Course Code	21CSE322T	Course Name	Multivariate Techniques for Data Analytics	Course Category	E	*Professional Elective*	L	T	P	C
							2	1	0	3

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*Data Science and Business Systems*	Data Book / Codes/Standards		*Nil*	

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*
CLR-1 :	*Utilize data characteristics in the form of distribution of the data structures*
CLR-2 :	*Learn the statistical data reduction techniques*
CLR-3 :	*Understand the usage of multivariate techniques for the problem under the consideration.*
CLR-4 :	*Draw valid inferences and to plan for future investigations*
CLR-5 :	*Optimize the different solutions that maximize returns and minimize cost*

Course Learning Outcomes (CO):	*At the end of this course, learners will be able to:*	Program Learning Outcomes (PO)														
		1	2	3	4	5	6	7	8	9	10	11	12	PSO		
		Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CO-1 :	*Understand the characteristics of data and its properties*	-	-	-	-	-	-	-	-	-	-	-	-	*1*	-	-
CO-2 :	*Effectively select and use the data reduction techniques*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*2*
CO-3 :	*Deploy the multivariate techniques to solve the real-world problems*	-	-	-	-	-	-	-	-	-	-	-	-	-	*2*	-
CO-4 :	*Acquire information and inferences from data to predict future output*	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO-5 :	*Achieve optimal solutions that maximize returns*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*1*

Unit-1:INTRODUCTION TO MULTIVARIATE ANALYSIS **9 hours**

Meaning of Multivariate Analysis - Measurements Scales - Metric measurement scales and non-metric measurement scales - Classification of multivariate techniques – Dependence Techniques - Inter-dependence Techniques - Applications of multivariate techniques - Applications of multivariate techniques -Examples - Applications of multivariate techniques – Demo and Examples.

T1: Exploration of data sets and characteristics in PYTHON

T2: Implementation of dependent and interdependence techniques in PYTHON

T3: Explore scope of multivariate analytics in different applications using PYTHON

Unit-2: FACTOR ANALYSIS9 hours

Factor Analysis Introduction - Meanings, Objectives – Assumptions - Designing a factor analysis - Designing a factor analysis – Example - Designing a factor analysis – Demo – Deriving factors and assessing overall factors - Interpreting the factors and validation of factor analysis - Interpreting the factors and validation of factor analysis – Demo and Examples.

T4: Implementation of factor analysis in PYTHON

T5: Interpreting and Validating factor analysis in PYTHON

Unit-3: CLUSTER ANALYSIS **9 hours**

Cluster Analysis Introduction - Objectives and Assumptions - Research design in cluster analysis - Deriving clusters - Assessing overall fit - Deriving clusters – Demo and examples - Hierarchical methods - Non-Hierarchical Methods – Combinations. T7: Implement Django framework using python – creating basic Django App

T6: Implementation of cluster analysis in PYTHON

T7: Interpretation and Validation of cluster analysis in PYTHON and R

Unit-4: DISCRIMINANT ANALYSIS **9 hours**

Discriminant Analysis Introduction and Purpose with Examples - Discriminant Analysis concept, objective - Discriminant Analysis applications - Procedure for conducting discriminant analysis - Procedure for conducting discriminant analysis – Demo - Procedure for conducting discriminant analysis – Examples - Stepwise discriminate analysis - Mahalanobis procedure - Logit model

T8: Implementation of discriminant analysis in PYTHON

T9: Interpretation and Validation of discriminant analysis in PYTHON and R

Unit-5: VISUALIZATION **9 hours**

Linear Programming problem Introduction - Linear Programming problem Applications - Formulation of LPP - Graphical method - Simplex method - Graphical and simplex methods – Problems, examples and demo - Graphical and Simplex - Integer Programming - Transportation problem - Assignment problem

T10: Formulating a LPP in PYTHON from a data set

T11: Solving LPP in PYTHON – Graphical and Simplex

T12: Implementation of transportation of assignment problem in PYTHON.

Learning Resources	1. Joseph F Hair, William C Black etal , "Multivariate Data Analysis" (2016). , "Multivariate Data Analysis". Pearson Education, 7th edition, 2. Anderson, T.W., 2003. "An introduction to statistical multivariate analysis", 3rd Edition", Wiley. 3. Dillon, W.R. and Goldstein, M., 1984. Multivariate analysis: Methods and applications. New York (NY): Wiley.	4. Malhotra, N.K. and Dash, S., 2011. Marketing Research: An Applied Orientation (; Pearson, Ed.). 5. Hamdy A Taha,(2012) "Operations Research", Pearson, 8th Edition. 6. S. R. Yadav, A. K. Malik (2014) "Operations Research", Oxford University Press. https://python-for-multivariate-analysis.readthedocs.io/ "A Little Book of Python for Multivariate Analysis"

	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) - By the Course Faculty		By The CoE
		Formative CLA-I Average of unit test (50%)	Life Long* Learning CLA-II- Practice (10%)	Summative Final Examination (40% weightage)
		Theory	Theory	Theory
Level 1	Remember	40%	20%	40%
Level 2	Understand	40%	20%	40%
Level 3	Apply	10%	20%	10%
Level 4	Analyze	10%	20%	10%
Level 5	Evaluate	-	10%	-
Level 6	Create	-	10%	-
	Total	100 %	100 %	100 %

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1.Mrs.Sivasankari.S , Freelance Software consultancy on Big data, analytics	1. . *Dr.JeyaShree, Professor, Rajalakshmi Institute of Technology*	*1. Dr.A.Shobanadevi, Asst. Professor, DSBS, SRMIST*