Course title: Time series and regression analysis			
Course code: MPE 178	**No. of credits:** 4	**L-T-P:** 46-0-28	**Learning hours:** 60
Pre-requisite course code and title (if any): MPE 172 or equivalent			
Department: Department of Policy Studies			
Course coordinator: Dr Kavita Sardana	**Course instructor:** Dr Kavita Sardana		
Contact details: kavita.sardana@terisas.ac.in			
Course type: Elective	**Course offered in:** Semester 3		

Course description:

The aim of this course is to provide students with the essential expertise to handle modern time series techniques. Idea is to introduce students to comprehensive set of tools and techniques for analysing various forms of univariate and multivariate time series and for understanding the current literature in applied time series. After the course students will also be able to appreciate and apply key concepts of estimation and forecasting in a time series context. Endeavor will be to provide simple examples that illustrate how the theoretical results are used and applied in Practice.

Lab Practicals

This course places heavy emphasis on solving computer exercises. Practicals will involve applications from the fields of macroeconomics with a focus on issues relating to environment and resource.

Course objectives:

1. To understand violation of classical linear model assumptions when continuous random variables change over time.
2. To learn about theoretical and empirical solutions when assumptions are violated.

Course contents

Module	Topic	L	T	P
1	**Theory of Univariate Time Series** **1. Model Specification** Normal (Gaussian) White Noise AR (1) Process Random Walk Unit Root Process AR (2) Process AR(p) Process MA (1) process ARMA(p) process Weakly Dependent processes or integrated of order zero Integration of order one **2. Efficiency and Inference** Testing for First Order Autocorrelation Testing for Serial Correlation in the Presence of Lagged Dependent Variable Testing for Serial Correlation with Strictly Exogeneous Regressors Testing for Higher Order Serial Correlation Correcting for Serial Correlation with First Order Autocorrelation, Lagged dependent Variable, and Strictly Exogeneous Regressor Serial Correlation Robust Inference after OLS Testing for Heteroskedasticity Autoregressive Conditional Heteroskedasticity (ARCH andGARCH models) Heteroskedasticity and Autocorrelation (HA) in RegressionModels Heteroskedasticity and Autocorrelation Corrected Inference (HAC)	14		6
2	**Theory of Multivariate Time Series** 1. Cointegration Analysis The Engel-Granger (EG) Approach	11		4

	The Johansen Approach Identification of the beta coefficient and Restriction Tests: Withone or more cointegrating vector(s) Vector Error Correction Models (VECM)			
3	**The Econometric Forecasting: Theory and Application** Modelling Trends, Seasonality and Cycles Graphic Method of Forecasting One-step-ahead forecast Point forecast Forecast Interval Vector Autoregressive Model Granger Causality Scenarios Analysis and Impulse Response Functions	21		18
	Total	**46**		**28**

Evaluation criteria:

Written Examination- (Test 1) 25% [Module1- 2]
Lab Practical - (Test 2) 25% [Modules 1-3]
Major Exam - (Test 3) 50% [Modules 1-3]

Learning outcomes:

After completing this course, the students will be able to

1. Distinguish problems in econometrics relating to cross-section and time series [Tests 1 and Test3]
2. To theoretically and empirically formulate problems that can be resolved using time series analysis [Test 2]
3. Proficiency in use of statistical package [Test 2]

Materials:

Core Reading

1. Wooldridge, J.M., 2015. Introductory econometrics: A modern approach. Nelson Education. Chapter 10-12 and 18

Other Readings

Module 1 and Module 2

1. Stock, J.H. and Watson, M.W., 2007. *Econometrics*. Addison Wesley. Chapter 12-16
2. Greene, W.H., 2003. *Econometric analysis*. Pearson Education India. Chapter 11, 12, 19, 20

Student responsibilities: Attendance, feedback, discipline: as per university rules.

Course reviewers:

1. Prof. Bharat Ramaswami Indian Statistical Institute
2. Prof. Abhiroop Mukhopadhyay, Indian Statistical Institute