



### STA 526 – Applied Time Series Course Syllabus

**Course description:** Time series of regression, autocorrelation and partial autocorrelation functions, autoregressive moving average models, model identification and specification techniques, stationarity and invertibility conditions, seasonal and nonseasonal modeling, forecasting.

**Credit hours:** 3

**Course Prerequisites and Corequisites:** STA 520 and MTH 317

**Course outline:**

|                                                        | Approximate time spent |
|--------------------------------------------------------|------------------------|
| • <b>Fundamental Concepts</b>                          | 15%                    |
| ○ Definition and Examples of Time Series               |                        |
| ○ Means and Covariances                                |                        |
| ○ Autocovariance and Autocorrelation Functions         |                        |
| ○ Stationarity                                         |                        |
| • <b>Stationary Processes</b>                          | 30%                    |
| ○ General Linear Processes                             |                        |
| ○ Moving Average (MA) Processes                        |                        |
| ○ Autoregressive (AR) Processes                        |                        |
| ○ Autoregressive Moving Average (ARMA) Processes       |                        |
| ○ Invertibility                                        |                        |
| • <b>Modeling and Forecasting with ARMA Processes</b>  | 25%                    |
| ○ Estimation                                           |                        |
| ○ Diagnostic Checking                                  |                        |
| ○ Order Selection                                      |                        |
| ▪ The FPE Criterion                                    |                        |
| ▪ The AICC Criterion                                   |                        |
| • <b>Nonstationary and Seasonal Time Series Models</b> | 30%                    |
| ○ Nonstationarity                                      |                        |
| ○ Stationarity through Differencing                    |                        |
| ○ Identification Techniques                            |                        |
| ○ Unit Roots in Time Series Models                     |                        |
| ○ Forecasting ARIMA Models                             |                        |
| ○ Seasonal ARIMA Models                                |                        |
| ○ Regression with ARMA Errors                          |                        |

**Student Learning Outcomes (SLO):** At the end of STA 524, a student who has studied and learned the material should be able to:

1. Recognize the type of data that might be modeled with time series models. [PLO: 1, 2, 4]
2. Identify appropriate time series models to fit data. [PLO: 1, 2, 4]
3. Identify and use techniques for dealing with the following components of a time series:  
[PLO: 1, 2, 3, 4]
  - \* Trend
  - \* Cycle
  - \* Seasonal variations
  - \* Irregular fluctuations
4. Employ time series for the purpose of investigating patterns. [PLO: 2, 4]
5. Employ time series for the purpose of forecasting. [PLO: 2, 3, 4]

**Program Learning Outcomes (PLO):**

Students graduating from SFASU with an M.S. degree and a major in statistics will demonstrate:

1. A command of core probability and statistical concepts through major definitions and theorems. **[Concepts]** (Probability and Statistical Inference)
2. Strategic competence in formulating a standard probabilistic/statistical model for a given problem. **[Modeling]** (Model Choice and Model Interpretation)
3. Skill in using statistical software in order to process and interpret data. **[Data Processing]** (Computational Skills and Model Validation)
4. The ability to independently apply principles of probability and statistics to model and solve new or non-standard problems. **[Independent Thinking and Application]** (Existing Literature Comprehension, Independent Progression, Resourcefulness)