

## DISCIPLINE SPECIFIC CORE COURSE – 20 (DSC-20): TIME SERIES ECONOMETRICS

### CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical		
<b>Time Series Econometrics (DSC 20)</b>	<b>4</b>	<b>3</b>	<b>0</b>	<b>1</b>	<b>Class 12</b>	<b>Prior knowledge of basic econometrics</b>

### Learning Objectives

The course aims:

- To develop a comprehensive set of tools and techniques for analyzing various forms of univariate and multivariate time series.
- To learn the skills needed to do empirical research in fields operating with time series data sets.
- To apply key concepts of estimation and forecasting in a time series context.
- To illustrate the theoretical results using software to estimate time series models

### Learning Outcomes

By studying this course, the students will be able to:

- To apply ideas to real time series data and interpret outcomes of analyses
- To demonstrate advanced understanding of the concepts of time series and their application to health, climate, finance and other areas.
- To select an appropriate regression model to analyze a given time-series economic data set, and then conduct forecasting and statistical inference and interpret the results.
- To present their understanding of certain economic problems, and use empirical results to justify their explanation.

### SYLLABUS OF DSC-20

#### **Unit 1**

**(9 hours)**

Introduction to time series: Exploring time series data patterns; Exploring data patterns with autocorrelation analysis; Decomposition of time series; Choosing a forecasting technique; Measuring Forecasting Error.

#### **Unit 2**

**(18 hours)**

Moving Averages and Smoothing Methods: Naïve Models: Forecasting based on averages; Exponential Smoothing Methods; Seasonally adjusting data. Properties of Stochastic Time Series:

Autocorrelation function; Stationarity; Random Walk; Testing for stationarity (unit root tests); Co-integrated Time Series.

### Unit 3

(9 hours)

Linear Time Series: Moving Average models; Autoregressive Models; Box-Jenkins methodology; Mixed autoregressive and moving average (ARMA) models. Forecasting with ARMA/ARIMA models; properties of ARIMA forecasts.

### Unit 4

(9 hours)

Regression with time series data; Conditional and Unconditional forecasting; Testing for causality; Vector Autoregressive (VAR) Models.

**Practical Component (15 practical sessions; total 30 Hours):** Practical to be based on econometrics packages such as Python/Eviews/R/Stata. The student is expected to conduct an end-to-end modelling journey which involves analyzing time ordered data, test for stationarity, forecasting and residual diagnostics for model validation. An econometrics-based project to be taken up to constitute the end-term practical examination.

### References:

#### *Essential*

1. Hanke, John E. and Dean W. Wichern (2005). Business Forecasting. 8th Edn. New Delhi: Pearson-Prentice Hall.
2. Makridakis, Spyros, Steven C. Wheelwright and Rob J. Hyndman (1998). Forecasting: Methods and Applications. 3rd Edn. USA: John Wiley and Sons.

#### *Additional*

1. Asteriou, D and Hall, S.G. Applied Econometrics, (4th Edition). Red Globe Press
2. Stock, J. and Watson, M. Introduction to Econometrics (4th edition) Pearson
3. Tsay, RS and Chen Rong. Nonlinear Time Series Analysis. Wiley Publications.