

Course Code	Course Title	L	T	P	C
OLMDS503	Forecasting and Predictive Analytics	3	1	0	4
Pre-requisite	NIL	Syllabus version			
		1.0			
Course Objectives					
1. Develop an understanding of concepts, elements and methods of forecasting and related models. 2. To develop inferential thinking and practical skills for tackling the issues of forecasting and related predictive analysis. 3. Investigate possible diagnostics in regression techniques. 4. Formulate feasible solution using OLS and GLM for real-life forecasting problems.					
Course Outcome					
At the end of the course students will be able to: 1. Develop in-depth understanding of the concept and methods of forecasting. 2. Demonstrate the knowledge of time Series forecasting, regression modeling and predictive analysis. 3. Examine the relationships between dependent and independent variables, estimate the parameters and fit a model to draw inferential implications for further implications. 4. Analyze and develop critical statistical thinking to execute various diagnostic measures in regression modeling and predictive analysis. 5. To communicate the generalizations of the linear model to binary and count data.					
Module:1	Introduction to Forecasting				
Nature of Forecasting, overview of forecasting, forecasting procedures, qualitative and quantitative forecast. Naïve forecast and naïve forecasting methods. Forecast performance criteria. Precautions in forecasting. Steps involved in forecasting. Types of forecasting. Measuring the forecast accuracy. Forecasts and confidence intervals.					
Module:2	Forecasting Methods for Time Series Data				
Introduction, Analysis of time series, additive and multiplicative model. Measurement of trend. Fitting a linear trend to time series data. Exponential smoothing methods. Single exponential smoothing, double exponential smoothing. Winter's exponential smoothing. Decomposition methods, tests of seasonality. Concept of stationary and non-stationary time series.					
Module:3	Simple Linear Regression(SLR)				
Introduction, Basic assumptions of regression models. Simple Linear Regression (SLR) model to describe the linear relationship, SLR as a descriptive technique, inferences from a simple linear regression, assessing the fit of the regression line, prediction or forecasting with a simple linear regression, Some cautions in interpreting regression. Assessing the assumptions of regression model. Validating simple regression model using t, F and p test. Problem of over fitting of a model. Residual analysis, detection and treatments of an outliers and influential data. Test of Linearity, test of normality and test of constant variance.					
Module:4	Multiple Linear Regression(MLR)				
Multiple Linear Regression Model (MLRM), multiple regressions as a tool to describe a linear relationship, matrices and their application to regression analysis. Inferences from a multiple regression analysis, assessing the fit of the MLR line, Concept of BLUE (Best Linear Unbiased Estimator) and Ordinary Least Square Method using Gauss Markov Theorem for prediction and forecasting, comparing two regression models, prediction with a multiple regression equation. Multicollinearity: a potential problem in multiple regression, identification and testing of multicollinearity and its remedial measures. Heteroscedasticity and its effects on forecasting.					
Module:5	Autocorrelation and Auto regression				
Concept, meaning and definition. Test of autocorrelation, Durbin Watson test, Durbin h-test,					

effects of autocorrelation, remedial measures, coefficient of serial correlation (ρ), AR (1) and AR (2), relationship between Durbin statistic (d) and ρ (coefficient of serial autocorrelation). Lagged variables as explanatory variables in time series regression. Concept and calculation of curvilinear relationship using correlation ratio(η),			
Module:6	Assessing the Prediction Quality and Model selection		
Meaning of Prediction quality and predictive power of a model. Data Splitting methods. PRESS Statistics and its application in predictive analysis. Transformation methods, variance stabilizing transformations, transformations to linearize the model, Box-Cox methods, suitable transformations on y and x using various functions. Computational technique for variable selection procedures. Consequences of model misspecification. Model selection criteria: AIC, BIC, SIC, C_p - Mallow statistics.			
Module:7	Generalised Linear Model(GLM) and Logistic Regression		
Generalized linear model: link functions and linear predictors, parameter estimation and inference in the GLM, estimation and prediction analysis using logistic regression. Residual Analysis and concept of over dispersion. Illustrations of cases using logistic regression for forecasting and predictive analysis. Generalized and weighted least squares. Some practical applications.			
	Total Lecture Hours		120 hours
Text Book(s)			
1.	Spyros Makridakis, Steven C., Wheelwright Rob J. Hyndma, Forecasting Methods and Applications, Sixth Edition, Wiley India, 2015		
2.	Rob J Hyndman, Forecasting: principles and practice, online, 2018		
Reference Books			
1.	T.M.J.A. Cooray, Applied Time Series: Analysis and Forecasting, Narosa Publication, 2008		
2.	Norman R. Draper, Harry Smith; Applied Regression Analysis, WILEY India Pvt. Ltd. New Delhi; Third Edition, 2015.		
3.	Forecasting, Time Series, and Regression, 4th edition, 2005, Bowerman, O'Connell, and Koehler, Thomson Learning ISBN 0-534-40977-6		
Mode of Evaluation: Quiz/Assignment/Mid-Term, FAT			
Recommended by Board of Studies		27.07.2022	
Approved by Academic Council		No. 67	Date 08-08-2022