Cohen, J. (1990). Things I have learned (so far). *American Psychologist, 45*, 1304-1312.
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- Cronk, B.C. (2006). *How to use SPSS: A step-by-step guide to analysis and interpretation* (4<sup>th</sup> ed.). Los Angeles: Pyrczak.
- Disch, J. (1989). Selected multivariate statistical techniques. In M.J. Safrit, & T.M. Wood (Eds.), *Measurement concepts in physical education and exercise science* (pp. 155-179). Champaign, IL: Human Kinetics.
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- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G\*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*, 175-191.
- Field, A. (2009). *Discovering statistics using SPSS* (3<sup>rd</sup> ed.). Los Angeles: Sage.
- Green, S. B. (1991). How many subjects does it take to do a regression analysis? *Multivariate Behavioral Research, 26*, 499-510.
- Hatfield, B. D., & Landers, D. M. (1978). Observer expectancy effects upon appraisal of gross motor performance. *Research Quarterly, 49*, 53-61.
- Hopkins, K. D., Hopkins, B. R., & Glass, G. V. (1995). *Basic statistics for the behavioral sciences*. Boston: Allyn & Bacon.
- Keppel, G., & Wickens, T. (2004). *Design and analysis: A researcher's handbook*. Englewood Cliffs, N.J.: Prentice-Hall.

- Kerlinger, F. N., & Pedhazur, E. J. (1973). *Multiple regression in behavioral research*. New York: Holt, Rinehart and Winston.
- Kinney, P. R., & Gray, C. D. (2009). *SPSS 16 made simple*. New York: Psychology Press
- Liu, Y. (2002). Analyzing RM ANOVA related data using SPSS 10. *Measurement in Physical Education and Exercise Science*, 6, 43-60.
- Locke, L.F., Silverman, S.J., & Spirduso, W.W. (2004). *Reading and understanding research* (2<sup>nd</sup> ed.). Thousand Oaks, CA: Sage Publications.
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- Mislevy, R. J. (2004). Can there be reliability without “reliability?”. *Journal of Educational and Behavioral Statistics*, 29(2), 241-244.
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- Moss, P. A. (2004). The meaning of consequences of “reliability”. *Journal of Educational and Behavioral Statistics*, 29(2), 245-249.
- Moss, P. A. (1994). Can there be validity without reliability? *Educational Researcher*, 23(2), 5-12.
- Mullineaux, D.R., Bartlett, R. M., & Bennett, S. (2001). Research design and statistics in biomechanics and motor control. *Journal of Sports Sciences*, 19, 739-760.
- Neutens, J. J., & Rubinson, L. (2002). *Research techniques for the health sciences* (3<sup>rd</sup> ed.). New York: Benjamin Cummings. [Note: good example of power analysis on pp. 148-152]
- Odom, L. R., & Morrow, J. R., Jr. (2006). What’s this r? A correlational approach to explaining validity, reliability and objectivity coefficients. *Measurement in Physical Education and Exercise Science*, 10(2), 137-145.
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- Thomas, J. R., Lochbaum, M. R., Landers, D. M., & He, C. (1997). Planning significant and meaningful research in exercise science: Estimating sample size. *Research Quarterly for Exercise and Sport*, 68, 33-43.
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