

COURSE NUMBER: MA1530

COURSE TITLE: Statistics

COURSE DESCRIPTION:

This course is designed to introduce the learner to the basic principles of statistics with the use of Microsoft Excel.

PREREQUISITES: None

CO-REQUISITES: None

CREDIT VALUE: Two (2)

COURSE HOURS PER WEEK: Two (2)

LAB HOURS PER WEEK: One (1)

SUGGESTED TEXT:

Handouts from instructor

Or

Berk, K. N., & Carey, P. (2009). *Data analysis with Microsoft Excel. Updated for Office 2007 (with web site printed access card)* (3rd ed.). Cengage Learning. ISBN-10: 0-538-494670; ISBN-13: 978-0538494670

Or

Larson, R. & Farber, E. (2011). *Elementary statistics: Picturing the world* (5th ed.). Toronto: Pearson Education. ISBN-10: 0321693620; ISBN-13: 9780321693624

LEARNING RESOURCES:

Berk, K. N., & Carey, P. (2009). *Data analysis with Microsoft Excel: Updated for Office 2007 (with web site printed access card)* (3rd ed.). Cengage Learning. ISBN-10: 0-538-494670; ISBN-13: 978-0538494670

Kirkup, L. (2002). *Data analysis with Excel: An introduction for physical scientists*. Cambridge, UK: Cambridge University Press. ISBN-10: 0-521-79737-3; ISBN-13: 978-0521797375

Lehmann, M., & Zeitz, P. (1998). *Statistical explorations with Microsoft Excel*. Pacific Grove, CA: Duxbury Press. ISBN-10: 0-534-51611-4; ISBN-13: 978-0534516116

Taylor, J. R. (1997). *An introduction to error analysis: The study of uncertainties in physical measurements* (2nd ed). Sausalito, CA: University Science Books. ISBN: 093570275X; ISBN-13: 978-0935702750

Keller, G. (2001). *Applied statistics with Microsoft Excel*. Pacific Grove, CA: Duxbury Press. ISBN-10: 0-534-37112-4; ISBN-13: 978-0534371128

Vining, G. G., & Kowalski, S.M. (2010). *Statistical methods for engineers* (3rd ed.). Cengage Learning. ISBN-10: 053873518X; ISBN-13: 978-0538735186

MAJOR TOPICS:

- 1.0 Introduction to Statistics
- 2.0 Descriptive Statistics
- 3.0 Introduction to Probability
- 4.0 Normal Distribution
- 5.0 Sampling Distributions
- 6.0 Measurement Error, Point Estimates and Confidence Intervals
- 7.0 Quality Control Charts
- 8.0 Scatter Diagrams

LEARNING OBJECTIVES:

1.0 Introduction to Statistics

- 1.1 Definitions
 - 1.1.1 Define the terms: statistics, data, population, sample and census
- 1.2 Types of Statistics
 - 1.2.1 Describe the difference between descriptive and inferential statistics
 - 1.2.2 Identify the four types of data and the characteristics of each type
- 1.3 Misuse of Statistics
 - 1.3.1 Identify some common misuses of statistics

2.0 Descriptive Statistics

- 2.1 Frequency Distributions
 - 2.1.1 Discuss what is meant by a frequency distribution
 - 2.1.2 Define the terms: frequency, relative frequency, classes, and class limits
 - 2.1.3 Construct a frequency distribution
- 2.2 Graphical Techniques
 - 2.2.1 Define and describe the shape of a distribution
 - 2.2.2 Construct and interpret a histogram

- 2.2.3 Construct and interpret a bar chart
 - 2.2.4 Construct and interpret a pie chart
 - 2.2.5 Construct and interpret a line chart
- 2.3 Deceptive Graphs
 - 2.3.1 Discuss how graphs can be misused
 - 2.3.2 Discuss guidelines for clear presentation of graphs
- 2.4 Numerical Techniques
 - 2.4.1 Use the summation notation representation to sum numbers
 - 2.4.2 Measures of Central Tendency
 - 2.4.2.1 Discuss the roles of mean, median, and mode as ways of measuring central tendency in data
 - 2.4.2.2 Define and calculate: mean, median, mode, and midrange
 - 2.4.3 Measures of Variation
 - 2.4.3.1 Define and calculate: range, variance, standard deviation
 - 2.4.3.2 Discuss the interpretation of standard deviation
 - 2.4.3.3 Discuss Chebyshev's Theorem
 - 2.4.3.4 Discuss The Empirical (68-95-99) Rule
- 2.5 Grouped Data (Optional)
 - 2.5.1 Describe what is meant by grouped data
 - 2.5.2 Calculate the mean and standard deviation for grouped data

3.0 Introduction to Probability

- 3.1 Introduction
 - 3.1.1 Define the terms: probability, experiment, event, outcome and sample space
 - 3.1.2 State and describe the methods for assigning probabilities
 - 3.1.3 State the law of large numbers
- 3.2 The Rules of Probability
 - 3.2.1 State and use the rules of probability
 - 3.2.2 Define the events: mutually exclusive, complementary, dependent and independent

4.0 Normal Distribution

- 4.1 Introduction
 - 4.1.1 Name and sketch the graph of the various continuous probability distributions
- 4.2 The General Normal Curve
 - 4.2.1 Sketch and discuss the normal distribution

- 4.2.2 State the properties of the normal distribution
- 4.2.3 Analyze the area under a curve and show how it is related to relative frequency and distribution
- 4.3 The Standard Normal Curve
 - 4.3.1 Use the standard normal distribution to calculate probabilities
- 4.4 Applications of the Normal Curve
 - 4.4.1 Solve normal distribution problems

5.0 Sampling Distributions

- 5.1 Introduction
 - 5.1.1 Define sampling
 - 5.1.2 Name and describe the various types of sampling
- 5.2 Selecting a Random Sample
 - 5.2.1 Define the term random sample
 - 5.2.2 Show how to obtain a random sample
 - 5.2.3 Show how to use a table of random digits to obtain a random sample
- 5.3 Chance Variation among Samples
 - 5.3.1 State the formula for variation of sample means
 - 5.3.2 Compute the standard deviation of sample means
- 5.4 The Distribution of Sample Means
 - 5.4.1 Show how to determine the distribution of sample means
 - 5.4.2 Analyze the standard error of the means and state what the error represents
 - 5.4.3 Solve probability problems for sample means
- 5.5 The Central Limit Theorem
 - 5.5.1 State the Central Limit Theorem
 - 5.5.2 Apply the central limit theorem to make predictions about and calculate probabilities for sample means

6.0 Measurement Error, Point Estimates and Confidence Intervals

- 6.1 Define: random error, systematic error, propagated error, precision and accuracy
- 6.2 Define a point estimate and a confidence interval
- 6.3 Construct a confidence interval for the population mean for large sample size

7.0 Quality Control Charts

- 7.1 Define controlled and uncontrolled variation
- 7.2 Construct and interpret a control chart
 - 7.2.1 Calculate control limits when σ is known

7.2.2 Construct and interpret a control chart

8.0 Scatter Diagrams

8.1 Introduction to Scatter Diagrams

8.1.1 Distinguish between independent and dependent variables

8.1.2 Construct a scatter diagram

8.2 Linear Correlation

8.2.1 Define the term linear correlation

8.2.2 Determine from scatter diagrams whether two variables are linearly correlated

8.2.3 Calculate and interpret the coefficient of correlation

8.3 Linear Regression

8.3.1 Describe the method of least squares for developing a simple linear regression model

8.3.2 Calculate a linear regression line and use it to predict the value of one variable when given the value of the other

8.3.3 Describe the relationship between correlation and linear regression

EVALUATION:

Assignment (s) 10%

Term Test (s): 20%

Laboratory Examination: 20%

Final Examination: 50%

DATE DEVELOPED: May 2004

DATE REVIEWED: January 2014

REVISION NUMBER: 2

DATE REVISED: June 2013

Note to instructor: Check PIRS to ensure this outline is the most current version.