

University of Arkansas - Fort Smith
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General Syllabus

STAT 3703 Statistical Computation

Credit Hours: 3

Lecture Hours: 3

Laboratory Hours: 0

Prerequisite or corequisite: STAT 2603 Probability Statistics II

Effective Catalog: 2018~2019

I. Course Information

A. Catalog Description

Instruction in the use of statistical software, such as *R*, SPSS, Minitab, Matlab, or Excel, etc., to analyze real-world data from a variety of disciplines and build on concepts covered in previous statistics courses.

B. Additional Information

This course allows students to learn and utilize various software packages used both in academia and in the workplace to analyze real-world data.

II. Student Learning Outcomes

A. Subject Matter

Upon successful completion of this course, the student will be able to use software packages to:

1. Construct tables, bar plots, pie charts, and dot charts for given categorical data and stem-and-leaf plots and strip charts for given numerical data.
2. Compute the mean, mode, and median measures of central tendency.
3. Compute the range, variance, standard deviation, and IQR.
4. Compute and analyze the shape of a distribution with histograms and boxplots and investigate the concepts of modes, symmetry, and skew.
5. Analyze bivariate data using the same statistical techniques as described above by constructing two-way tables, comparing independent samples, calculating the correlation between two variables.
6. Perform linear regression for simple linear regression models, conduct statistical tests of inference for simple linear regression, and constructing multiple linear regression models.
7. Describe populations involving discrete and continuous random variables, sampling from a population, and investigate binomial and normal distributions.

8. Understand the central limit theorem.
9. Construct confidence intervals for a population proportion, population means, variance, difference of proportions, difference of mean and median.
10. Conduct significance tests for a population proportion, mean, median, two-sample tests of proportion, two-sample tests of center.
11. Conduct chi-squared goodness of fit tests, tests of independence, and goodness of fit tests for continuous distributions, such as Kolmogorov-Smirnov test and the Shapiro-Wilk test for normality of data.
12. Conducting Analysis of Variance (ANOVA) tests.

B. University Learning Outcomes

Statistical Computation enhances student abilities in the following areas:

Analytical Skills

Critical Thinking Skills: Students will use statistical software to draw conclusions and/or solve problems. Students will access and evaluate appropriate information through written and electronic means. Students will think critically to reach viable solutions to a problem and be able to justify those solutions.

Communication Skills (written and oral)

Students will communicate effectively with a variety of audiences in any setting. Students will compose coherent documents appropriate to the intended audience. Students will effectively communicate orally in a public setting.

Ethical Decision Making

Students will recognize and analyze ethical dilemmas. Students will apply ethical concepts and rules to determine viable alternatives in any given situation.

Global & Cultural Perspectives

Students will understand the general concept of statistics and perform a variety of statistical analyses using statistical software. Students will communicate findings with others in a global environment using appropriate statistical and non-statistical language.

III. Major Course Topics

- A. What are Data?
 1. Concept of Sample vs. Population
 2. Sampling Methods
- B. Univariate Data
 1. Descriptive Statistics
 2. Visualization of Data
- C. Bivariate Data
 1. Descriptive Statistics
 2. Visualization of Data
- D. Multivariate Data

1. Descriptive Statistics
2. Visualization of Data
- E. Describing Populations
 1. Inferences for One Population Mean
 2. Inferences for Two Population Means
 3. Inferences for Population Standard Deviations
 4. Inferences for Population Proportions
- F. Confidence Intervals
 1. Confidence Interval for One Population Mean
- G. Significance Tests
 1. One-Sample t-test
 2. Two-Sample t-test
 3. Chi-Square Goodness-of-fit Test
 4. Chi-Square Independence Test
 5. Chi-Square Homogeneity Test
- H. Linear Regression
 1. Linear Equation
 2. Regression Equation
 3. The Coefficient of Determination
 4. Linear Correlation
 5. Regression Model; Analysis of Residuals
 6. Estimation and Prediction
 7. Testing for Normality
- I. Analysis of Variance
 1. One-Way ANOVA
 2. Kruskal-Wallis Test
 3. Two-Way ANOVA
- J. Use of Statistical Software to Understand All of the Major Course Topics
 1. SPSS
 2. Excel
3. R