

AUBURN UNIVERSITY  
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Office Hours: Mon. and Wed. 11:00 a. m. – 12:00 p.m.

1. **Course Number and Title:** ERMA 7300 Educational Design and Analysis I  
**Credit:** 3 Semester Hours (Lecture 3)  
**Prerequisites:** ERMA 7200 or Departmental Approval
2. **Date:** May, 2009
3. **Required Manual:** Green, Salkind, N. (2003). Data Analysis with SPSS: A first course in applied statistics. (5<sup>th</sup> ed.). New York, NY: Allyn and Bacon.

**Other Course Supplements:** The professor may provide handouts from time to time to supplement the textbook and reference manual.

**Recommended:** (a) Calculator with basic algebraic functions and  
(b) mechanical pencil that takes 0.9mm or 0.7mm size lead. Use black color lead and HB or B hardness.

4. **Course Description:**

The focus of this course is on the knowledge, concepts, applications, interpretations, and reporting of basic and practical statistical procedures related to educational problems. Specifically, the course covers applications of basic inferential statistics and their applications to education. Content includes sampling, reliability and validity, and hypothesis testing. Statistical procedures include inferences using the t-tools, one-way and two-way analysis of variance (RCBD designs) F-test, one-way repeated-measures analysis of variance, and hierarchical designs. In addition, the course is designed to assist students in applying theory and applications to practical situations, so that they may begin to develop and apply their own critical thinking and decision-making skills as future professional educators. The content for this course is planned to provide successful experiences which lead to development of basic and practical knowledge and skills in using statistical procedures to investigate educational problems so that students will gain and enhance their confidence in the applications of statistical procedures to educational problems.

**Objectives, Content, Student Activities, and Student Evaluation**

**5. Course Objectives:**

The following objectives are designed to develop students' competence in knowledge, applications, and interpretations of basic and practical statistical procedures to educational problems. We will cover the following as time permits.

- A. Use research and statistical terminology appropriately and accurately
- B. Demonstrate knowledge of the following subject matter:
  - a. Basic algebraic symbols and mathematical and measurement concepts
  - b. Descriptive statistics
  - c. Research problems, variables, and measurement scales
  - d. Distributions—binomial, normal, t, z, F (others may be added as time permits)
  - e. Random sampling and probability
  - f. Reliability and validity
  - g. Hypothesis testing, decision rule, and alpha level
  - h. Type I and Type II error
  - i. Power
  - j. Effect size
  - k. One sample and two sample tests of significance
  - l. T-tools
  - m. One-way and two-way analysis of variance
  - n. One-way repeated measures
  - o. Multiple comparisons
  - p. Statistical tests and assumptions
- C. Use a hand calculator to perform the following procedures
  - a. Solve basic algebraic problems related to measurement concepts
  - b. Solve probability problems
  - c. Calculate descriptive statistics
  - d. Calculate area under the normal curve (integration not required) and binomial distribution
  - e. Calculate z-tests, t-tests, F tests
  - f. Calculate power
  - g. Calculate effect size
- D. Use statistical software (SPSS) to perform the following procedures.
  - a. Descriptive statistics
  - b. Power
  - c. Effect size
  - d. One sample and two sample tests of significance
  - e. T-tools

- f. One-way and two-way analysis of variance
- g. One-way repeated measures
- h. Multiple comparisons

E. Evaluate educational problems in terms of the appropriate analysis to perform and conduct the procedures.

F. Interpret results of statistical analyses.

**6. Course Content and Schedule:**

Following topics will be covered to the extent that time allows

A. Course Overview

- 1. Introduction
- 2. Synopsis of course
- 3. Course syllabus
- 4. Background survey
- 5. Pretest

B. Creating Variables and Computing Descriptive Statistics using SPSS

- 1. Creating variables
- 2. Descriptive statistics for qualitative variables
- 3. Descriptive statistics for quantitative variables

C. Student's t Test for Single Sample

- 1. t distribution
- 2. Applications of one-sample t test
- 3. degrees of freedom
- 4. Confidence intervals
- 5. Testing the significance of Pearson  $r$
- 6. Interpreting results of single sample t test
- 7. Reporting results of single sample t test

D. Paired (Correlated) Samples t Test

- 1. Applications of the paired samples t test
- 2. Assumptions of correlated samples t test
- 3. Using graphs to display results
- 4. Interpreting results of paired samples t test
- 5. Reporting results of paired samples t test

E. Independent Samples t Test

- 1. Applications of independent samples t test

2. Assumptions of independent samples t test
3. Effect size statistic
4. Using graphs to display results
5. Interpreting results of independent samples t test
6. Reporting results of independent samples t test

F. One-way Analysis of Variance (ANOVA)

1. F distribution
2. Applications of one-way ANOVA
3. Assumptions of one-way ANOVA
4. Interpreting results of one-way ANOVA
5. Reporting results of one-way ANOVA

G. Two-way and Higher-way ANOVA

1. Applications of two-way ANOVA
2. Assumptions underlying two-way ANOVA
3. Effect size statistics for two-way ANOVA
4. Follow-up analyses for significant main effect (pair-wise comparisons)
5. Follow-up analyses for significant interaction effects
6. Using graphs to display results
7. Interpreting results
8. Reporting results

H. One-way Repeated Measures

**7. Course Requirements/Evaluation:**

- A. Read all assigned materials prior to class and be prepared to respond to questions in class.
- B. Complete all homework assignments.
- C. Complete the all tests and the final examination.

Final grades will be based on the following:

1. Homework Assignments	100 points
2. Test 1(Midterm)	50 points
3. Test 2	50 points
4. Final examination	<u>100 points</u>
Total	300 points

The following grading scale will be used.

93% - 100% = A (Superior; Consistently well-prepared; very high performance)

81% - 92% = B (Above average performance; consistently prepared)

71% - 80% = C (Average to above average performance; usually prepared)

60% - 70% = D (Unacceptable performance)

Below 60% = F (Failing)

### **8. Class Policy Statements:**

The following guidelines should help students to know the course expectations that will help them to complete the course requirements successfully.

- A. There will be no unannounced quizzes in this class. However, it is strongly recommended that students read the material before coming to class. Each student's grade in this course is based on his/her own performance and not in comparison to the performance of others.
- B. Please ask for help if needed **at least 2 week days before homework** is due. Email almost anytime works well if you have a quick question. **No late homework will be graded.** Plenty of lead time is provided for students in case they have a planned or unplanned absence. The professor will provide due dates for assignments at the time assignments are made or earlier. **Only hard copies** of homework will be accepted. All assignments should be typed, double-spaced on one side of the paper, using 12-point font and dark, sharp print and **stapled in the upper left corner**. Assignments should be clean and neat. **Unstapled pages will not be graded.** For example, assignments held together with paper clips, folders, rubber bands, three-ring binders etc., **will not be accepted.** The first page should identify the student by full name, the assignment, and the date. The entire assignment must be turned in at the same time. **Partial assignments will not be graded.**

NOTE: Because of the nature of this course, students are expected to submit the copied and pasted (to a Word document) **computer output** showing results of analysis, solutions to problems, or supporting statistics for results sections. **No credit will be given for answers to questions without the supporting output.** The student should **copy and paste only the relevant part** of the computer output to a Word document, and then save and print the file to submit each assignment.

The answers to Home Work problems should be **clearly stated with the output on the SAME PAGE as the answer. Tables may not be broken between pages. It is O.K. to circle** appropriate statistics on the output. **NO CREDIT FOR DARK HIGHLIGHTED ANSWERS ON THE OUTPUT, AS I WILL NOT BE ABLE TO SEE THEM CLEARLY. USE ONLY LIGHT YELLOW HIGHLIGHTING IF YOU WISH TO HIGHLIGHT ON THE OUTPUT.** If you highlight or circle the answer, you must also write the answer. I must be able to tie your written response to the output. **Report the answer and the relevant output only. See the attached example.**

- C. Academic dishonesty is an offense that will be reported to the Academic Honesty Committee. (See related pages in the Tiger Cub.)
- D. Attendance/Absences: Attendance is required at each class meeting. It is the **student's responsibility to arrange for a classmate** to take notes for him/her and to get a copy of all handouts for him/her in the event of an absence.
- E. Accommodations: Students who need accommodations are asked to arrange a meeting during office hours the first week of classes, or as soon as possible if accommodations are needed immediately. If you have a conflict with my office hours, an alternative time can be arranged. To set up this meeting, please contact me by e-mail. Bring a copy of your Accommodation Memo and an Instructor Verification Form to the meeting. If you do not have an Accommodation Memo but need accommodations, make an appointment with the Program for Students with Disabilities at 1244 Haley Center, 844-2096 (V/TT).
- F. Honesty Code: The University Academic Honesty Code and the Tiger Cub Rules and Regulations pertaining to Cheating will apply to this class.
- G. Professionalism: As faculty, staff, and students interact in professional settings, they are expected to demonstrate professional behaviors as defined in the College's conceptual framework. These professional commitments or dispositions are listed below:
  - Engage in responsible and ethical professional practices
  - Contribute to collaborative learning communities
  - Demonstrate a commitment to diversity
  - Model and nurture intellectual vitality

## 9. **Justification for Graduate Credit**

Graduate courses "should be progressively more advanced in academic content than undergraduate programs" and should "foster independent learning" (SACS guidelines 3.6.1 and 3.6.2). Further, the guidelines presented in the Statement of Clarification of the Definition and Use of 6000-level courses as approved by the Graduate Council, May 21, 1997 apply:

Factors to consider in evaluating a course for graduate credit include but are not limited to the following:

--use of specific requisites

--content of sufficient depth to justify graduate credit (materials beyond the introductory level)

--content should develop the critical and analytical skills of students including their application of the relevant literature

--rigorous standards for student evaluation (all students in a 6000-level course must be evaluated using the same standards)

--course instructor must hold graduate faculty status or be approved by the Dean of the Graduate School

**10. Methodologies and Course Evaluation:**

A variety of teaching techniques and strategies will be used in the instruction of this course. The principal methods of instruction include, but may not be limited to lecture, demonstration, and question/answer sessions. Students will evaluate the course using a checklist of criteria.



### Instructions for Homework Submissions

The following format should be used to receive credit for homework problems. Homework problems should be presented in consecutive numerical order. In order to receive credit for a problem, each problem should include:

- (1) The problem numbered and stated as in the homework assignment (Instructor handout or textbook). Type the problem number as stated in the book or on the handout and type the problem. For example, if problems # 3, 6, and 9 are assigned, then these are numbered #3, 6, and 9, not numbered #1, 2, and 3.
- (2) Typed response to the problem.
- (3) Correct and appropriate statistical output that provides the evidence for the response must be copied and pasted in a Word document. (Only light yellow highlighting is acceptable, and this is optional. Circles and boxes around the correct statistics are acceptable, as is bolding. However, none of these extra notations is required.)
- (4) Each problem and its respective response and statistical output should be presented in the order given here – no exceptions. Only hard copy will be accepted for grading.

Example:

1. How many subjects have missing values for the statistics variable?

**There is one missing value for the “I like my statistics classes.”**

#### **Statistics**

I like my statistics classes

N	Valid	11
	Missing	1



Course Schedule and Assignments

Monday and Wednesday

Week	Date	Assignments
1	Monday June 30	<p>Become familiar with SPSS—e.g. how to start, open files, enter data, create charts, save and exit a file. Part I (Lessons 1-9: 16A, 17A in Green and Salkind [G&amp;S])</p> <p>Recommendation: Go to a computer lab and experiment with SPSS.</p> <p>Read Lesson 19 (Creating Variables)</p> <p>Suggested reading in Pagano: Chapter 1 (Statistics and Scientific Method) Chapter 2 (Basic Mathematical and Measurement Concepts) Skim Chapter 3 (Frequency Distributions) [with particular attention to definitions, graphs, and curves] Chapter 4 (Measures of Central Tendency and Variability) Chapter 5 (The Normal Curve and Standard Scores)</p>
1	Wednesday July 2	<p>Discuss Lesson 19 (Creating Variables)</p> <p>Assign: HW #1 (a) Exercises 1, 2, and 3 in Lesson 19</p> <p>Read Lesson 20 (Univariate Descriptive Statistics for Qualitative Variables)</p> <p>Suggested readings: Same as Previous Class Assignment</p>
2	Monday July 7	<p>Due: HW #1 on Lesson 19</p> <p>Discuss Lesson 20 (Univariate Descriptive Statistics for Qualitative Variables)</p> <p>Assign: HW #2 (b) Exercises 1, 2, and 5 in Lesson 20</p> <p>Read Lesson 21 ((Univariate Descriptive Statistics for Quantitative Variables)</p>

2	Wednesday July 9	<p>Due: HW #2 on Lesson 20</p> <p>Discuss Lesson 21 (Univariate Descriptive Statistics for Quantitative Variables) Assign: HW #3 Exercises 1, 2, and 3 in Lesson 21</p> <p>Read Lesson 22 (One sample t test) Suggested readings: Same as Week 1</p>
3	Monday July 14	<p>Due: HW #3 on Lesson 21</p> <p>Discuss Lesson 22 (One sample t test) Assign: HW #4 Exercises 1, 2, and 4 in Lesson 22</p> <p>Read Lesson 23 (Paired-Samples t test)</p>
3	Wednesday July 16	<p>Due: HW# 4 Due on Lesson 22</p> <p>Discuss Lesson 23 (Paired samples t test) Assign: HW#5 Exercises 2, 4, and 6 in Lesson 23</p> <p>Read Lesson 24 (Independent-Samples t test)</p>
4	<b>Monday July 21</b>	<p><b>Test #1 on Lessons 19, 20, 21, and 22</b></p> <p>Due: HW#5 on Lesson 23</p> <p>Discuss Lesson 24 (Independent-Samples t test) Assign: HW #6 Exercises 1, 2, 3, 4, and 6 in Lesson 24</p> <p>Read Lesson 25 (One-Way Analysis of Variance)</p>
4	Wednesday July 23	<p>Due: HW#6 Due on Lesson 24</p> <p>Discuss Lesson 25 (One-Way Analysis of Variance) Assign: HW#7 Exercises 1, 2, and 4 in Lesson 25</p> <p>Read Lesson 26 (Two-Way Analysis of Variance)</p>

5	Monday July 28	Due: HW #7 on Lesson 25  Discuss Lesson 26 (Two-Way Analysis of Variance) Assign: HW #8 Exercises 1, 2, 5, and 6 in Lesson 26  Read Lesson 29 (One-Way Repeated Measures Analysis of Variance)
5	Wednesday July 30	Due: HW #8 on Lesson 26  Discuss Lesson 29 (One-Way Repeated Measures Analysis of Variance) Assign: HW#9 Exercises 1, 2, 3, and 4 on Lesson 29  Review for test
6	Monday August 4	Due: HW #9 on Lesson 29 Last Class Day Final Examination on Lessons 23, 24, 25, 26, and 29

Please always check your email before class to assure that there are no changes/announcements, etc.

