

University of Arkansas – Fort Smith
5210 Grand Avenue
P.O. Box 3649
Fort Smith, AR 72913
479-788-7000

General Syllabus

STAT 4403 Time Series Analysis

Credit Hours: 3

Lecture Hours: 3

Laboratory Hours: 0

Prerequisite: STAT 4103 Applied Regression Analysis

Effective Catalog: 2018~2019

I. Course Information

A. Catalog Description

An applied approach to time series analysis. Fundamental time series concepts such as descriptive techniques, probability models, autoregressive processes, moving average processes and forecasting will be covered as well as Box-Jenkins methods and spectral analysis. This course requires the use of computer technology.

B. Additional Information

This course allows students to learn and utilize R package to analyze real time series data sets.

II. Student Learning Outcomes

A. Subject Matter

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

1. Understand the structures and characteristics of time series data, and the procedures and concepts of time series models and forecasting.
2. Explain and perform time series analysis and build time series models.
3. Forecast the future values of given time series from current and past observations.
4. Utilize R package to analyze real time series data.
5. Analyze and apply transfer functions and transformation techniques.

B. University Learning Outcomes

Time Series Analysis enhances student abilities in the following areas:

Analytical Skills

Critical Thinking Skills: Students will use analytical strategy to make conclusions and/or solve problems. Students will understand critical skills for assessing the validity of claims based on time series data analysis. Students will build and evaluate time series models statistically.

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 time series modeling and perform a variety of time series analysis. Students will communicate findings with others in a global environment using appropriate statistical and non-statistical language.

III. Major Course Topics

- A. What is Time Series Data?
 - 1. Time Series Statistical Models
 - 2. Measure of Dependence
- B. Stochastic Process
 - 1. Stationary Time Series
 - 2. Independence and Dependence
- C. Autocovariance and Autocorrelation Functions
 - 1. Estimation of Covariance and Correlation
- D. White Noise Processes
 - 1. Assumptions
- E. Estimation of the Mean, Autocovariances and Autocorrelations
 - 1. Autocorrelation Function (ACF)
 - 2. Partial Autocorrelation Function (PACF)
- F. Moving Average and Autoregressive Representations of Time Series Processes
- G. Moving Average (MA) processes and Autoregressive (AR) processes
- H. Autoregressive Integrated Moving Average (ARIMA) Models
 - 1. MA process
 - 2. AR process
 - 3. Seasoning effect
- I. Forecasting
 - 1. One-step-ahead Prediction
 - 2. m-step-ahead Prediction
 - 3. Yule-Walker Estimation
- J. Model Identifications
 - 1. Behaviors of the ACF and PACF for ARMA models

