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# Syllabus

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## Course Description

In a world that's full of data, we have many questions. Luckily, all this data can also help us answer those questions. This course will walk through the basics of statistical thinking and will teach the correct statistical tool to help answer our questions of interest. Ultimately our goal is to assist you in learning how to interpret our findings and develop meaningful conclusions.

This course is intended to have the same “punch” as a typical introductory undergraduate statistics course, with an added twist of modeling. This course is also intentionally devised to be sequential, with each new piece building on the previous topics. Once completed, students should feel comfortable using basic statistical techniques to answer their own questions about their own data, using a widely available statistical software package (R).

## Course Outline

### Week One: Introduction to Data

- Variables and data
- Getting to know R and RStudio

## **Week Two: Univariate Descriptive Statistics**

- Graphs and distribution shapes
- Measures of center and spread
- The Normal distribution
- Z-scores

## **Week Three: Bivariate Distributions**

- The scatterplot
- Correlation

## **Week Four: Bivariate Distributions (Categorical Data)**

- Contingency tables
- Conditional probability
- Examining independence

## **Week Five: Linear Functions**

- What is a function?
- Least squares

- The Linear function – regression

### **Week Six: Exponential and Logistic Function Models**

- Exponential data
- Logs
- The Logistic function model
- Picking a good model

### **Week Seven: Sampling**

- The sampling distribution
- Central limit theorem
- Confidence intervals

### **Week Eight: Hypothesis Testing (One Group Means)**

- What makes a hypothesis test?
- Errors in testing
- Alpha and critical values
- Single sample test

### **Week Nine: Hypothesis Testing (Two Group Means)**

- Independent t-test

- Dependent t-test

### Week Ten: Hypothesis Testing (Categorical Data)

- The chi-square test
- Goodness-of-Fit
- Test-of-Independence

### Week Eleven: Hypothesis Testing (More Than Two Group Means)

- The ANOVA
- One-way ANOVA

### Grading Policy

Videos, Readings, and Comprehension Checks are worth **20%** of your grade. Pre-Labs are worth **15%**; Labs are worth **30%**; and Problem Sets are worth **35%** of your grade. A final score of 70% or more is a passing grade to receive the course certificate.

There are no formal due dates for course assignments. However, to receive the maximum benefit from the course, we suggest that you complete each chapter's coursework by noon on the Tuesday on which the next chapter opens.

In order to receive your certificate of completion, you must submit all coursework (and receive a passing grade) by 12:00 CST (18:00 UTC) on Tuesday, February 3.

### Texts & Software

We will be using a custom created open source text that will be embedded into the edX course as PDF readings. Your reading assignments will be released weekly with links to the appropriate PDF readings. The current reading assignments (including

the optional reading assignments) are also available under the "Readings" tab.

You will need to install R and RStudio onto the computer you will be using for the course. Instructions for downloading the software can be found here (Mac users) or here (Windows users) as well as on the sidebar of the "Course Info" page and the "Download R and RStudio" page.

## Help

### Pre-Labs & Labs

Each week includes an instructional component, R tutorial videos, a Pre-Lab, and a Lab exercise to give you an opportunity to see statistics in action and to help you learn how to apply the statistics to answer a real world question.

Before each Lab, there will be a Pre-Lab that offers guided instruction processes to help you answer the questions. Each Pre-Lab and Lab is focused around a particular question. You will (1) Reflect on the Question, (2) Analyze the Data, and (3) Draw Conclusions.

The **Reflect on the Question** sections always begin by examining the question to see what it's really asking. In the Pre-Labs, you will examine the variables of interest and correctly categorize them as well as answer a few questions about the method you will use in Lab. In this section of the Labs, you will answer more specific questions about the method you're using.

In **Analyze the Data**, you will learn how to apply the correct statistical tool to help answer the question as well as how to run a script and interpret your results. In the Pre-Labs, this section will be covered over two learning sequence units on the horizontal navigation bar ("Prepare for the Analysis" and "Conduct the Analysis") while only one sequence unit will be used in the Labs ("Analyze the Data").

**Draw Conclusions** allows you to summarize your findings to give meaning and relevance to answer. In this final section, you are asked to write an answer to the lab question, using the results of your analysis as support. You will use the template we've provided and just fill in the blanks.

Today

January 2015 ▼

 Print [Week](#) [Month](#) [Agenda](#) ▼

Sun	Mon	Tue	Wed	Thu	Fri	Sat
28 ◀ Winter Break: No Content Release	29	30	31	Jan 1	2	3
4	5 10:30am Office Hours	6 Week 8: Hypothesis 12pm Release of Cor	7	8	9	10
11	12 10:30am Office Hours	13 Week 9: Hypothesis 12pm Release of Cor	14	15	16	17
18	19	20 Week 10: Hypothesi 10:30am Office Hours 12pm Release of Cor	21	22	23	24
25	26 10:30am Office Hours	27 Week 11: Hypothesi 12pm Release of Cor	28	29	30	31

Events shown in time zone: Central Time



Help



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