

University of Arkansas – Fort Smith
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General Syllabus

STAT 4103 Applied Regression Analysis

Credit Hours: 3

Lecture Hours: 3

Laboratory Hours: 0

Prerequisite: STAT 3703 Statistical Computation

Effective Catalog: 2018~2019

I. Course Information

A. Catalog Description

Discussion of simple linear regression, multiple regression, parameter estimation and testing, residual analysis, correlation analysis, analysis of covariance, model selection procedures, polynomial regression, indicator variables, and regression diagnostics.

B. Additional Information

This course allows students to investigate and perform regression analysis on a more in depth level than in previous courses and apply it to data in their particular disciplines.

II. Student Learning Outcomes

A. Subject Matter

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

1. Apply the methods, procedures, and concepts of simple regression, multiple and polynomial regressions.
2. Build regression models.
3. Perform regression analysis on real-world data from a variety of disciplines using regression models, procedures, and statistical software.
4. Effectively present results and findings in both written and oral forms.

B. University Learning Outcomes

Applied Regression Analysis enhances student abilities in the following areas:

Analytical Skills

Critical Thinking Skills: Students will draw conclusions and/or solve problems. Students will access and evaluate appropriate information through written and

electronic means. Students will 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 be able to 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 regression analysis and perform a variety of regression analyses. Students will be able to communicate findings with others in a global environment using appropriate statistical and non-statistical language.

III. Major Course Topics

- A. What is Regression Analysis?
 - 1. Quantitative data
 - 2. Inference for Mean
 - 3. Comparing Variances
- B. Review of Linear Regression, Correlation Coefficient, and ANOVA Concepts
 - 1. Simple Linear Regression
 - 2. The Method of Least Squares
 - 3. Model Assumptions
 - 4. ANOVA table
 - 5. The Coefficient of Correlation
 - 6. The Coefficient of Determination
 - 7. Regression through the Origin
- C. Multiple Regression Analysis
 - 1. Model Assumptions
 - 2. ANOVA table
 - 3. Degree of Freedoms
 - 4. The Coefficient of Determination and Adjusted R^2
 - 5. Complex Multiple Regression Models
- D. Parameter Estimation and Testing
 - 1. Multicollinearity
 - 2. Tolerance and Variance Influence Factor (VIF)
- E. Residual Analysis
 - 1. Regression Residuals
 - 2. Detecting Unequal Variances
 - 3. Checking the Normality Assumption
 - 4. Detecting Outliers and Identifying Influential cases

- F. Correlation Analysis
- G. Analysis of Covariance
- H. Model Selection Procedures
 - 1. Backward Elimination
 - 2. Forward Selection
 - 3. Stepwise Section
- I. Polynomial Regression
 - 1. Higher-order Linear Regression Model
- J. Indicator Variables
 - 1. Model with Qualitative variables
 - 2. Dummy variable
- K. Regression Diagnostics
 - 1. Residual Analysis
 - 2. Lack of Fit