

## **STATISTICS 3300**

### **Applied Statistics: Regression**

### **Jan Term 2020**

#### **Course Description:**

STAT 3300, “Applied Statistics: Regression”, covers a variety of topics related to more advanced statistical techniques. While regression is a key component, several other analysis tools will be explored. The course is a “Part 2” of STAT 2331 (Intro to Statistical Methods), and is a required course for statistics majors and minors. A significant majority of the data analysis techniques will be computed using popular statistical software packages, but knowledge of these packages are not a prerequisite. Students in this class will benefit from the professor’s experience in applying statistical analysis to the solution of industry problems. Prerequisites for this course include the equivalent of elementary undergraduate statistics, STAT 2331.

#### **Professor Background:**

Dr. Stephen Robertson is a Senior Lecturer in the Department of Statistical Science at SMU. He has been at SMU for eight years, and is the director of the MASDA (Masters in Applied Statistics and Data Analytics) program. He has extensive work experience in the financial sector, particularly in the area of risk management and predictive modeling for Citigroup, Fannie Mae, and Towers Watson Consulting. Dr. Robertson integrates his previous work experience in the financial industry into class lectures and assignments to give students a “real-world” perspective. In addition, he draws upon his experience teaching and tutoring numerous SMU students to create a positive, fun, and interactive learning environment in which to learn statistics.

#### **Benefits of taking STAT 3300 in Jan Term:**

- Stay productive over winter break with this challenging Jan Term course
- Complete a core statistics course in 8 efficient class days
- Prepare for future quantitative courses by learning advanced statistical analysis and software programming
- Focus on a statistics course without juggling a typical heavy course load
- Avoid the crowds — Small class size and professor accessibility often improves performance

## **STAT 3300**

### **Applied Statistics: Regression**

Instructor: Stephen Robertson

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January 6-10, 14-16, 2020, SMU Main Campus (Classroom: Hyer Hall, 106)

**9:00 am to 12 noon and 1:00 to 4:00 pm**

#### Course Description:

This course is intended for students interested in statistical analysis techniques. The basic theory behind these techniques will be presented, and popular statistical software will be taught to assist with the computations needed in the various analysis problems. This course is the second semester of STAT 2331 and is a required course for statistics majors and minors. The goal of this course is to enable students to broaden their knowledge of more advanced statistical analysis techniques.

Prerequisites: STAT 2331 or equivalent.

**\* Students must bring a laptop to class since computers are not provided in class.**

**\*\*Students must also complete selected reading prior to the beginning of class, specified below in the Class Schedule section.**

#### **Course Objectives:**

The goal of this course is to enable students to broaden their knowledge of more advanced statistical analysis using commonly used statistical software.

#### **Student Learning Outcomes:**

After this course, the student should be able to . . .

- Analyze the comparison of means between groups (both independent and dependent groups.)
- Analyze the comparison of proportions between groups.
- Conduct tests of independence (Chi-square tests).
- Extend comparison of means between more than 2 groups (ANOVA).
- Analyze the comparison of proportions between groups.
- Extend simple linear regression to multiple linear regression.
- Check the various assumptions for multiple linear regression, and perform diagnostic tests.
- Use logistic regression to predict a binary outcome.
- Use various basic non-parametric tests to analyze data.

## Tentative Class Schedule:

- Become efficient with commonly-used statistical software to conduct the various analyses listed above.

**\*\* Before the first day of class, students are expected to read the following material from selected pages taken from the prerequisite STAT 2331 Textbook, “*STAT 2331, Introduction to Statistical Methods*, by Southern Methodist University.”**

**Chapter 5: Sections 1-2 (Pages 303-329)**

**Chapter 6: Section 1-3 (Pages 367-415)**

Class	Date	Topics
1	Mon Jan 6	<ul style="list-style-type: none"> <li>• Chapters 1 and 2 (Inference for Means and Proportions)</li> <li>• Course introduction</li> <li>• Inference for the Mean</li> <li>• Additional Topics on Inference (Sample size, Power)</li> <li>• Introduction to R</li> </ul>
2	Tue Jan 7	<ul style="list-style-type: none"> <li>• Chapter 2 (Inference for Proportions)</li> <li>• Inference for Single Proportion, Two Proportions</li> <li>• Sample size, power, Relative risk</li> <li>• Applications using R code</li> </ul>
3	Wed Jan 8	<ul style="list-style-type: none"> <li>• Chapter 4, 5 (Inference for Regression, Multiple Regression)</li> <li>• Simple Linear Regression, Prediction Intervals, Transforming Variables, Non-Linear Regression</li> <li>• More details: The ANOVA F-test, Calculations for Regression Inference</li> <li>• Inference for Multiple Regression, A Case Study</li> <li>• Applications using R code</li> </ul>
4	Thurs Jan 9	<ul style="list-style-type: none"> <li>• Chapter 6 (One-Way Analysis of Variance)</li> <li>• Inference for One-Way ANOVA, Levine’s Test</li> <li>• Comparing the Means, Contrasts, Multiple Comparisons</li> <li>• Applications using R code</li> </ul>
5	Fri Jan 10	<ul style="list-style-type: none"> <li>• Exam 1</li> <li>• Chapter 7 (Two-Way Analysis of Variance)</li> <li>• The Two-Way ANOVA Model, Main Effects and Interaction</li> </ul>
	Mon Jan 13	<b>READING DAY</b>
6	Tues Jan 14	<ul style="list-style-type: none"> <li>• Chapter 8 (Logistic Regression)</li> <li>• The Logistic Regression Model, Binomial Distribution and Odds, Odds for Two Groups</li> <li>• Inference for Logistic Regression- Multiple Logistic Regression</li> </ul>

7	Wed Jan 15	<ul style="list-style-type: none"> <li>• Chapter 9 (Non-Parametric Tests)</li> <li>• Wilcoxon Rank Sum Test, Wilcoxon Signed Rank Test, Kruskal Wallis Test</li> </ul>
8	Thurs Jan 16	<ul style="list-style-type: none"> <li>• REVIEW</li> <li>• Exam 2</li> </ul>

**Method of evaluation:**

Grading criteria:

Exam 1: 35%

Exam 2: 35%

Homework/In-class Exercises: 30%

**The Course is based on this text:**

*STAT 3300 Applied Statistics, Southern Methodist University*, Publisher: W.H. Freeman, Macmillan Learning, 2017.