

Statistics for Business & Economics

BUS/MAT 2700

Spring 2006

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University and Departmental Mission: Seattle Pacific University seeks to be a premier Christian university fully committed to engaging the culture and changing the world by graduating people of competence and character, becoming people of wisdom, and modeling grace-filled community. The mathematics department at Seattle Pacific University seeks to provide excellent instruction to enable our students to be competent in the mathematics required for their chosen fields, and to share our expertise with the community through service and leadership. Hence, common goals for students in mathematics courses include 1) becoming competent in the topics covered in the course, 2) demonstrating skills and attitudes which contribute to professional, ethical behavior, 3) the ability to communicate mathematically, in both written and verbal form, and 4) learning to appreciate the beauty and utility of mathematics.

Course Goals: The aim of this course is to develop critical reasoning skills necessary to understand, interpret, and draw conclusions from the abundant quantitative data available in the business world. The focus of the course is the process of learning how to ask appropriate questions, how to collect data effectively, how to summarize, interpret, and draw conclusions from that data, and how to understand the limitations of statistical inference.

Learning Objectives: By the end of the course, you should acquire:

- an understanding of some fundamental statistical concepts, including randomization, estimation, confidence, testing, and significance;
- an understanding of fundamental concerns involved in proper data collection;
- the ability to construct, analyze, and interpret graphical, numerical, and verbal summaries of data;
- the ability to perform basic probability computations and an understanding of the role that probability plays in statistical inference;
- an understanding of the central limit theorem and the role that it plays in inferential statistics;
- the ability to construct, analyze, and interpret confidence intervals for proportions and means;
- the ability to conduct and interpret tests of hypotheses in a wide variety of contexts;
- the ability to use linear regression and the correlation coefficient to analyze the relationship between two variables and to predict the value of the dependent variable;
- facility with approaching and solving practical problems and analyzing genuine data using statistical reasoning;
- the ability to use a computer and Excel to analyze data and the ability to understand, interpret, and apply the output from Excel;
- skills of effectively communicating the results of statistical analyses through graphical and verbal means; and
- an appreciation for the role that statistics plays in the business world.

Overview: Statistics is the science of collecting and analyzing data for the purpose of drawing conclusions and making decisions. This includes methods for planning experiments, obtaining data, and organizing, summarizing, presenting, analyzing, interpreting, and drawing conclusions based on the data. Its purpose is to aid people in making decisions based on the analysis of numerical information. Data and numerical arguments abound in the business world. One of the primary goals of statistics is *inferential statistics*, which can be defined as drawing conclusions and/or making decisions concerning a large population based only on data about a *sample* from the population. When trying to draw conclusions about an entire population based only on a sample, it is essential that the sample be *representative* of the population. Poorly collected data can lead to misleading (if not completely meaningless) conclusions. As a result, we will begin the course by examining some fundamental concerns involved in *data collection* in chapter 1. Once data has been collected, it needs to be organized, summarized, and effectively presented in both graphical and numerical forms in order to facilitate understanding of the data. These methods are known collectively as *descriptive statistics* and are covered in chapters 2 and 3. Formal methods of inference are based heavily on *probability theory*, which is the subject of chapters 4 through 6. Most of the remainder of the course will deal with inferential statistics.

Please note that this is not a traditional mathematics course – the emphasis of the course will be on understanding statistical concepts and on interpreting and communicating the results of statistical analyses, *not* on mathematical computations. In other words, you will be expected to learn to construct and analyze numerical *arguments*. In contrast to most mathematics courses, we will be using phrases such as "there is strong evidence that ..." and "the data suggest that ..." rather than "the exact answer is ..." and "it is therefore proven that ...". To alleviate the computational burdens involved, we will make heavy use of Excel to perform calculations and produce visual displays.

Textbook and Course Materials: *Business Statistics: A First Course*, 4th edition, by Levine, Krehbiel, & Berenson.

Details about the topics to be covered can be found in the course overview above and in the schedule on the last page of this syllabus.

Throughout the course Microsoft Excel and PHStat (a statistical add-in for Excel) will be used to do most of the necessary computations and graphs. Excel and PHStat are available for your use on all computers in the classroom as well as in the computer labs in the library and in Otto Miller Hall. It will frequently be necessary to use Excel and PHStat for homework assignments. If you wish to use your own computer, Microsoft Office (including Excel) is available for purchase through CIS (in the basement of Marston Hall), and PHStat is included for free with the textbook.

Prerequisites: Completion of the University's Math Skills Competency Requirement. You are expected to be able to perform mathematically at the level of basic high school algebra. BUS 1700 or passing a competency exam in spreadsheets is also a prerequisite. We will use Excel extensively, and prior familiarity with Excel will be expected. No prior knowledge of statistics is expected.

The main things that you need to bring to the course are an open mind for tackling numerical questions in a conceptual manner and a willingness to participate actively in class.

Grading and Course Expectations

Attendance: Unless you have an acceptable excuse *and* make special arrangements with me *before* class begins, you are expected to attend class every day, arrive on time, and remain until class is over. Unless you have made special arrangements with me *before* class begins, missing an exam or quiz will result in a grade of zero. If you arrive for class late on the day of a quiz, and the quiz is already over, then you will receive a grade of zero for the quiz.

NOTE: Things such as oversleeping, lack of preparation, or sneezing twice are NOT acceptable excuses. Acceptable excuses include a death in your immediate family or a *severe* illness, and *you are responsible for providing me with documentation of your excuse.*

Homework: The only way to truly learn statistics is to work as many exercises as possible. There will be homework assignments given virtually every class period, and they will usually be due at the next class meeting. All assignments will be posted on the course website; however, you are also responsible for all announcements made in class (whether or not they are posted on the web). Many assignments require the use of Excel and PHStat, so you will need to plan to have access to a computer with this software when doing your homework.

Homework must be turned in by the start of class on the day it is due. **Late homework will not be accepted for any reason** (*and homework is considered late at 1:31*).

You are strongly encouraged to come to my office to ask me questions about the homework. You are also encouraged to work with other students on the homework, but you must individually write up and turn in your own solutions to the problems. You are required to list on your paper any other individuals that you worked with or that gave you assistance with the homework – failure to do so will be considered cheating (turning in someone else's work as your own). Homework must be neat and easily readable or you will receive NO credit. You must show all of your work – a correct answer with no justification will also be worth NO credit, particularly for exercises with answers in the back of the book. Not all homework exercises will be graded, but a representative sample will be selected for grading over the course of the quarter.

Quizzes: There will be occasional quizzes, some of which may be administered online outside of regular class time. Quiz scores will count as a part of your homework grade.

Team Projects: Early in the quarter the class will be divided into small groups for a series of three to four team data analysis projects. Half of the grade for each project will be based on the statistical accuracy of your results, and the other half will be based on the writing and presentation of the results. Each project will be assigned at least one week prior to its due date. They will require substantial time spent together with your team. Do not wait until the day before the project is due to begin the assignment. **The project deadline will be strictly adhered to. No excuses for not completing a project on time will be accepted. A deduction of a full letter grade (10 points) per day (weekends count as one day) will result for projects turned in after 1:30 (the start of class) on the due date. Please do not use computer problems as an excuse – computers will frequently have problems, so back up your work often and don't wait until the last second to print your project – make sure that you build in enough time to deal with problems.**

Collaboration: Collaboration will be an important part of this course. The team projects will require students to work in groups with each other, and each project will require a signed statement from every group member that verifies participation. Problems will also be assigned in class that will require group participation; many of these problems will be collected and will be treated as a part of your homework/quiz average for the quarter.

Exams: There will be two midterm exams and a cumulative final exam. Use of Microsoft Excel will be required for parts of the exams. Tentative dates for the exams are listed in the schedule at the end of this syllabus, but those dates are subject to change.

Course Grades: Your overall average for the course will be computed as a weighted average of your homework and quizzes (30%), team projects (20%), exam 1 (15%), exam 2 (15%), and the final (20%). Course grades will be based on the following scale:

	93-100% A	90-92% A-
87-89% B+	83-86% B	80-82% B-
77-79% C+	73-76% C	70-72% C-
67-69% D+	60-66% D	Below 60% E

A grade of I (incomplete) is *only* given for non-academic reasons such as a severe illness that prevents you from completing the course. You *must* have a passing grade on the material that you have completed in order to receive an incomplete.

Academic Dishonesty: Academic dishonesty includes copying another's work on an exam, preparing for an exam by using test questions from a stolen exam, bringing concealed answers to an exam, turning in another person's work as your own, committing plagiarism, or assisting another student in cheating. The *minimum* penalty for cheating or plagiarism in any form will be a zero for the assignment or exam in question. In addition, all students have an obligation to make efforts to prevent other students from cheating and to report incidents of cheating or plagiarism. Further details regarding SPU's academic dishonesty policies can be found on p. 44-45 of the 2005-2006 Undergraduate Catalog.

Office Hours: My office hours will be announced in class during the first week of class and will be posted on the course web pages and outside my office door. You are strongly encouraged to drop by my office to ask questions, discuss problems, and just to get to know me better. If you are unable to meet with me during my scheduled office hours, I am available at other times by appointment. I also maintain an "open door" policy at my office – any time that my door is open you are welcome to drop in to talk to me, even if it is not during my scheduled office hours. *Please note that I also work as the statistician for a research lab at the University of Washington, so I will not be on campus at all on Tuesdays and Thursdays. Please plan accordingly.*

Additional Notes:

E-mail: All SPU students have an SPU e-mail address. I will occasionally make use of these SPU e-mail addresses to send information to all members of the class, so you should check your e-mail regularly. If you do not use your SPU e-mail account, there is a utility available through Banner to set up your SPU e-mail account to forward messages to some other e-mail address. I strongly recommend doing this so that you do not miss any important messages.

Please note that while it can be a great tool for quick communication (such as scheduling an appointment to talk with me face-to-face), *e-mail is rarely a good substitute for face-to-face conversations and is very poorly suited for answering mathematical questions.* When you come to my office to ask me questions, I engage you in a discussion about the problem, ask questions about what ideas you have for approaching the problem, explore various possible approaches (and what goes wrong with some of them), etc. In the process, I can usually find out precisely where your difficulties lie and help you to learn how to get past them. Such a conversation is impossible by e-mail. Furthermore, typing and e-mailing mathematical symbols is very time consuming, and the resulting equations in the e-mail e-mails often come out garbled (or even completely missing).

Students with Disabilities: Students with disabilities need to contact Disabled Student Services in the Center for Learning to request academic accommodations. Disabled Student Services sends letters out to all your professors indicating the appropriate accommodations for the classroom based on your disability. Once you have done this, you should also make an appointment to meet with me as soon as possible to discuss the details of how we will implement the accommodations in this course.

Tentative Class Schedule

The table below provides a listing of topics that I plan to cover from the textbook. The exact dates on which we cover material will almost certainly vary somewhat from this list. Also, topics may be added to or removed from this list at any time.

Date	Topics Covered
March 29	Chapter 1: Introduction and Data Collection
March 31	Section 2.1: Tables and Charts for Categorical Data
April 3	Section 2.2: Organizing Numerical Data Section 2.3: Tables and Charts for Numerical Data
April 5	Section 2.4: Cross Tabulations Section 2.6: Misusing Graphs & Ethical Issues
April 7	Section 3.1: Measures of Central Tendency, Variation, and Shape
April 10	Section 3.2: Numerical Descriptive Measures for a Population Section 3.3: Exploratory Data Analysis Section 3.5: Pitfalls and Ethical Issues
April 12	Section 4.1: Basic Probability Concepts Section 4.2: Conditional Probability and Independence
April 14	No Class – Good Friday
April 17	Review/Catch-up
April 19	Exam #1
April 21	Section 5.1: Discrete Probability Distributions Section 5.2: The Binomial Distribution Section 6.1 Continuous Probability Distributions
April 24	Section 6.2: The Normal Distribution Section 6.3: Assessing Normality Section 4.5: Ethical Issues and Probability
April 26	Sections 7.1, 7.2, 7.3: Sampling Distributions
April 28	Sections 7.4, 7.5: Survey Sampling Introduction to Confidence Intervals for the Mean (section 8.1)
May 1	Sections 8.1, 8.2: Confidence Intervals for the Mean
May 3, 5	Sections 7.1, 7.2, 7.3: Hypothesis Testing for the Mean <i>May 5 is the last day to withdraw from courses</i>
May 8	Section 7.4: The t -test of Hypotheses for the Mean
May 10	Review
May 12	Exam #2
May 15	Sections 8.3, 9.5: Confidence Intervals and Hypothesis Tests for Proportions
May 17	Section 8.4: Sample Size Section 8.5, 9.6: Cautions, Pitfalls, and Ethical Issues in Estimation & Hypothesis Testing
May 19	Section 10.1: Comparing Means of Two Independent Populations Section 10.2: Comparing Means of Two Related Populations Section 10.3: Comparing Two Proportions Sections 11.1, 11.2, 11.3: Chi-Square Tests of Independence
May 22	Section 10.4: F Test for the Difference between Two Variances Section 10.5: One-Factor Analysis of Variance
May 24	Section 2.5: Scatter Diagrams Sections 12.1, 12.2: Linear Regression
May 26	Sections 12.4, 12.5, 12.6: More on Linear Regression Section 3.4 The Covariance and Coefficient of Correlation
May 29	No class: Memorial Day
May 31	Section 2 12.7, 12.8: Inference for Regression Section 12.9: Pitfall and Ethical Issues in Regression
June 2	Review
June 6	Final Exam 1:00-3:00

Modifications to the course requirements can be made at any time. It is *your* responsibility to know all course requirements as described here or announced in class.