



# Course Specification

— (Bachelor)

**Course Title:** Time Series And Forecasting

**Course Code:** STS 224

**Program:** Applied Statistics & Data Management

**Department:** Mathematics

**College:** College of Science

**Institution:** Majmaah University, Saudi Arabia

**Version:** 2023

**Last Revision Date:** 08/02/2023



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## A. General information about the course:

### 1. Course Identification

1. Credit hours: (3(2+2))

#### 2. Course type

A. University College Department Track Others

B. Required Elective

3. Level/year at which this course is offered: (Level:5/year:2)

#### 4. Course general Description:

This course introduces the basic time series analysis and forecasting methods. Topics include stationary processes, ARMA models, spectral analysis, model and forecasting using ARMA models, nonstationary and seasonal time series models, multivariate time series, state-space models, and forecasting techniques

#### 5. Pre-requirements for this course (if any):

STS 211 Probability and Statistics 2

#### 6. Co-requisites for this course (if any):

#### 7. Course Main Objective(s):

1	Students will learn about important time series models and their applications in various fields.
2	Students will be able to formulate real life problems using time series models.
3	Students will be able to use statistical software to estimate the models from real data, and draw conclusions and develop solutions from the estimated models.
4	Students will learn to use visual and numerical diagnostics to assess the soundness of their models.
5	Students will learn to communicate the statistical analyses of substantial data sets through explanatory text, tables and graphs.
6	Students will learn to combine and adapt different statistical models to analyze larger and more complex data.

### 2. Teaching mode (mark all that apply)





No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	30	50%
2	E-learning	10	16%
3	Hybrid <ul style="list-style-type: none"> <li>Traditional classroom</li> <li>E-learning</li> </ul>	10	16%
4	Distance learning	10	16%

### 3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	40
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	20
5.	Others (specify)	
<b>Total</b>		<b>60</b>

## B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
<b>1.0</b>	<b>Knowledge and understanding</b>			
1.1	Define Time series. Concepts and Components of (trend – seasonality – cyclical). Some adequacy measures. Time Series Models - ARMA(p,q). Modeling, controlling and forecasting.	K3	Direct teaching: Lectures Aimed teaching: Discovery and oral questions Indirect teaching: Cooperative Learning	<ul style="list-style-type: none"> <li>Homework</li> <li>Quiz</li> <li>Midterms</li> <li>Final Exams</li> </ul>
1.2				
...				
<b>2.0</b>	<b>Skills</b>			





Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.1	Define time series and trend direction and seasonal changes as well as diagnose its stability list time series models, describe the best modeling to fit.	S1	Direct teaching: Lectures Aimed teaching: Discovery and oral questions Indirect teaching: Cooperative Learning	<ul style="list-style-type: none"> <li>• Homework</li> <li>• Quiz</li> <li>• Midterms</li> <li>• Final Exams</li> </ul>
2.2	Graph the data explain the features of model, interpret the output and evaluate.	S3	Direct teaching: Lectures Aimed teaching: Discovery and oral questions Indirect teaching: Cooperative Learning	<ul style="list-style-type: none"> <li>• Homework</li> <li>• Quiz</li> <li>• Midterms</li> <li>• Final Exams</li> </ul>
...				
<b>3.0</b>	<b>Values, autonomy, and responsibility</b>			
3.1				
3.2				
...				

### C. Course Content

No	List of Topics	Contact Hours
1.	Introduction: Definitions and Examples. trend – seasonality – cyclical Transformation: Differences method – Seasonal adjustment. Forecasting: How to forecast future - adequacy of a forecast - regression forecasting against time series forecasting	10
2.	Some adequacy measures (MAD, MSE, MAPE). Decomposition and smoothing of times series: moving averages - exponential smoothing double exponential smoothing.	10
3.	Stationary Time Series Models: Auto-Regressive processes (AR(1), AR(2), AR(p)), Moving Average processes (MA(1), MA(2), MA(q)), The mixed Autoregressive-Moving Average Model ARMA(p,q). Forecasting: Minimum Mean Square Error Forecasts for ARMA and ARIMA models	5





4.	Forecasting, prediction limits and updating forecasts. ARIMA(p,d,q) models: Autocorrelation and partial autocorrelation functions - identification of appropriate model	20
5.	Fitting models to real and simulated data sets. Diagnostic checks on the residuals. Case studies: training on how to analyze real life data sets using the statistical package MINITAB - write reports.	15
<b>Total</b>		<b>60</b>

## D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes	Week4 , Week9	10%
2.	Assignments/Exercises	Wee 4 , Week 9	10%
3.	Mid Term Exam	Week7	30%
4.	Final Exam	End of Semester	40%
5.	E-exam	Week 9	10%

\*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

## E. Learning Resources and Facilities

### 1. References and Learning Resources

<b>Essential References</b>	Introduction to Time Series Analysis C. Chatfield, Chapman & Hall .2003  Time Series Analysis Cryer, J.D Duxbury Press Latest edition
<b>Supportive References</b>	Time Series Analysis: Forecasting and Control, 3rd Edition Box, G.E.P., Jenkins, G.M. and Reinsel, G.C. Prentice Hall, 1994  Time Series Analysis and Its Applications Shumway, R.H., Stoffer, D.S Springer-Verlag 2006
<b>Electronic Materials</b>	<a href="https://scholar.google.com/">https://scholar.google.com/</a>
<b>Other Learning Materials</b>	



## 2. Required Facilities and equipment

Items	Resources
<b>facilities</b> (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom Laboratory
<b>Technology equipment</b> (projector, smart board, software)	Smart Board ,Projector
<b>Other equipment</b> (depending on the nature of the specialty)	Laboratory

## F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Peer faculty members	Review
Effectiveness of Students assessment	Students	Survey
Quality of learning resources		
The extent to which CLOs have been achieved		
Other		

**Assessors** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

**Assessment Methods** (Direct, Indirect)

## G. Specification Approval

<b>COUNCIL /COMMITTEE</b>	
<b>REFERENCE NO.</b>	
<b>DATE</b>	

