

St. Ambrose University
College for Professional Studies / ACCEL Program

STBE 337 Statistics for Business and Economics
ACCEL Module

I. COURSE DESCRIPTION

Principles and applications of descriptive and inferential statistics. Topics covered are data summarization, measures of central tendency, measures of dispersion, fundamental principles of probability, discrete and continuous probability distributions, probability calculations for normal and t-distributions, confidence intervals, hypothesis testing, analysis of variance (ANOVA), correlation and regression, and goodness-of-fit tests.

II. COURSE OVERVIEW

This course will explain and expand the tools and techniques of statistical analysis that are applicable to the business environment.

III. PREREQUISITES

MATH 151 or 161, ECON 201

IV. MATERIALS OF INSTRUCTION

Lind, D. (2010). *Statistical techniques in business and economics*. (14th ed.)
McGraw-Hill. ISBN 978-0-07-340176-8, or
with CD (not necessary) ISBN 978-0-07-730942-8

Optional

Lind, D. (2010). *Basic statistics using Excel 2007*. (14th ed.) McGraw-Hill.
ISBN 978-0-07- 727001-8

Calculator

Excel 2007 will be used for statistical calculations.

V. COURSE LEARNING OUTCOMES

Upon successful completion of this course, students will be able to:

- Explain what is meant by descriptive statistics and inferential statistics and why they are important in the business world.
- Organize qualitative data into a frequency table, present this data as a bar chart or a pie chart using software, and create a frequency distribution using histograms for quantitative data.
- Calculate and interpret the arithmetic mean, weighted mean, median, mode, range, mean deviation, variance, and standard deviation.
- Compute and interpret quartiles, deciles, and percentages.
- Explain the terms experiments, event, outcome, permutation, and combination, calculate probabilities using the rules of addition and rules of multiplication.
- Compute probabilities using the binomial probability distribution.
- Compute probabilities and confidence intervals for continuous population and sample data using the normal distribution and student t-distribution, and interpret the results.

- Carry out one-sample and two-sample hypothesis tests and produce appropriate conclusions based on the results. Conduct a test of hypothesis to determine whether the variances of two populations are equal.
- Create a scatter diagram for two variables, conduct a test of hypothesis to determine if two variables are associated, and calculate the least squares regression line.
- Compute the intercept and coefficients for multiple variables using multiple regression analysis.
- Compute and interpret the probabilities associated with goodness-of-fit tests using the chi-square distribution.
- Use Excel to perform statistical calculations

VI. ACROSS THE CURRICULUM LEARNING OUTCOMES

In addition to the acquisition of subject-area knowledge and skill, students who have completed baccalaureate degree programs at the St. Ambrose University ACCEL Program will have demonstrated competence in a wide range of cross curriculum learning. Across-the-curriculum learning outcomes specifically enhanced through this course are identified below:

ACROSS THE CURRICULUM LEARNING OUTCOMES					
Creativity		Ethics and Values		Management Skills	
Spiritual Growth		Group/Team Process		Presentation Skills	
Research		Independent Thinking		Problem Solving	x
Professional Growth	x	Artistic Appreciation		Service to Others	
Awareness of Cultures		Interpersonal Relations		Writing	
Decision Making	x	Lifelong Learning		Physical Development	
Mutual Respect		Leadership		Critical/Analytic Ability	x

VII. POLICIES/STATEMENTS

Refer to Appendix A for certain ACCEL and University policies and statements. Additional policies can be found in the SAU student handbook and the ACCEL student information guide.

VIII. WORKLOAD AND GRADING

The course grade is based on exams and homework. Homework and attendance are crucial to succeeding in this class.

Exams	50%
Homework	40%
Attendance/participation	10%

Grading Scale

93-100% = A	87-93% = B+	80-87% = B	77-80% = C+
70-77% = C	60-70% = D	60% and below = F	

IX. COURSE SPECIFIC INFORMATION

Delivery

This course is a “hybrid” course, where students meet “in-class,” face-to-face, once a week and then meet “online” once a week.

Computers, Excel2007, and Internet

This course will rely heavily on the instructor’s website and videos. Students typically need access to a computer, Excel2007, and a high-speed Internet connection outside of class in order to receive lectures, support materials, and to do homework. The computer lab at the College for Professional Studies, which does have Excel2007 and a high-speed Internet connection, can be used when the lab is not being used for other classes. Inquire about availability at the front desk. Students are welcome to bring their own laptops to class. Wireless Internet is available throughout the ACCEL building. If needed, Office 2007 can be purchased from the SAU Bookstore, however many students have found that Office 2007 can be purchased through their company or other stores at a lower price.

Assistance

Individual assistance is available prior to and following each in-class session. The instructor is available by email and phone most other times simply by suggesting a common time to meet. Email works best.

Time for Preparation

The class will meet for five hours each week for eight weeks. Typically, a student will spend between 2 and 3 hours outside of class studying and doing homework for each hour spent in class. Prior to the beginning of the course, it would be to the student’s advantage to become familiar with Excel 2007 spreadsheets at least to the point of being able to start the program, and enter formulas involving addition, subtraction, multiplication, division, and simple functions.

Attendance

This course is intensive, and students are expected to attend scheduled classes to gain full advantage of the course. If you must miss a class, please let the instructor know. You should get class notes from a classmate. Please note the ACCEL attendance policy.

Exams

There are four examinations. If you feel you may miss the exam, contact the instructor to discuss alternative options. Otherwise, if you miss an exam, there will be no make-up and you will receive a zero. All examinations are somewhat comprehensive in that a student must know the prior material in order to proceed with subsequent material.

Homework

Homework for each chapter will be made available on the course website along with due dates. Homework includes both statistics concepts and problem solving. Ample time is provided for all homework, therefore late homework will NOT be accepted. All homework is graded. If you are having troubles with any of the homework problems, please contact the instructor for help; the assigned problems are crucial to succeeding in this class.

Tentative Schedule

Week	Day 1	Day 2
1	Chapter 1 Admin. Basic Terminology	Chapter 2 Frequency Distributions
2	Chapter 3 Measures of Central Tendency and Dispersion	Chapter 4 Exploring Data
3	Exam 1 (Chapters 1 – 4) Chapter 5 Probability Concepts	Chapter 5 (continued)
4	Chapter 6 Binomial and Poisson Distributions	Chapter 7 Uniform Distribution Normal Distribution
5	Exam 2 (chapters 5, 6, & 7) Chapter 8 Sample Distribution of the Mean Central Limit Theorem	Chapter 9 Confidence Interval Estimation
6	Chapter 10 One-sample Hypothesis Tests Means & Proportions	Chapter 11 Two-sample tests Chapter 12 ANOVA
7	Exam 3 (Chapters 8, 9, 10, 11, & 12) Chapter 13 Regression & Correlation	Chapter 14 Multiple Regression
8	Chapter 17 Chi-Square Tests	Exam 4 (Chapters 13, 14, & 17)

X. ASSIGNMENT REQUIRED TO BE COMPLETED BEFORE THE FIRST CLASS

The instructor will email you a “pre-course” assignment before the first class meeting that should be completed before the first class. **YOUR SAU EMAIL ADDRESSES, on record with the Registrar,** will be used by the instructor for this initial email. Be sure to contact the IT department at 333-6368 if you have trouble accessing your SAU email. After the semester begins, the professor will use your preferred email address for regular communication. You should also verify that your network login (username and password) is also working so that you can use the computers in the ACCEL lab, unless you decide to bring your own laptop.

WEEK ONE

LEARNING OUTCOMES

Upon the successful completion of this class and all assignments, students will be able to:

- Explain why we study statistics.
- Explain what is meant by descriptive statistics and inferential statistics.
- Distinguish between a qualitative variable and quantitative variable.
- Distinguish among the nominal, ordinal, interval, and ratio level of measurement.
- Classify variables by their level of measurement.
- Define the term mutually exclusive.
- Determine if a variable is discrete or continuous.
- List several uses and abuse of statistics.
- Construct a frequency distribution for discrete and a continuous variable using Excel.
- Organize qualitative data into a frequency table using Excel.
- Present a frequency table as a bar chart or a pie chart using Excel.
- Organize quantitative data into a frequency distribution.
- Present a frequency distribution for quantitative data using histograms, frequency polygons, and cumulative frequency polygons using Excel.
- Calculate the appropriate class interval for each graphic display.
- Create a line chart from a small dataset.
- Create a bar chart from a small dataset.
- Explain why a graphic display is misleading.

ACTIVITIES

1. Welcome
2. Procedures, expectations, and the course website
3. Definitions
4. Levels of measurement
5. Use and abuse of statistics
6. Construction of a frequency distribution
7. Histograms.
8. Cumulative frequency distributions.
9. Other graphic techniques.

WEEK TWO

LEARNING OUTCOMES

Upon the successful completion of this class and all assignments, students will be able to:

- Calculate the arithmetic mean, weighted mean, median, mode, and geometric mean.
- Explain the characteristics, uses, advantages, and disadvantages of each measure of location.
- Identify the position of the mean, median, and mode for both symmetric and skewed distributions.
- Compute and interpret the range, mean deviation, variance, and standard deviation.
- Explain the characteristics, uses, advantages, and disadvantages of each measure of dispersion.
- Compute and understand quartiles, deciles, and percentiles.
- Construct and interpret box plots.
- Compute and understand the coefficient of skewness.
- Draw and interpret a scatter diagram.

ACTIVITIES

1. Mean, Median, and Mode for ungrouped (raw) data.
2. Weighted Mean.
3. Mean, Median, and Mode for grouped data.
4. Dot plot.
5. Scatter diagram.
6. Definitions

WEEK THREE

LEARNING OUTCOMES

Upon the successful completion of this class and all assignments, students will be able to:

- Define probability.
- Describe the classical, empirical, and subjective approaches to probability.
- Explain the terms experiment, event, outcome, permutations, and combinations.
- Define the terms conditional probability.
- Define the terms joint probability.
- Calculate probabilities using the rules of addition.
- Calculate probabilities using the rules of multiplication.
- Define what is meant by joint probability.
- Define what is meant by conditional probabilities and independence.
- Apply a tree diagram to organize and compute probabilities.
- Identify the two components of a probability distribution.
- Provide examples of discrete random variables.
- Calculate the mean and standard deviation of discrete random variable.
- Explain what the standard deviation represents.

ACTIVITIES

1. Definitions
2. Classical, empirical, and subjective probabilities.
3. Rules for addition of probabilities
4. Rules for multiplication of probabilities
5. Joint and conditional probabilities
6. Concept of probability distribution
7. Random variables
8. Mean, variance, and standard deviation of probability distribution

WEEK FOUR

LEARNING OUTCOMES

Upon the successful completion of this class and all assignments, students will be able to:

- Define the terms probability distribution and random variable.
- Distinguish between discrete and continuous probability distributions.
- Calculate the mean, variance, and standard deviation of a discrete probability distribution.
- Describe the characteristics of and compute probabilities using the binomial probability distribution.
- Compute the mean and the standard deviation for a uniform distribution.
- Compute probabilities by using the uniform distribution.
- List the characteristic of the normal probability distribution.
- Define z values.
- Determine the probability an observation is between two points on a normal probability distribution.
- Determine the probability an observation is above (or below) a point on a normal probability distribution using Excel.
- Identify variables that we might expect to have a normal distribution.
- Explain why a sample is often the only feasible way to learn something about a population.
- Describe methods to select a sample.
- Define and construct a sampling distribution of the sample mean.
- Explain the central limit theorem.
- Define a point estimate.
- Define level of confidence.
- Construct a confidence interval for the population mean when the population standard deviation is known.
- Construct a confidence interval for the population mean when the population standard deviation is unknown.
- Determine the sample size for attribute and variable sampling.
- Drive the formula for a 95% confidence interval using the Empirical Rule and the central limit theorem.
- Determine when to use a z or t distribution.
- Calculate confidence intervals using z and t distributions.

ACTIVITIES

1. Family of normal distribution
2. Standard normal distribution
3. Applications
4. Reasons for sampling
5. Methods of sampling
6. Sampling error
7. Sampling distribution of the sample mean
8. Central limit theorem
9. Standard error
10. Point estimates
11. Confidence intervals for mean (large sample)
13. Student's t-distribution
14. Confidence intervals for means (small sample)

WEEK FIVE

LEARNING OUTCOMES

Upon the successful completion of this class and all assignments, students will be able to:

- Calculate confidence intervals for proportions.
- Explain the impact of sample size and confidence- levels on the width of a confidence interval.
- Calculate the appropriate sample size in order to obtain a set level of confidence.
- Explain what is meant by statistical inference or hypothesis testing.
- Write out the null and alternate hypotheses for situation.
- Choose an appropriate alpha-level for hypothesis test.
- Compare their observed value to the critical value in order to make a decision.
- Calculate a p-value.
- Explain what is meant by a p-value.

ACTIVITIES

1. Confidence interval for proportions(large samples)
2. Sample size computations for means and proportions
3. Hypothesis testing procedure
4. One tail and two tail tests of significance
5. Determination of p-value
6. Application to large and small samples involving means.
7. Application to large samples involving proportions

WEEK SIX

LEARNING OUTCOMES

Upon the successful completion of this class and all assignments, students will be able to:

- Complete a one sample hypothesis test for a population mean.
- Define Type I and Type II errors.
- Compute the probability of a Type II error.
- Use the following steps to conduct an independent sample t or z test:
 1. Write out the null and alternate hypothesis
 2. Determine the impact of making Type I and Type II errors
 3. Choose an appropriate alpha level
 4. Make a decision to accept or reject the null hypothesis
- Explain the relationship between confidence interval and hypothesis tests.
- Classify two samples as being independent or dependent.
- Conduct a dependent samples hypothesis test.

ACTIVITIES

1. Relationship of Type I (α) and Type (β) error and associated hypothesis tests
2. Two sample hypothesis tests (independent populations)
3. Dependent samples and associated hypothesis tests

WEEK SEVEN

LEARNING OUTCOMES

Upon the successful completion of this class and all assignments, students will be able to:

- List the characteristics of the F distribution.
- Conduct a test of hypothesis to determine whether the variances of two populations are equal.
- Discuss the general idea of analysis of variance.
- Conduct a test of hypothesis among two or more treatment means.
- Develop confidence intervals for the difference in treatment means.
- Make a decision based on previous calculations.
- Create a scatter plot from a small data set.
- Classify scatter plots as showing positive or negative relationships.
- Classify scatter plots as showing linear or nonlinear relationships.
- Calculate the correlation between two variables.
- Explain what is meant by a correlation coefficient.
- Identify the independent and dependent variable in a situation.
- Create a scatter plot using Excel.
- Explain how to determine which line best fits a scatter plot.
- Calculate the coefficient of determination and standard error of estimate.
- Explain the meaning of the coefficient of determination and standard error of estimate.
- Calculate the least squares regression line.
- Identify potential independent variables to use in a regression analysis.
- Explain which variables would be entered first in a regression analysis.
- Interpret the coefficient of determination in multiple regression analysis.
- List the assumptions needed to conduct a multiple regression analysis.
- Identify procedures that could be used to test these assumptions.
- Interpret the results of a multiple regression analysis.
- Choose the final predictive model they would use in a situation.

ACTIVITIES

1. F distribution
2. Comparison of two population variances
3. ANOVA assumptions
4. One way ANOVA test procedures and inferences (three or more populations)
5. Correlation analysis
6. Coefficient of correlation and determination
7. Hypothesis test for significance of correlation coefficient
8. Regression analysis and methodology
9. Confidence interval and prediction interval
10. Relationship among coefficients of correlation and determination and the standard error (through use of ANOVA results)
11. Multiple regression analysis
12. Evaluation of regression equation
13. Analysis of residuals

WEEK EIGHT

LEARNING OUTCOMES

Upon the successful completion of this class and all assignments, students will be able to:

- List the characteristics of the Chi-squared distribution.
- Discuss the general concepts of goodness-of-fit tests.
- State the hypothesis for goodness-of-fit tests.
- Calculate p-values for equal and unequal expected frequencies using Excel.
- Apply statistical concepts and techniques to the solution of business related problems.

ACTIVITIES

1. Goodness-of-fit tests using the Chi-squared distribution
2. Goodness-of-fit for Equal Expected Frequencies
3. Goodness-of-fit for Unequal Expected Frequencies
4. Discuss homework problems
5. Complete end of course evaluations
6. Final exam

APPENDIX A

POLICIES--Students are responsible for being familiar with and abiding by policies of ACCEL and the University. Please see the University catalog and Student Handbook for additional information.

ACADEMIC INTEGRITY

All members of the St. Ambrose community are called upon to uphold the standards of academic integrity. Academic dishonesty in any form (cheating, plagiarism, unauthorized assistance, multiple use, falsification or fabrication, complicity, and/or abuse of academic materials) is not tolerated and will be dealt with according to university policies.

ATTENDANCE POLICY

ACCEL courses are highly interactive which means that students need to be extremely motivated to meet the challenge. Students need to be on time and in attendance at ALL class meetings and for the entire time. **A student who knows he/she will miss a class should not register for the course.**

- Attendance at all class meetings is mandatory.
- At the discretion of the instructor or ACCEL program administration, exceptions may be made for up to one absence during a five-week course or up to two absences during an eight- or ten-week course. A request for exception must be made to the instructor in advance or as soon as is possible but must be made prior to the next class meeting following the absence. All work must be submitted on time.
- Absences from class will be considered in the final evaluation and may result in a lower or failing grade.
- No exceptions to the attendance policy will be made for the first class meeting. **Students who miss the first class meeting will be dropped from the course and may not continue with the course.** (Students receiving financial aid must initiate contact with the Financial Aid Office if they are dropped from a class.)
- The instructor may assign additional work to a student who misses a class.

CELL PHONE/ELECTRONIC DEVICE

Cell phones, pagers, and similar communication devices should not be used during class meetings. All such devices must be turned off or put in a silent mode and should not be taken out during class. At the discretion of the instructor, exception to this policy is possible in emergency or special circumstances. Computers should not be used for leisure activities or to complete other course work during class time.

LATE ASSIGNMENTS

Assignments that are submitted after the due date will not receive full credit or, at the discretion of the instructor, may not be accepted at all.

STUDENTS WITH DISABILITIES

Students with disabilities who believe that they may need accommodations in this class are encouraged to contact the Office of Services for Students with Disabilities at 333-6275 as soon as possible to better ensure that such accommodations are implemented in a timely fashion.