

# **EPPS 2303.001 (86395) Descriptive and Inferential Statistics for the Social and Policy Sciences (3cr)**

**Classroom Building 2 (CB2) 1.202 – Monday and Wednesday 1:00pm -2:15pm, Fall 2016**

**Instructor Contact:** Professor Simon Fass

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([fass@utdallas.edu](mailto:fass@utdallas.edu) only if elearning is dysfunctional)

Office Hours (GR 3.224): Monday 11:00-12:30 and 5:30-6:30

Wednesday 11:00-12:30

Thursday 5:30-6:30 and by appointment

**Teaching Assistant:** Sean Hubbard (office hours TBD)

**Supplemental Instruction:** TBD

## **Pre-requisites:**

MATH 1314 (College Algebra) or equivalent. Please note that passing a prior course in college algebra may not by itself assure success in this class. To do well a student should be very comfortable with college algebra and arithmetic.

## **Description:**

This course is an introduction to statistical procedures that researchers and analysts in the public, nonprofit and private sectors use to examine quantitative relationships in social and policy science and practice to improve understanding of human circumstances and to assess potential impacts of actions taken to address the circumstances. Coverage includes:

- methods of producing data (e.g., sampling);
- techniques for displaying/visualizing data (e.g., frequency, contingency tables);
- different types of data (e.g., continuous, categorical)
- how to measure data (e.g. central tendency, variability);
- probability distributions of data (e.g., discrete, continuous, normal);
- how to infer population characteristics from sample data (e.g. hypothesis testing);
- how to test for true differences between group averages, proportions, medians, etc.
  - (e.g. Z-test, t-test, F-test, chi-square test, etc.);
- how to assess the strength of relationships between variable pairs (e.g., correlation);
- explaining and predicting outcomes based on causal factors (e.g. regression); and
- applying software to help crunch numbers associated with all the foregoing.

*NOTE: EPPS 2303 (or 2302) is required for all majors in the School of Economic, Political and Policy Sciences and is a prerequisite for required research methods courses in economics (ECON 3304). Students cannot receive credit for both EPPS 2302 and EPPS 2303.*

## **Student Learning Objectives/Outcomes:**

Students who complete this course successfully will have acquired a sound understanding of what data are and of how to apply some basic statistical tools to extract information and meaning from them. As a result, students will be knowledgeable and critical consumers of published information that present statistical data, able to carry out statistical analysis in their own research, and prepared to undertake advanced statistics courses. Accordingly, at the end of the course students should be equipped to:

- describe and present data clearly, and use them effectively in support of arguments;
- grasp and apply probability-related concepts to assess claims made about populations;
- appreciate how regression techniques are used to assess cause-effect relationships; and
- understand how to apply statistical analysis software.

## **Required Textbook and Materials:**

### **Basic Business Statistics, 13/E. 2015**

Mark L. Berenson, David M. Levine, Kathryn A. Szabat. Pearson

ISBN-10: 0321870026 or ISBN-13: 9780321870025

Get standalone **hardcopy** version... just the text without CD or other bells and whistles

This text should be available at campus bookstore and at off-campus retailers in the area

### **Calculator:**

A basic \$5-\$20 calculator with memory and square root functions but **NO STATISTICAL FUNCTIONS** is very helpful for in-class quizzes. Cellphones, tablets, laptops and like gizmos are banned. So using their built-in calculators may prove challenging.

### **Software:**

**STATA** software is available on EPPS labs computers for student use. Students may find it more convenient to buy an individual Small Stata 6-month license for \$38 or, though not necessary, Intercooled Stata (IC) for \$75 at:

<http://www.stata.com/order/new/edu/gradplans/student-pricing>

Students may prefer to use a more challenging program: **R**. It is free and downloadable at:

<https://cran.r-project.org/bin/windows/base>

A graphical interface to simplify working with R: R-Studio, is downloadable at:

<https://www.rstudio.com/products/rstudio/download>

## **Suggested Course Materials**

Statistics may seem dry and boring to those not enamored of numbers. If students would like to accompany reading of the text with a parallel book that is light and does a credible job of illustrating the basics, then they might consider getting hold of:

Naked Statistics: Stripping the Dread from the Data, 2013. Charles Wheelan. WW Norton

## **Reading Assignments and Calendar**

### **1. August 22/24 Introduction to the Course**

Chapter 1: Defining and Collecting Data

*1.1 Defining Data*

*1.2 Measurement Scales for variables*

*1.3 Collecting Data*

*1.4 Types of Sampling Methods*

### **2. August 29/31 How to Manage and Present Data**

Chapter 2: Organizing and Visualizing Data

*2.1 Organizing Categorical Variables*

*2.2 Organizing Numerical Variables*

*2.4 Visualizing Numerical Variables*

*The Stem and Leaf Display*

*The Histogram*

*2.5 Visualizing Two Numerical Variables*

*The Scatter Plot*

**3. Sept. 7    How to Measure Data**

Chapter 3: Numerical Descriptive Measures

*3.1 Central Tendency*

*3.2 Variation and Shape*

*3.3 Exploring Numerical Data*

*Quartiles*

*The Interquartile Range*

*The Boxplot*

*3.4 Numerical Descriptive Measures for a Population*

*The Population Mean*

*The Population Variance and Standard Deviation*

*The Empirical rule*

*3.5 The Covariance and the Coefficient of Correlation*

**4. Sept. 12/14    How to Calculate Probabilities of Events**

[\*Quiz 1 on 9/12\*](#)

Chapter 4: Basic Probability

*4.1 Basic Probability Concepts*

*4.2 Conditional Probability*

**5. Sept. 19/21    Understanding the Distribution of Discrete Probabilities**

Chapter 5: Discrete Probability Distributions

*5.1 The Probability Distribution for a Discrete variable*

*5.2 Covariance of a Probability Distribution*

*Covariance*

*Expected Value, Variance and...the Sum of Two Variables*

**6. Sept. 26/28    Understanding the Distribution of Continuous Probabilities** [\*Quiz 2 on 9/26\*](#)

Chapter 6: Normal and Other Continuous Distributions

*6.1 Continuous Probability Distributions*

*6.2 The Normal Distribution*

*6.3 Evaluating Normality*

*6.4 The Uniform Distribution*

**7. October 3/5    Relationships between Samples and Populations**

Chapter 7: Sampling Distributions

*7.1 Sampling Distributions*

*7.2 Sampling Distribution of the Mean*

*7.3 Sampling Distribution of the Proportion*

**8. October 10/12    Estimating Population Characteristics from a Sample** [\*Quiz 3 on 10/10\*](#)

Chapter 8: Confidence Interval Estimation

*8.1 Confidence Interval Estimate for the Mean ( $\sigma$  Known)*

*8.2 Confidence Interval Estimate for the Mean ( $\sigma$  Unknown)*

*8.3 Confidence Interval Estimate for the Proportion*

*8.4 Determining Sample Size*

- 9. October 17/19    How to Assess a Claim Made About 1 Population**  
Chapter 9: Fundamentals of Hypothesis Testing: 1-Sample  
    *9.1 Fundamentals of Hypothesis-Testing Methodology*  
    *9.2 t Test of Hypothesis for the Mean ( $\sigma$  Unknown)*  
    *9.3 One-Tail Tests*  
    *9.4 Z Test of Hypothesis for the Proportion*
- 10. October 24/26    How to Evaluate Claims Made About 2 Populations    *Quiz 4 on 10/24***  
Chapter 10: Two-Sample Tests  
    *10.1 Comparing the Means of Two Independent Populations*  
    *10.2 Comparing the Means of Two Related Populations*  
    *10.3 Comparing the Proportions of Two Independent Populations*  
    *10.4 F Test for the Ratio of Two Variances*
- 11. Oct. 31/Nov. 2    Assessing Claims about More than 2 Populations**  
Chapter 11: Analysis of Variance  
    *11.1 The Completely Randomized Design: One-Way ANOVA*  
        *Analyzing variation in One-Way ANOVA*  
        *F Test for Differences among More Than Two Means*  
        *Multiple Comparisons: The Tukey-Kramer Procedure*
- 12. Nov. 7/9    How to Analyze Categorical Data    *Quiz 5 on 11/7***  
Chapter 12: Chi-Square and Nonparametric Tests  
    *12.1 Chi-Square Test for the Difference between Two Proportions*  
    *12.2 Chi-Square Test for Differences between More Than Two Proportions*  
    *12.3 Chi-Square Test of Independence*
- 13. Nov. 14/16    Finding Simple Relationships and Making Predictions**  
Chapter 13: Simple Linear Regression  
    *13.1 Types of Regression Models*  
    *13.2 Determining the Simple Linear Regression Equation*  
    *13.3 Measures of Variation*  
    *13.4 Assumptions of Regression*  
    *13.5 Residual Analysis*  
    *13.7 Inferences about the Slope and Correlation Coefficient*
- 14. Nov. 28/30    Finding Not so Simple Relationships and Predicting Better    *Quiz 6 on 11/28***  
Chapter 14 Introduction to Multiple Regression  
    *14.1 Developing a Multiple Regression Model*  
    *14.2  $r^2$ , Adjusted  $r^2$ , and the Overall F Test*  
    *14.4 Inferences Concerning the Population Regression Coefficients*  
    *14.6 Using Dummy Variables and Interaction Terms in Regression Models*  
        *Dummy Variables*
- 15. December 5/7    Summing Up    *Quiz 7 on 12/5***  
*Final Assessment on 12/7*

### **Grading:**

Grades stem from demonstrated performance on bi-weekly quizzes (50%), four take-home assignments (40%), and a final assessment (10%). There are seven (7) bi-weekly quizzes, open book and note - but not open computer, cellphone or similar gizmo. The average of a student's five (5) best results in the bi-weekly quizzes sets the quiz portion of the course grade. The overall grade structure is:

A+ = 97-100	B+ = 87-89	C+ = 77-79	D+ = 67-69
A = 93-96	B = 83-86	C = 73-76	D = 63-66
A- = 90-92	B- = 80-82	C- = 70-72	D- = 60-62
F = 59 and less			

There are no makeup quizzes. The "best 5-out-of-7" quiz grade allows for unanticipated absences. There is no extra credit mechanism for this course.

Take home assignments are spelled out about one week before the due date. These are good exercises for learning software and for quiz preparation. Students submit assignments via eLearning's "*COURSE MESSAGES*." The assignment is prepared in MSWord using 12 point, Times New Roman font with 1-inch margin all around. Points are lost for late submission.

Filename (not subject line) format must be: <*last name first name Assignment #*>. So for instance, Jon Smith's second assignment would be: **Smith Jon Assignment2 (or Smith Jon A2)**.

### **Course and Instructor Policies**

Attendance is highly recommended but not mandatory. However, because a student cannot make up for missed quizzes, and because quizzes are based to an important extent on lecture content, attending all classes is a good idea. Oh, and keep in mind that sleeping in class (stats does not help with this, of course) undermines the purpose of attendance. So awake is good too.

Kindly silence cell phones while in class, and do not talk or text on the phone during class. This behavior disrupts nearby students and disrespects the instructor... who typically takes unrepentant dissing into account when adjusting grades.

More generally, unless otherwise instructed by the professor, cell phones, laptop computers and other electronic devices must be off during every class, and especially off during quizzes (except for approved calculator). If on during a quiz, then the quiz grade is zero (0)

Students should print posted class lecture notes and bring them to class. In general, the way to succeed in the course is to read the assigned text chapter and lecture notes ahead of time, arrive to class on time, participate in discussions, not be embarrassed to ask questions, study diligently and take advantage of any Supplemental Instruction opportunities and/or Teaching Assistant support if available, and the Professor's office hours.

"COURSE MESSAGES" on the eLearning course page is the only electronic way to communicate with the instructor. Students should check it often for messages that may contain important information.

**Make-up Quizzes** none

**Extra Credit** none

**Late Work** 10% of assignment value is lost for each day overdue

## **Learning Resources**

**Refreshing:** Solid understanding of arithmetic and college-level algebra is essential. If uncertain about the solidity of your grasp, and/or if you want/need a rapid refresher, I recommend quality time with *MathTutor*, a learning site by UK academics to prepare students who arrive at university not as well prepared in basics as they should be: <http://www.mathtutor.ac.uk/>

**Therapeutic Reading:** The recommended text, *Naked Statistics*, is a light exploration of how the various concepts we cover in class apply in the world of the everyday. In the process, this text also helps to further clarify what the concepts mean and what they can do.

**Videos:** In addition to STATCLIPS posted on elearning, there are a great many independent and corporate how-to videos associated with statistics in general, and with STATA software that populate the YouTube universe (e.g., search for *STATA regression* on the web). But for getting extra guidance on course materials, a quite good learning source is Khan Academy. It offers a wide array of video mini-lectures that can help illuminate key concepts and methods:

<https://www.khanacademy.org/math/probability>

## **Syllabus Addendum adapted from the Office of Judicial Affairs**

Each student must exercise independent thought, expression and aptitude. This addendum to the syllabus can assist in maintaining academic integrity while seeking scholastic success.

### **General Comments:**

- All assignments and examinations require individual, independent work. Any exception(s) will be clearly identified by the instructor.
- Be sure your name is on all your work.
- Complete and turn in assignments and exams on time and in the required format.
- Retain all research notes and drafts until the assignment has been graded.
- Obtain written authorization from the instructor prior to submitting a portion of academic work previously submitted for any academic exercise. (This includes an individual or group project submitted for another course or at another school.)

### **Assignments, class paper and examinations:** Be prepared:

- to present periodic drafts of work in process
- to correctly and completely reference all sources using the citation format prescribed
- to submit your completed work in a timely and in the prescribed manner.

All episodes of suspected scholastic dishonesty are reported according to University policy. Students who violate University rules on scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. Since such dishonesty harms the individual, all students and the University, policies on scholastic dishonesty will be strictly enforced.

To be as explicit as possible about the meaning of cheating (i.e. academic dishonesty): all assignments or other homework and exams are individual efforts (except when group work is assigned). Students do not collaborate with other students, or discuss assignments with other students prior to submission. Copying of assignments, other homework or exams, in whole or in part, from other students or from submitted academic work from previous semesters is an act of academic dishonesty. For details please see: <http://www.utdallas.edu/conduct/integrity/>

### **Classroom Citizenship**

Like academic integrity, debate about opposing views is a cornerstone of higher education. Your opinions matter as well as those of others. Please feel free to express yourself, but with courtesy and respect to all. Although large classes can make participation difficult, it is still the student's responsibility to engage with the material. This means paying attention and not texting, web surfing, having loud conversations or other disruptive behaviors. These kinds of behavior may influence a student's grade.

**UT Dallas Syllabus Policies and Procedures**

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus. It also provides information about your rights and links for a variety of services available to students: <http://go.utdallas.edu/syllabus-policies>

*All descriptions and timelines above are subject to change at the discretion of the instructor*