Course Code	Course Title	L	T	P	C
PMDS504L	Regression Analysis and Predictive Models	3	0	0	3
Pre-requisite	NIL	Syllabus version			
		1.0			

Course Objectives

1. Understand the notions of regression and time series model building.
2. Impart application of regression and time series models in various domains.
3. Instruct the methodology to test assumptions and conditions involved in regression and time series models.

Course Outcomes

At the end of the course, students will be able to:
1. Understand the simple linear regression.
2. Apply the tests for assumption for checking normality and homoscedasticity.
3. Analyse the data using multiple linear and non-linear regression models
4. Apply an appropriate time series forecasting method in any given situation.
5. Analyse model validation of time series forecasting techniques.

Module:1	Simple Linear Regression	4 hours

Simple Regression Models with One Independent Variable - Assumptions, Estimation of Parameters - Standard Error of Estimator - Testing the Significance of Regression Coefficients - Standard Error of Prediction.

Module:2	Multiple Linear Regression	7 hours

Multiple Regression: Standard Gauss Markov Setup, Least Square (LS) Estimation, Error and Estimation Spaces - Variance - Covariance of LS Estimators - Estimation of Error Variance - Case with Correlated Observations - LS Estimation with Restriction on Parameters - Multicollinearity.

Module:3	Diagnostics	7 hours

Diagnostic Checks and Correction: Graphical Techniques, Tests for Normality, Uncorrelatedness, Homoscedasticity, Lack of Fit - Polynomial Regression - Transformations on Y or X - Inverse Regression.

Module:4	Nonlinear Regression	6 hours

Non-Linear Regression: Linearization Transforms, Advantages, Limitations, Non-Linear Least Squares, Parameter Estimation in a Non-Linear Systems - Generalized Linear Models: Logistic Regression, Poisson Regression.

Module:5	Introduction To Time Series Analysis	5 hours

Graphical Display - Classical Decomposition Model - Components and Various Decompositions of Time Series Models - Data Transformations - Methods of Estimation Trend, Seasonal and Exponential.

Module:6	Stationary Time Series Models	7 hours

Stationary and types of Stationary - White Noise Processes - Autocorrelation Function - Partial Autocorrelation Function and their Standard Errors - Autoregressive Model - Moving Average Model - Autoregressive Moving Average Model - Autoregressive Integrated Moving Average Model.

Module:7	Non-Stationary time series models	7 hours

Tests For Non-Stationarity: Random Walk, Unit Root Tests: Dickey Fuller Test, Augmented Dickey Fuller Test - ARIMA Models: Basic Formulation of The ARIMA Model and their Statistical Properties - Forecasting Model Selection Techniques: AIC, BIC And AICC Forecasting Model Monitoring.

Module:8	Contemporary Issues	2 hours

		Total Lecture hours	**45 hours**

Text Book(s)

1	Douglas C. Montgomery, Elizabeth A. Peck, G. Geoffrey Vining, Introduction to Linear Regression Analysis, 2016, 3rd Edition, Wiley India Pvt. Ltd., New Delhi.
2	Douglas C. Montgomery, Cheryl L. Jennings, Murat Kulahci, Introduction to TimeSeries Analysis and Forecasting, 2016, 2nd Edition, Wiley India Pvt. Ltd., New Delhi.

Reference Book(s)

1	George E. P. Box, Gwilym M. Jenkins, Gregory C. Reinsel, Greta M. Ljung, Time Series Analysis: Forecasting and Control, 2016, 5th Edition, Wiley India Pvt. Ltd., New Delhi.
2	Norman R. Draper, Harry Smith, Applied Regression Analysis, 2015, 3rd Edition, Wiley India Pvt. Ltd., New Delhi.

Mode of Evaluation: CAT, Assignment, Quiz and FAT			
Recommended by Board of Studies	15-02-2024		
Approved by Academic Council	No. 73	Date	14-03-2024