

**Carrie T. Dugan, Ph.D.**

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### Course Description

This course teaches students fundamentals of statistical analysis. This includes evaluating statistical information, performing data analyses, interpreting and communicating analytical results. The course requires students to learn use of the programming language R for statistical analysis. In addition to learning R programming, topics covered include descriptive statistics, data display, central tendency, dispersion, exploratory data analysis; probability; discrete and continuous distributions such as the normal distribution; inference, including confidence intervals and hypothesis testing; correlation; multiple linear regression; contingency tables and chi-square. Selected contemporary statistical concepts are introduced to supplement traditional statistical methods.

### Learning Goals

At the conclusion of the course, students will be able to: 1) perform statistical analyses, 2) interpret and evaluate statistical information, 3) prepare technical reports, and 4) use the language R for data analysis.

### Prerequisites

PREDICT 400 is a prerequisite for MSPA students who begin graduate studies fall term 2014 and thereafter.

### Texts

Required:

Black, K. (2013). *Business Statistics*. 9<sup>th</sup> ed. Hoboken, NJ: John Wiley & Sons, Inc. [ISBN-13: 978-1119334965]

Davies, Tilman M. (2016) *The Book of R*, San Francisco, CA: No Starch Press [ISBN-13: 978-1593276515]

Kabacoff, R. I. (2015) *R in Action*, 2<sup>nd</sup> ed. Shelter Island, NY: Manning Co. [ISBN-13: 978-1617291388]

Wilcox, R. R. (2009). *Basic Statistics* New York, NY: Oxford University Press [ISBN-13: 978-0195315103]

The texts by Black and Wilcox will have reading assignments. The biweekly tests and final exam will be based on the material in these texts. The texts by Davies and Kabacoff deal with R programming and statistical applications. They are intended as reference aids during the course, and are used for the two data analysis assignments plus the optional *Lessons in R*. These references may be used for the programming in R test.

### Library Reserves

Chihara, L. and Hesterberg, T. (2011). *Mathematical Statistics with Resampling and R*. Hoboken, NJ: John Wiley & Sons, Inc. [ISBN-13: 978-1118029855]

Downey, A. B. (2013). *Think Bayes*. Sebastopol, CA: O'Reilly Media, Inc. [ISBN-13: 978-1449370787]  
(A pdf copy may be downloaded at <http://www.greenteapress.com/thinkbayes/thinkbayes.pdf> )

**Optional Supplemental Texts and Materials Available for Free Download**

Muenchen, R. A. (2011). *R for SAS and SPSS Users*. 2<sup>nd</sup> ed. New York. Apress [ISBN-13: 978-1461406846]

Stowell, S. (2014). *Using R for statistics*. New York: Apress (distributed by Springer Science+Business Media) [ISBN-13: 978-1484201404]

Tollefson, M. (2014). *R Quick Syntax Reference*. New York. Apress [ISBN-13: 978-1430266402]

Wilcox, R. R. (2010). *Fundamentals of Modern Statistical Methods*. 2<sup>nd</sup> ed. New York: Apress (distributed by Springer Science+Business Media) [ISBN-13: 978-1441955241]

Kuhn, M. and Johnson, K. (2013). *Applied Predictive Modeling*. New York: Apress (distributed by Springer Science+Business Media) [ISBN-13: 978-1461468486]

These books may be downloaded from the Springer library. Access this library at <http://link.springer.com.turing.library.northwestern.edu/> with your NetID and password.

**Software**

Predict 401 will use the high-level language R. R can be obtained at <http://cran.r-project.org/>. Instructions are given on the course site. RStudio is recommended for new users of R. It is not required. Everything students need to do in this course can be accomplished using the standard R console with a plain text editor. RStudio is an integrated development environment. Installer packages for RStudio are located at [www.rstudio.com/](http://www.rstudio.com/). The installation process is straightforward. Tutorials dealing with R are available on the course site.

**Evaluation**

The student's final grade will be determined as follows:

- Participation 20% (100 possible points)
- Six Tests 35% (175 possible points online, non-proctored)
- Two Data Analysis Assignments 25% (125 possible points)
- Final exam 20% (100 possible points online, proctored)

**Proctored Final Exam**

Examity, an independent organization, does the final exam proctoring. The proctor must be able to monitor the student using a webcam, and also view the screen images seen by the student. The exam is taken within Canvas using the course site. Access to and use of WileyPlus, texts, printed materials, notes and all files stored on your computer is permitted during the exam. Computational applications such as R, Excel or equivalent stored on your computer are permitted during the exam. Calculators, such as a TI 84, Casio or comparable are permitted. **Access to the internet during the exam is not permitted. Separate portable devices such as iPads and Kindles are not permitted.** This means a student who uses a device such as an iPad or Kindle must plan ahead and be prepared to migrate the necessary files to the computer used for the final exam. Students with disabilities working through AccessibleNU must discuss reasonable accommodations, including use of non-approved technology, with the instructor and the proctors well before their exam. Please see the Canvas course site for more information.

**Grading Scale**

A	=	93–100%	(465-500 points)
A-	=	90–92%	(450-464 points)
B+	=	87–89%	(435-449 points)
B	=	83–86%	(415-434 points)
B-	=	80–82%	(400-414 points)
C+	=	77–79%	(385-399 points)
C	=	73–76%	(365-384 points)
C-	=	70–72%	(350-364 points)
F	=	0–69%	(000–349 points)

**Discussion Board Etiquette**

The purpose of the discussion board groups is to allow students to freely exchange ideas. It is imperative to remain respectful of all viewpoints and positions and, when necessary, agree to respectfully disagree. While active and frequent participation is encouraged, cluttering a discussion board with inappropriate, irrelevant, or insignificant material will not earn additional points and may result in receiving less than full credit. Content of the message is paramount. Please remember to cite all sources (when relevant) in order to avoid plagiarism.

You are expected to log on and participate actively on a regular basis each week. You are expected to respond to three discussion threads each week. The first two questions are directly related to the week's topics and the last will be a reflection question, where you will be asked to tie the ideas from the week's materials to your profession, hobbies, etc. Additionally, you are expected to participate in discussions with others. I expect several polished, well-structured and APA-compliant posts each week. Please add references and check spelling and grammar.

I'm looking for insightful analysis, probing questions, and *constructive* suggestions to each other. Keep thinking from the perspective—how can I *add something useful*? It may be an experience you have had professionally or a quote from an article/web site you come across. If it is the latter, cite it properly.

It is highly desirable that your initial comments be posted Thursday so that follow-up comments can be made. The discussion forum is intended for exchange of ideas between students. **The discussion topics will become unavailable at 11:59 pm CT each Sunday.** I monitor the discussions and do my best to provide feedback to some of your posts. **Five points are available for the first discussion topic, two points for class participation and three points for the reflections topic making ten points total per week.**

**Attendance**

This course will not meet at a particular time each week. All course goals, session learning objectives, and assessments are supported through course site elements that can be accessed at any time. Your participation in threaded discussion boards is required, graded, and paramount to your success in this class.

**Sync Sessions**

There will be two scheduled sync sessions. They are listed in the Course Schedule. They will also be announced on the course site. Please note that any scheduled synchronous or "live" meetings are considered supplemental and optional. While your attendance is highly encouraged, it is not required and you will not be graded on your attendance or participation. Recordings are made available the following day.

**Due Dates and Late Work**

When stating due dates for work, the abbreviation "CT" is used. "CT" is to always be taken to mean Chicago, IL clock time. This defines "course time". Canvas will adjust what students see as deadlines according to the time zone specified by the student in personal settings for Canvas. (Thus an 8 pm CT deadline is a 6 pm deadline on the West Coast, and so forth depending on time zone.) Deadlines for all work are stated in this syllabus and posted on the Course Site. This includes exams, reports and participation in the discussions. Late work is not accepted without prior arrangement. Communication with the instructor is essential in these matters.

One more piece of advice—**do not fall behind**. We cover a great deal of material in this course, and falling behind is the primary reason why folks have difficulty particularly toward the end of the course. To that end, the Course Schedule gives you due dates for the entire course. It is much, much better to be ahead than fall behind.

**Academic Integrity at Northwestern**

Students are required to comply with University regulations regarding academic integrity. If you are in doubt about what constitutes academic dishonesty, speak with your instructor or graduate coordinator before the assignment is due and/or examine the University Web site. Academic dishonesty includes, but is not limited to, cheating on an exam, obtaining an unfair advantage, and plagiarism (e.g., using material from readings without citing or copying another student's paper). Failure to maintain academic integrity will result in a grade sanction, possibly as severe as failing and being required to retake the course, and could lead to a suspension or expulsion from the program. For more information, visit: [www.scs.northwestern.edu/student/issues/academic\\_integrity.cfm](http://www.scs.northwestern.edu/student/issues/academic_integrity.cfm).

Please refer to your SPS student handbook at [www.scs.northwestern.edu/grad/information/handbook.cfm](http://www.scs.northwestern.edu/grad/information/handbook.cfm) for additional course and program processes and policies.

## **Course Schedule**

### **Session 1 – Complete by Sunday, June 25, 2017**

#### **Learning Objectives**

After this session, the student will be able to:

- List examples of statistical applications in business.
- Describe different types of data displays.
- Define important statistical terms.
- Explain the difference between variables, measurement and data.
- Define and compare four different levels of data.
- Construct a frequency distribution.
- Construct different types of data displays.
- Construct and interpret two-variable tables and scatter plots.
- Write simple programs using the language R.

#### **Course Content**

##### **Reading**

Black, K. *Business Statistics* Chapter 1 Sections 1.1 – 1.2 & Chapter 2 Sections 2.1 – 2.4

##### **Videos**

Levels of Data Measurement

Stem-and-Leaf Plot

#### **Assignments –**

- Install R
- Read *The Quick Start Guide to R*

This session requires installation of R and completion of *The Quick Start Guide to R*. Completion of the tutorials in lynda.com is encouraged. Future sessions will have one or more optional practice lessons using R for data analysis. Each lesson is numbered corresponding to a chapter in *Business Statistics*. These lessons, the associated data, solution code and answers are posted within the course shell. These lessons carry no point value.

Instructions on how to access the WileyPlus materials are posted in the module *Business Statistics Videos + WileyPLUS*. Students should be aware that the videos listed above and in other sessions are available in WileyPlus and can be downloaded and retained for future viewing. Instructions on how to do this appear in the course shell.

Students should be aware that there is a required self-administered test of programming in R due at the end of Session 3 (and a second test due at the end of Session 7). This is open book, open notes. R may be used for computation.

Students should be aware the first Data Analysis Assignment is due the end of Session 5. This assignment should be started early in the quarter. Do not wait until the last minute. The assignment instructions and data are available in a separate module on the course site. This report carries 50 points toward the final grade.

Separate from the above, future sessions will list one or more optional practice lessons using R for data analysis. Each lesson is numbered corresponding to a chapter in *Business Statistics*. These lessons, the associated data, solution code and answers are posted within the course shell. These lessons carry no point value. In addition each week there is an optional video that shows how R can be used to solve problems in *Business Statistics*. The video for this week is *Calculations with R Week 1*.

Instructions on how to access the WileyPlus materials are posted in the module *Business Statistics Videos + WileyPLUS*. Students should be aware that the videos available in WileyPlus and can be downloaded and retained for future viewing. Instructions on how to do this appear in the course shell.

**Sync Session**

There will be a sync session the first week of class Wednesday, June 21, 2017 at 7 PM CT. Attendance is optional. A recording of the session will be posted in class the following day. The first session will address course requirements and course schedule.

**Session 2 – Complete by Sunday, July 2, 2017****Learning Objectives**

After this session, the student will be able to:

- Calculate and apply measures of central tendency and variability.
- Describe a data distribution using a box-and-whisker plot.
- Interpret graphical data displays.
- Detect outliers by two methods.
- Perform calculations to trim data.

**Course Content****Reading**

Black, K. *Business Statistics* Chapter 3 Sections 3.1 – 3.5

Wilcox R. R. *Basic Statistics* Chapter 2 Sections 2.1 – 2.5 & Chapter 3 Sections 3.1 – 3.4

**Videos**

Computing Variance and Standard Deviation  
Understanding and Using the Empirical Rule

**Assignments**

Complete the self-administered test by 11:55 pm CT Sunday, July 2, 2017. This test will cover material from Sessions 1 and 2. It carries 25 points toward the final grade.

Students should be aware the self-administered test of programming in R due at the end of Session 3. This test is open book, open notes and carries 25 points toward the final grade. The test questions are based on *The Quick Start Guide to R*, and will require submission of R script. It is to be handed in and will be graded by the instructor.

Students should be aware the first Data Analysis Assignment is due the end of Session 5. The assignment instructions and data are available in a separate module on the course site. This report carries 50 points toward the final grade. Students are strongly advised to start this assignment early. Do not wait to the last weekend.

Optional R Lessons 1, 2 & 3 are posted within the course session module. These lessons carry no point value. Students are encouraged to complete these lessons as they provide a way to apply course concepts and learn about R. In addition, there is a supplemental and optional video that shows how R can be used to solve problems in *Business Statistics*. The video for this week is *Calculations with R Week 2*.

**Sync Session**

None

**Session 3 -- Complete by Sunday, July 9, 2017****Learning Objectives**

After this session, the student will be able to:

- Describe probability.
- Articulate the different methods of assigning probabilities.

- Understand and apply axioms and properties of probability.
- Compute probabilities under different conditions.
- Understand conditional probability and Bayes' theorem.
- Determine the mean, variance and standard deviation for a discrete variable.
- Solve problems using binomial and Poisson probability distributions.

**Course Content****Reading**

Black, K. *Business Statistics* Chapters 4 Sections 4.1 – 4.7 & Chapter 5 Sections 5.1 – 5.5

Downey, A. B. *Think Bayes* Chapter 1 pages 1-10 (Check Library Reserves)

**Videos**

Constructing and Solving Joint Probability Tables

Solving Probability Word Problems

Solving Binomial Distribution Problems, Part I

Solving Binomial Distribution Problems, Part II

**Assignments**

The self-administered test of programming in R is due by 11:55 pm CST Sunday, July 9, 2017. This test is open book, open notes and carries 25 points toward the final grade. The test questions are based on *The Quick Start Guide to R*, and will require submission of R script. It is to be handed in and will be graded by the instructor.

Students should be aware a self-administered test is required by the end of Session 4. This test comes available the start of Session 3. This test will cover Sessions 3 and 4 and count for 25 points toward the final grade.

Students should be aware the first Data Analysis Assignment is due the end of Session 5. This assignment should be started early in the quarter. Do not wait until the last minute. The assignment instructions and data are available in a separate module on the course site. This report carries 50 points toward the final grade.

Optional R Lessons 4 and 5 are posted within the course shell. These are practice problems and carry no point value. Students are encouraged to complete these lessons as they provide a way to apply course concepts and learn about R. In addition, there is a supplemental and optional video that shows how R can be used to solve problems in *Business Statistics*. The video for this week is *Calculations with R Week 3*.

**Sync Session**

**None**

**Session 4 -- Complete by Sunday, July 16, 2017****Learning Objectives**

After this session, the student will be able to:

- Explain what is a probability density function for a continuous variable.
- Compute the expected mean value and variance.
- Describe a standard normal distribution and its properties
- Use the standard normal distribution to find  $z$ -scores, and convert distributions to standard normal.
- Use the normal distribution as an approximation to the binomial distribution.
- Explain different types of sampling plans.
- Explain the central limit theorem.

**Course Content****Reading**

Black, K. *Business Statistics* Chapter 6 Sections 6.1 – 6.4 & Chapter 7 Sections 7.1 – 7.3

Wilcox R. R. *Basic Statistics* Chapter 4 Section 4.1 & Chapter 5 Sections 5.1 – 5.3

**Videos**

Solving Problems Using the Normal Curve

Solving for Probabilities of Sample Means using the z Statistic

**Assignments**

Complete the self-administered test by 11:55 pm CST Sunday, July 16, 2017. This test will cover material from Sessions 3 and 4. It carries 25 points toward the final grade.

Students should be aware the first Data Analysis Assignment is due the end of Session 5. This assignment should be started early in the quarter. Do not wait until the last minute. The assignment instructions and data are available in a separate module on the course site. This report carries 50 points toward the final grade.

Students should be aware there is a self-administered test of programming in R due the end of the Session 7. This test is open book, open notes and carries 25 points toward the final grade. It is to be handed in and will be graded by the instructor.

Optional R Lessons 6 and 7 are posted within the course session module. In addition, there is a supplemental and optional video that shows how R can be used to solve problems in *Business Statistics*. The video for this week is *Calculations with R Week 4*.

**Sync Session**

None

**Session 5 -- Complete by Sunday, July 23, 2017****Learning Objectives**

After this session, the student will be able to:

- Estimate a population mean and a proportion.
- Define the t-distribution and determine probabilities given degrees of freedom.
- Use the chi-square distribution to estimate a population variance.
- Determine the sample size needed to estimate a population mean and a proportion.
- State what is a confidence interval and how it is used for statistical inference.
- Compute confidence intervals for a mean and a proportion.

**Course Content****Reading**

Black, K. *Business Statistics* Chapter 8 Sections 8.1 – 8.5

Wilcox R. R. *Basic Statistics* Chapter 6 Section 6.5

**Video**

Confidence Intervals

**Assignments**

Complete and submit the first Data Analysis Assignment by 11:55 pm CST Sunday, July 23, 2017. This assignment carries 50 points toward the final grade. The assignment instructions and data are available in a separate module on the course site.

Students should be aware a self-administered test is due the end of Session 6. This test comes available the start of Session 5. This test will cover Sessions 5 and 6. It carries 25 points toward the final grade.

Students should be aware there is a self-administered test of programming in R due the end of Session 7. This test is open book, open notes and carries 50 points toward the final grade. It is to be handed in and will be graded by the instructor.

Optional R Lesson 8 is posted within the course shell. These are practice problems and carry no point value. In addition, there is a supplemental and optional video that shows how R can be used to solve problems in *Business Statistics*. The video for this week is *Calculations with R Week 5*.

### Sync Session

There will be a sync session Wednesday, July 19, 2017 at 7 PM CT. Attendance is optional. A recording of the session will be posted in class the following day.

## **Session 6 -- Complete by Sunday, July 30, 2017**

### Learning Objectives

After this session, the student will be able to:

- Develop one- and two-tailed hypotheses that can be tested.
- Develop test critical regions.
- Reach conclusions based on hypothesis tests
- Explain Type I and Type II errors.
- Perform hypothesis tests on means and proportions.
- Use p-values for hypothesis testing.
- Discuss statistical significance versus practical significance.

### Course Content

#### Reading

Black, K. *Business Statistics* Chapter 9 Sections 9.1 – 9.6 & Chapter 16 Sections 16.1 – 16.2

#### Videos

Establishing Hypotheses  
Two-Tailed Tests  
Hypothesis Testing Using the z Statistic  
Type I and Type II Errors  
Understanding p-values

### Assignments

Complete the self-administered test by 11:55 pm CST Sunday, July 30, 2017. This test covers material from Sessions 5 and 6. It carries 25 points to the final grade.

Students should be aware there is a self-administered test of programming in R due the end of Session 7. This test is open book, open notes and carries 25 points toward the final grade. It is to be handed in and will be graded by the instructor.

Students should be aware the second Data Analysis Assignment is due the end of Session 10. Do not wait until the last minute to get started. The assignment instructions and data are available in a separate module on the course site. This report carries 75 points toward the final grade.

Optional R Lesson 9 is posted within the course session module of the course shell. These are practice problems and carry no point value. In addition, there is a supplemental and optional video that shows how R can be used to solve problems in *Business Statistics*. The video for this week is *Calculations with R Week 6*.

### Sync Session

None.

## **Session 7 -- Complete by Sunday, August 6, 2017**



**Learning Objectives**

After this session, the student will be able to:

- Develop hypotheses for testing the difference in means or proportions of two populations.
- Use the z-statistic to develop confidence intervals for the difference in two means.
- Perform a two-sample t-test and construct a confidence interval.
- Perform a paired t-test and construct a confidence interval.
- Develop confidence intervals for the difference in two population proportions.
- Test hypotheses about the difference in variance between two populations.

**Course Content****Reading**

Black, K. *Business Statistics* Chapter 10 Sections 10.1 – 10.5

Wilcox R. R. *Basic Statistics* pages Chapter 9 pages 184 – 193 & Section 9.2 pages 201 – 202

**Videos**

Determining Which Inferential Technique to Use, Part I: Confidence Intervals

Determining Which Inferential Technique to Use, Part II: Hypothesis Tests

t Test for Two Samples

**Assignments**

The self-administered test of programming in R is due by 11:55 pm CST Sunday, August 6, 2017. This test is open book, open notes and carries 25 points toward the final grade. It is to be handed in and will be graded by the instructor.

Students should be aware that a self-administered test is due the end of Session 8. This test comes available the start of Session 7. This test will cover Sessions 7 and 8. It carries 25 points toward the final grade.

Students should be aware the second Data Analysis Assignment is due the end of Session 10. Do not wait until the last minute to get started. The assignment instructions and data are available in a separate module on the course site. This report carries 75 points toward the final grade.

Optional R Lesson 10 is posted within the course session module. These are practice problems and carry no point value. In addition, there is a supplemental and optional video that shows how R can be used to solve problems in *Business Statistics*. The video for this week is *Calculations with R Week 7*.

**Sync Session**

None.

**Session 8 – Complete by Sunday, August 13, 2017****Learning Objectives**

After this session, the student will be able to:

- Describe an experimental design.
- Use a single factor AOV model for analysis
- Recognize a randomized block design.
- Explain the advantages of a two-way AOV.
- Compute sums of squares and mean squares
- Use multiple comparison tests.
- Explain what is an interaction.
- Calculate correlations.
- Fit a simple linear regression equation.

**Course Content****Reading**

Black, K. *Business Statistics* pages Chapter 11 Sections 11.1 – 11.3 & Chapter 12 Sections 12.1 – 12.3

Wilcox R. R. *Basic Statistics* Chapter 10 Section 10.1 pages 210-217.

**Videos**

Computing and Interpreting a One-Way ANOVA

Testing the Regression Model I : Predicted Values, Residuals, and Sum of Squares of Error

**Assignments**

Complete the self-administered test by 11:55 pm CST Sunday, August 13, 2017. This quiz covers material from Sessions 7 and 8. It carries 25 points toward the final grade.

Students should be aware the second Data Analysis Assignment due at the end of Session 10. Do not wait until the last minute to get started. The assignment instructions and data are available in a separate module on the course site. This carries 75 points toward the final grade.

Optional R Lesson 11 is posted within the course session module. These are practice problems and carry no point value. In addition, there is a supplemental and optional video that shows how R can be used to solve problems in *Business Statistics*. The video for this week is *Calculations with R Week 8*.

**Sync Session**

None.

**Session 9 – Complete by Sunday, August 20, 2017****Learning Objectives**

After this session, the student will be able to:

- Explain a simple linear regression model.
- Determine the equation of a simple linear regression line.
- Specify the two parameters of a straight line.
- Discuss the risks of extrapolation.
- Define the “best equation” based on minimization of the residual sum of squares.
- Perform inference about regression coefficients.
- Calculate the Pearson product-moment correlation coefficient.
- Calculate standard errors and confidence intervals for regression coefficients.
- Test the overall model.
- Assess Model Adequacy.

**Course Content****Reading**

Black, K. *Business Statistics* Chapter 12 Sections 12.4 – 12.7 & Chapter 13 Sections 13.1 – 13.3

Wilcox R. R. *Basic Statistics* Chapter 8 pages 172-176 and Chapter 13 pages 283-286.

**Video**

Testing the Regression Model II—Standard Error of the Estimate and  $r^2$

**Assignments**

Students should be aware that the proctored final exam opens at 12:01 am CST Monday, August 14, 2017. The Final Examination is due by 11:55 pm CST Sunday, August 27, 2017. This is an open book, open notes Proctored exam. For calculations Excel, R or some other computational aid may be used. **You are responsible for scheduling this proctored exam.**

Students should be aware the second Data Analysis Assignment is due by 11:55 pm CST Sunday, August 27, 2017. Do not wait until the last minute to get started. The assignment instructions and data are available in a separate module on the course site. This carries 75 points toward the final grade. Please be aware late submissions will be penalized 25 points unless there are prior arrangements.

Optional R Lesson 12 is posted in the course session module. These are practice problems with no point value. In addition, there is a supplemental and optional video that shows how R can be used to solve problems in *Business Statistics*. The video for this week is *Calculations with R Week 9*.

**Sync Session**

None

**Session 10 – Complete Sunday, August 27, 2017****Learning Objectives**

- No new learning objectives.

**Course Content**

None

**Assignments**

Complete and submit the second Data Analysis Assignment by 11:55 pm CST Sunday, August 27, 2017. The assignment instructions and data are available in a separate module on the course site. This assignment carries 75 points toward the final grade. Please be aware late submissions will be penalized 25 points unless there are prior arrangements.

The Final Examination opens at 12:01 am CST Monday, August 14, 2017. It is due by 11:55 pm CST Sunday, August 27, 2017. This is an open book, open notes Proctored exam. For calculations Excel, R or some other computational aid may be used. Check the course site for more information.

**You are responsible for scheduling this proctored exam.**

**Sync Session**

None