

EPSY 503: Introduction to Inferential Statistics

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If you have a specific question that you want me, the instructor, to answer, then you should send me an email at evsmith@uic.edu using as a subject line 'EPSY 503'. Do **NOT** use the course email system and do **NOT** post questions to me on the Discussion boards as I will not check these nearly as often as my primary UIC email account.

Course Description

The course is designed as an entry level course in statistics and covers both descriptive and inferential statistical techniques to solve applied research problems. Emphasis is also placed on using statistical software packages.

Prerequisites: None

Course Materials

Required Texts

- King, B.M., Rosopa, P.J., & Minium, E.W. (2018). *Statistical reasoning in the behavioral sciences, 7th Ed.* Hoboken, NJ: Wiley. ISBN: 9781119379737. Visit [Amazon](#) or [Chegg.com](#). Note if you search around maybe you can find other sites selling or renting this book.
- Green, S.B., & Salkind, N.J. (2017). *Using SPSS for Windows and Macintosh, Books a la Carte, 8th Edition.* Upper Saddle River, NJ: Pearson Education. Visit <https://www.pearson.com/us/higher-education/program/Green-Using-SPSS-for-Windows-and-Macintosh-Books-a-la-Carte-8th-Edition/PGM14536.html>

Required Technology

You will need regular access to a computer with a connection to the Internet. A dial-up telephone connection will suffice, but high-speed access via broadband, satellite, or direct subscriber line (DSL) will greatly enhance your online learning experience. This is an online course, and all course

materials and instruction are presented online. A student CANNOT expect to complete the course using only this syllabus as a guide. Therefore, if you have difficulty accessing the course website, it is imperative that you take action immediately to solve the problem. Do not wait! It is YOUR responsibility to maintain connectivity throughout the entire length of the course regardless of where you are (this includes vacations, work-related travel, etc.). Remember that you may access the course from any computer that is capable of searching the Internet, so if you have difficulty with your home computer, please try a local public computer or a computer at work instead.

You will also need the following software:

- SPSS Statistical Package: Version 15 or higher for Windows or Version 13 or higher for Macintosh (more recent the better to match the Green and Salkind book). The Webstore (<http://webstore.illinois.edu/home/> or directly to <https://webstore.illinois.edu/shop/product.aspx?zpid=4022> has SPSS for download. If you want to use a trial version please see <https://www.ibm.com/analytics/us/en/technology/spss/spss-trials.html#spss-trials>.
- If you purchased from the WebStore please make sure to run the License Authorization Wizard immediately after installation. The WebStore should have provided you with the license code right after your purchase (log into the WebStore and view your purchase history if you did not write the license code down).
- Adobe Acrobat Reader® to open PDF files that may be used during the course.
- You will need to have access to **The Microsoft Office** suite of software. This includes Word, PowerPoint, Excel, and Access. Work will not be accepted in other formats for this course.

Course Outcomes

- Students can recognize and define basic descriptive and inferential statistical terms and concepts.
- Students can arrive at reasonable accurate answers to selected statistical problems and procedures.
- Students can demonstrate competence in using SPSS for data manipulations and analysis.
- Students can recognize when and when not to use certain statistical procedures.
- Students can apply statistical procedures to data in order to answer research questions.

Course Topics and Objectives

Introductory Concepts

- Distinguish between a population and a sample.
- Distinguish between a parameter and a statistic.
- Distinguish between the purposes of descriptive statistics and inferential statistics.
- Describe the methods, benefits, and limitations of probability sampling strategies.
- Distinguish between independent, dependent, constant, and intervening variables.
- Compare and contrast nominal, ordinal, interval, and ratio scales of measurement.
- Describe threats to internal and external validity and ways to control them in research designs.

- Distinguish between pre-experimental, experimental, quasi-experimental, and ex post facto research designs.

Frequency Distributions

- Construct a distribution of class intervals from a given a data set.
- Determine the midpoint, upper class limit, and lower class limit of a given class interval.
- Calculate a specified proportion and percentage from a given data set.
- Compare and contrast histograms, bar graphs, frequency polygons, and stem and leaf plots in terms of their function and characteristics.
- Construct a frequency table from a given data set.
- Construct a histogram, bar graph, frequency polygon, stem and leaf plot, and frequency ogive from a given data set.
- Describe the symmetry of a distribution or data set.
- Determine whether a given data set represents a leptokurtic, mesokurtic, or platykurtic distribution.
- Construct a grouped frequency distribution from a given data set.
- Interpret the practical significance of a given frequency distribution.

Central Tendency and Variability

- Compare and contrast measures of central tendency in terms of their meaning and limitations.
- Calculate the mean, median, and mode of a given data set.
- Explain the meaning of a multimodal distribution.
- Determine the impact of changing values in a given data set on the mean of the mean, median, and mode.
- Describe how measures of central tendency and measures of dispersion complement one another.
- Compare and contrast measures of dispersion in terms of their meaning and limitations.
- Calculate the range, interquartile range, semi-interquartile range, variance, and standard deviation of a given data set.
- Explain the implications of calculating the standard deviation or range for a sample versus a population.
- Explain the practical significance of degrees of freedom.
- Determine the most appropriate measure for reporting the central tendency and dispersion of a given data set.

Normal Curve and Inferential Statistics

- Describe the properties of the normal distribution.
- Compare two scores from given distributions and interpret the results.
- Explain the purpose of using standardized scores.
- Convert raw scores to standardized scores and vice versa based on a given set of data.
- Explain the practical significance of a standardized distribution.
- Determine the proportion of scores within a given standard deviation in a standardized distribution.
- Compare and contrast percentile ranks and percentiles.
- Interpret a percentile based on a raw score and normal distribution.
- Explain the relationship between probability and inferential statistics.

Hypothesis Testing, Error, and Power

- Explain what a sampling distribution represents.
- Explain how the sampling distribution of the mean relates to population parameters.
- Explain the implications of the central limit theorem for research design.
- Explain the relationship between standard error, standard deviation, and population variance.
- Explain the implications of standard error for research design and interpretation of scores.
- Determine the probability of obtaining a particular mean or score range for a given sampling distribution.
- Formulate a null, alternative, directional, and nondirectional hypothesis for a specified test.
- Explain the relationship between probability and hypothesis testing.
- Explain the practical significance of Type I and Type II error and the procedures used to minimize them.
- Test a statistical hypothesis and interpret the results.
- Determine whether a one- or two-tailed test is more appropriate for evaluating a specific situation.
- Explain the practical significance of statistical power.
- Explain the implications of the relationship between alpha level, power, and Type I and Type II error for research design and hypothesis testing.

Correlation and Regression

- Explain the purpose of correlation testing.
- Describe the relationship between two variables based on their distribution.
- Calculate Pearson's correlation coefficient for a given data set.
- Explain the assumptions that should be checked when calculating Pearson's correlation coefficient.
- Explain the differences between correlation and causation.
- Describe how restricted ranges and outliers affect correlation coefficients.
- Explain the relationship between the correlation coefficient and the coefficient of determination.
- Calculate Pearson's correlation coefficient for a given data set.
- Conduct a correlation analysis and interpret the results.
- Describe the relationship between correlation and regression analyses.
- Determine the equation for the regression line for a given data set or correlation coefficient.
- Conduct a regression and interpret the results.
- Explain what a standard error of the estimate means in terms of regression.
- Determine the proportion of variance accounted for by a set of variables.

T-tests

- Describe the differences between an independent-samples t-test and a dependent-sample t-test.
- Conduct a t-test to compare two groups of equal sample sizes and interpret the results.
- Conduct a t-test to compare two groups of unequal sample sizes and interpret the results.
- Apply the procedures for comparing the means of two independent samples and interpret the results.
- Explain the assumptions that should be checked when conducting an independent-samples t-test.
- Conduct a t-test for two dependent sample and interpret the results.

- Explain the assumptions that should be checked when conducting a dependent-samples t-test.

ANOVA

- Determine whether a t-test or ANOVA is more appropriate in a given situation.
- Identify the levels and variables used in an ANOVA.
- Compare and contrast testwise and experimentwise error.
- Conduct an ANOVA and interpret the results.
- Compare and contrast between-groups and within-groups variance.
- Describe the characteristics of the F distribution.
- Explain the assumptions that should be checked when conducting an ANOVA.
- Explain the considerations for sample size when conducting an ANOVA.
- Calculate the values needed to construct an ANOVA summary table.
- Explain the purpose and considerations for conducting post hoc ANOVA comparisons.
- Calculate the effect size for an ANOVA and interpret the results.

Chi-Square

- Compare and contrast parametric and nonparametric statistical tests.
- Explain the purpose of one-way and two-way chi-square tests.
- Conduct a chi-square goodness-of-fit test, and interpret the results.

Course Requirements

The success of any course is dependent on active and full participation by each class member. It can equally be said that the success of an individual class member is dependent on the individual's active and full engagement with peers, instructors, and assignments. Each student is expected to log-in to the course frequently and take full responsibility for engaging with content and monitoring their own progress. Timely completion of assignments will be the primary evidence of his/her participation in the course. The course is structured with a schedule and weekly due dates to assist students in appropriately structuring the time they should devote **weekly** to learning content.

Please note the beginning and ending date for each week in the course schedule and make sure that you complete and submit **required** assignments by the ending date and time indicated on the course schedule for online activities. Students who wait until the weekends to first check for the new content postings may encounter difficulties in keeping pace with the course and schedule.

Students are expected to keep current with the readings and practice exercises/quizzes assigned each week. All of the course readings should be in the primary text or accessible as a link within the course site. If for any reason a student encounters problems with accessing information the student is expected to notify the instructor/facilitator of the problem as soon as possible and assistance will be provided.

Each student is expected to read and carefully study the reading and module assignments in the text and on this course website. In addition, the student is encouraged to do a sufficient number of practice exercises that are found in each week's instruction on the website and at the end of each chapter in the text in order to help achieve a greater understanding of the concepts. It is the responsibility of each student to monitor his/her progress in meeting learning objectives and understanding the content and application of knowledge acquired each week via completion of modules, chapter quizzes, and practice exercises. If a student determines that he/she is not mastering the content covered each week, it is his/her responsibility to contact the instructor to seek assistance. Such assistance may include asking additional questions, requesting clarification on a topic, inquiring about additional instructional resources, etc.

Your final grade will be calculated by weighting your performance on the following course requirements:

Exams: There will be two graded examinations given during the course that contribute to your final grade in the course. Both exams will be taken within the online course management system (Blackboard). See the course schedule for the dates of these exams. Each exam will include multiple choice and short answer items that require application of knowledge and skills covered in the modules and chapter readings assigned for that exam. Objectives will be distributed for each exam to assist students in studying appropriately for the exam.

SPSS Assignments: A number of SPSS assignments will be given throughout the course. SPSS Assignments require students to apply concepts presented in the content modules to run statistical analyses using given datasets within SPSS software. Each assignment will pose a number of questions to be answered using results of appropriate statistical analyses. Students will be required to answer these questions in short answer form. Each assignment will be submitted within the online course management system (Blackboard).

Chapter Quizzes: Chapter Quizzes for each text chapter are all made available. The purpose of the chapter quizzes is to allow students to monitor their comprehension and application of chapter and module content within the week it is covered. Students should use the results of these quizzes to monitor their understanding and to identify areas in which they need further study or clarification. You are **required** to complete each quiz within the week it is assigned and due. You will have three attempts to take each quiz and the scores will be averaged to give you your final score. The combined score you receive on each quiz will contribute to your final grade. Thus, failing to **complete** any chapter quiz when assigned will adversely affect your final grade in this course. The quizzes should be used as a tool for students to monitor their mastery of content. Scoring poorly on any of these chapter quizzes is an indication that a student should actively take steps to seek additional assistance in a timely manner. They are not meant to be high stakes quizzes, which is why three attempts are allowed per quiz. Statistics is a subject area in which the concepts build upon one another. The order of presentation of modules within this course reflects the sequential nature of learning statistical concepts. Mastery of content within each module provides you with knowledge needed to master content in subsequent modules. It is important that students master weekly learning objectives as they move forward with content in the following week. Performance on these chapter quizzes provide students with practice and feedback and can help identify misconceptions or poor mastery of topics so he/she can seek targeted assistance.

The final grade will be determined by students' performance on the two examinations, the graded SPSS assignments, and chapter quizzes. The weight assigned to each of these components for computation of the final grade is as follows:

Exams – 45%

SPSS Assignments – 35%

Chapter Quizzes – 20%

Course Grades

In this course, your instructor will assess whether your work demonstrates that you have mastered the learning outcomes. For each unit, you will complete one or more assignments. Each assignment grade will in turn contribute to your final course grade, according to the weight of each assignment. Your final course grade will be one of the following:

A	90 – 100%	Excellent	The student's work demonstrates excellent grasp of all the learning outcomes associated with the course.
B	79 – 89%	Good	The student's work demonstrates mastery of the majority of learning outcomes associated with the course.
C	68 – 78%	Average	The student's work demonstrates mastery of approximately two-thirds of the learning outcomes associated with the course.
D	57 – 67%	Poor	The student's work demonstrates mastery of fewer than half of the learning outcomes associated with the course.
F	56% and Below	Failure	The student's work does not sufficiently demonstrate that he or she has adequately grasped any of the learning outcomes associated with the course.

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WEEK	BEGIN DATE	END DATE	READINGS	MODULES	ASSIGNMENTS DUE (At Midnight CST on End Date)
1	1/14	1/20	Course Syllabus Course Schedule King, Rosopa, & Minium (K/R/M): Appendix A Green & Salkind (G/S): Unit 1: Lessons 1-4	Online Learning in MESA EPSY 503 Course Orientation	Obtain ALL required course textbooks (see Syllabus) Post (and reply if you like) in the Icebreaker Discussion Obtain SPSS Software and Complete Unit 1: Lessons 1-4 in G/S text (SPSS Lessons in G/S are for practice and are not turned in) Complete all activities associated with modules Review Appendix A: Basic Mathematics in K/R/M
2	1/21	1/27	K/R/M: Chap 1 G/S: Units 2-3: Lessons 5- 15	Module 1: Introductory Concepts in Statistics	Complete Units 2-3: Lessons 5-15 in G/S text Complete Chapter 1 Quiz
3	1/28	2/3	K/R/M: Chaps 2 and 3 G/S: Unit 4A OR 4B Lessons 16-18 (depending on Operating System)	Module 2: Frequency Distributions	Complete Chapter 2 Quiz Complete Chapter 3 Quiz Complete Unit 4A OR 4B: Lessons 16-18 in G/S text Begin SPSS Assignment 1
4	2/4	2/10	K/R/M: Chaps 4 and 5 G/S: Unit 5: Lessons 19-21	Module 3: Central Tendency and Variability	Complete Chapter 4 Quiz Complete Chapter 5 Quiz Complete SPSS Assignment 1 Unit 5: Lessons 19-21 in G/S text
5	2/11	2/17	K/R/M: Chap 6	Module 4: Standard Scores and Normal Curve	Complete Chapter 6 Quiz Begin SPSS Assignment 2
6	2/18	2/24	K/R/M: Chaps 10 and 11	Module 5: Probability and Inferential Statistics	Complete Chapter 10 Quiz Complete Chapter 11 Quiz Complete SPSS Assignment 2
7	2/25	3/3	K/R/M: Chaps 12, 13, and 14 G/S: Unit 6: Lesson 22 Exam 1 Objectives	Module 5: Hypothesis Testing, Error, and Power	Complete Chapter 12 & 13 Quiz Complete Chapter 14 Quiz Complete Unit 6: Lesson 22 in G/S text

8	3/4	3/10	None	Exam 1: Covers chapters 1-6 and 10-14	Exam 1 will be open from 3/3 at 11:59 PM to 3/10 11:59 PM CST. You must access, complete, and submit Exam 1 during this time period. Once you open the exam you will have 5 hours to complete and submit it. It must be completed and submitted by 11:59 PM CST on 3/10.
9	3/11	3/17	K/R/M: Chaps 7 and 17 G/S: Unit 8: Lesson 31	Module 6: Correlation	Complete Chapter 7 Quiz Complete Chapter 17 Quiz Complete G/S: Unit 8: Lesson 31 Begin SPSS Assignment 3
10	3/18	3/24	K/R/M: Chaps 8 and 9 G/S: Unit 8: Lesson 33	Module 7: Regression	Complete Chapter 8 Quiz Complete Chapter 9 Quiz Complete G/S: Unit 8: Lesson 33 Complete SPSS Assignment 3
11	3/25	3/31	Spring Break!		To be consistent with our Thursday to Wednesday schedule.
12	4/1	4/7	K/R/M: Chaps 15 and 16 G/S: Unit 6: Lessons 23-24	Module 8: T-tests	Complete Chapter 15 Quiz Complete Chapter 16 Quiz Complete G/S: Unit 6: Lessons 23-24 Begin and Complete SPSS Assignment 4
13	4/8	4/14	K/R/M: Chap 19 G/S: Unit 7: Lesson 25	Module 9: ANOVA	Complete Chapter 19 Quiz Complete G/S: Unit 7: Lesson 25 Begin and Complete SPSS Assignment 5
14	4/15	4/21	K/R/M: Chap 21 G/S: Unit 10: Lessons 39-41 Exam 2 Objectives	Module 10: Chi-Square	Complete Chapter 21 Quiz Complete G/S: Unit 10: Lesson 40 Begin and Complete SPSS Assignment 6
15	4/22	4/28	None	Exam 2: Covers chapters 7-9, 15-17, 19, and 21	Exam 2 will be open from 4/21 11:59 PM PM to 4/28 11:59 PM CST. You must access, complete, and submit Exam 2 during this time period. Once you open the exam you will have 5 hours to complete and submit it. It must be completed and submitted by 11:59 PM CST on 4/28.