

Course Code	Course Title	L	T	P	C
OLMDS602	Multivariate Data Analysis	3	1	0	4
Pre. requisite	OLMDS502	Syllabus version			
		1.0			
Course Objectives					
The aim of the course is to make the student to: 1. Conversant with various methods and techniques used in summarization and analysis of multivariate data. 2. Prepare for investigation of multivariate data and examine the possible diagnostics in multivariate methods. 3. Formulate real time problem in a form of multivariate model. 4. Develop feasible solution of real-life problems, using multivariate methods and techniques. 5. Conduct research using multivariate data analysis techniques.					
Course Outcomes:					
At the end of the course students will be able to: 1. Learn to develop an in-depth understanding of the Multivariate methods, multivariate normal distributions and their applications. 2. Examine the relationships between dependent and independent variables of multivariate models, estimate the parameters and fit a model. 3. Perform, handle and manipulate the analysis of discriminant function and logistic regression. 4. Apply the method and analysis of principal components, factor analysis and dimension reduction of sample data. 5. Investigate the events of clustering and multidimensional scaling presence in sample data and the application of Structural Equation Modeling.					
Module:1	Introduction				
Multivariate data and their diagrammatic representation. Exploratory multivariate data analysis, sample mean vector, sample dispersion matrix, sample correlation matrix, graphical representation, means, variances, co-variances, correlations of linear transforms.					
Module:2	Multivariate Normal Distribution				
Probability density function and moment generating function of multivariate normal distribution, singular and nonsingular normal distributions, distribution of linear and quadratic form of normal variables, marginal and conditional distributions. Random sampling from multivariate normal distributions. Goodness of fit of multivariate normal distribution.					
Module:3	Multivariate Linear Model				
Maximum likelihood estimation of parameters, tests of linear hypothesis, distribution of partial and multiple correlation coefficients and regression coefficients. Multivariate linear regression, multivariate analysis of variance of one and two way classification data (only LR test). Multivariate analysis of covariance. Hoteling T^2 and Mahalanobis D^2 applications in testing and confidence set construction.					
Module:4	Multiple Discriminant Analysis and Logistic Regression				
Discriminant model and analysis: a two group discriminant analysis, a three group discriminant analysis, the decision process of discriminant analysis-objective					

research design, assumptions, estimation of the model, assessing overall fit of a model, interpretation of the results, validation of the results.			
Module:5 Logistic Regression model and analysis			
Regression with a binary dependent variable, representation of the binary dependent variable, estimating the logistic regression model, assessing the goodness of fit of the estimation model, testing for significance of the coefficients, interpreting the coefficients.			
Module:6 Factor Analysis			
Population and sample principal components, their uses and applications, large sample inferences, graphical representation of principal components, Biplots, the orthogonal factor model, dimension reduction, estimation of factor loading and factor scores, interpretation of factor analysis.			
Module:7 Multivariate Correlation Analysis			
Canonical correlation analysis, conjoint analysis.			
Total Lecture hours:			120 Hours
Text Book(s)			
1.	Hardle W.K. and Simar L., Applied Multivariate Statistical Analysis, 5 th Edition, Springer- Verlag, 2019.		
2.	Richard A. Johnson and Dean W. Wichern, Applied Multivariate Statistical Analysis, Prentice hall India, 7 th Edition, 2017.		
Reference Books			
1.	Joseph F. Hair, Jr., William C. Black, Barry J. Babin, Rolph E. Anderson and Ronald L. Tatham, Multivariate Data Analysis, 7 th Edition, Pearson Education India, 2014.		
2.	Rao, C. R. and Rao, M. M., Multivariate Statistics and Probability, Elsevier & Academic Press, 2014.		
3.	Kshirsagar, A. M., Multivariate Analysis, Marcel Dekkar, 2006.		
4.	Anderson T.W., An Introduction to Multivariate Statistical Analysis, John Wiley & sons, 3 rd Edition, 2009.		
5.	Bhuyan, K. C., Multivariate Analysis and its Applications, New Central book Agency Pvt. Ltd., 2005.		
6.	Weisberg S., Applied Linear Regression, 4 th Edition, Wiley, 2013.		
7.	Kollo T., and Rosen D. Von, Advanced Multivariate Statistical Analysis with Matrices, Springer, New York, 2005.		
Mode of Evaluation: / Written assignment /Digital Assignment / Quiz / FAT / Project / Seminar/Cases			
Recommended by Board of Studies		16-10-2023	
Approved by Academic Council		No. 72	Date 13-12-2023