

ACADEMIC CURRICULA
UNDERGRADUATE DEGREE PROGRAMME

**Bachelor of Science in
Statistics**

Three Years /

**Bachelor of Science (Honours) in
Statistics**

Four Years

**Learning Outcomes Based Curriculum Framework
(LOCF)**

Choice Based Flexible Credit System

**Academic Year
2023-2024**



SRM
INSTITUTE OF SCIENCE & TECHNOLOGY
(Deemed to be University u/s 3 of UGC Act, 1956)

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

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Kattankulathur, Chengalpattu District 603203, Tamil Nadu, India

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Department Mathematics and Statistics

1. Department Vision Statement	
Stmnt - 1	Endeavour to impart the systematic learning and to make available the scientific and technical knowledge to outlive in all feasible domain
Stmnt - 2	Encourage professional skills to analyze and identify the appropriate solution for any practical situation.
Stmnt - 3	Developing statistical and mathematical thinking and facilitate to explore innovative ideas to the society through research

2. Department Mission Statement	
Stmnt - 1	To equip the students to learn the essential knowledge of statistical techniques to meet the global competencies
Stmnt - 2	Demonstrate the importance of statistical models and approaches to analyse the real-life problems
Stmnt - 3	Motivating students to become skilled at statistics software and learn to understand the best practices
Stmnt - 4	Creating an environment to prepare for professional careers and developments.
Stmnt - 5	Persuading students to pursue advanced technical ability study and IT-based solutions

3. Program Education Objectives (PEO)	
PEO - 1	To develop the skill with the help of <i>statistical analysis</i> , simulations or predictive modelling.
PEO - 2	To attain the ability to present data in the best forms for decision-making and problem-solving.
PEO - 3	To acquire the ability to apply math and statistics appropriately
PEO - 4	To develop the ability how to approach problems by identifying existing assumptions and resources
PEO - 5	To acquire the domain knowledge to pursue higher education and research.

4. Program Specific Outcomes (PSO)	
PSO - 1	Students will acquire knowledge and develop their skill in statistical techniques in order to fit into global competency
PSO - 2	Students will be skilled in problem-solving and decision-making processes in any organisation
PSO - 3	Students will be equipped with skill enhancement courses like Research methodology, Statistical packages to enter into a promising professional life as well as research environment

5. Consistency of PEO's with Mission of the Department					
	Mission Stmt. - 1	Mission Stmt. - 2	Mission Stmt. - 3	Mission Stmt. - 4	Mission Stmt. - 5
PEO - 1	H	H	H	H	H
PEO - 2	H	H	H	M	H
PEO - 3	H	M	H	H	H
PEO - 4	H	M	M	M	H
PEO - 5	H	H	H	H	H

H – High Correlation, M – Medium Correlation, L – Low Correlation

6. Consistency of PEO's with Program Learning Outcomes (PLO)															
	Program Learning Outcomes (PLO)														
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
PEO - 1	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
PEO - 2	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
PEO - 3	H	H	H	H	H	H	H	H	H	H	H	M	H	H	H
PEO - 4	H	M	H	M	H	M	L	M	L	H	H	L	M	H	H
PEO - 5	H	H	H	H	H	H	H	M	H	H	H	H	H	H	H

H – High Correlation, M – Medium Correlation, L – Low Correlation

7. Programme Structure													
1. Discipline Specific Core Courses (C)							2. Discipline Specific Elective Courses (D)						
(20 Courses)							(5 Courses)						
Course Code	Course Title	Hours/ Week					Course Code	Course Title	Hours/ Week				
		L	T	P	O	C			L	T	P	O	C
UST23101J	Probability and Random Variables	2	0	5	2	4	UST23D01J	Applied Statistics	3	0	2	2	4
UST23102J	Descriptive Statistics	2	0	5	2	4	UST23D02J	Demography					
UST23103T	Mathematics for Statistics - I	4	0	0	2	4	UST23D03J	Industrial Statistics	3	0	2	2	4
UST23201J	Distribution Theory - I	2	0	5	2	4	UST23D04J	Actuarial Statistics					
UST23202J	Sampling Techniques	3	0	3	2	4	UST23D05J	Time Series Analysis	3	0	3	2	4
UST23203T	Mathematics for Statistics - II	4	0	0	2	4	UST23D06J	Queueing Theory and Inventory Models					
UST23301J	Distribution Theory - II	2	0	5	2	4	UST23D07J	Advanced optimisation techniques	3	0	2	2	4
UST23302J	Sampling Distributions	3	0	3	2	4	UST23D08J	Statistical quality management and reliability theory					
UST23303T	Real Analysis and Matrix Algebra	4	0	0	2	4	UST23D09T	Basic Econometrics	4	0	0	2	4
UST23401J	Statistical Inference - I	3	0	3	2	4	UST23D10T	Bayesian Inference					
UST23402J	Statistical Quality Control	3	0	3	2	4		Total Learning Credits					20
UST23403T	Measures and Probability Theory	4	0	0	2	4							
UST23501J	Statistical Inference - II	3	0	3	2	4	4. Skill Enhancement Courses(S)						
UST23502J	Operations Research	3	0	3	2	4	(5 Courses)						
UST23503J	Regression Analysis	3	0	3	2	4	Course Code	Course Title	Hours/ Week				
UST23601J	Stochastic Processes	3	0	3	2	4			L	T	P	O	C
UST23602J	Design of Experiments	3	0	3	2	4	UCD23S01L	Quantitative Aptitude and Logical Reasoning	0	0	2	2	1
UST23603T	Research Methodology	4	0	0	2	4	UCD23S02T	Verbal Ability and Skill Development	2	0	0	2	2
UST23701J	Multivariate Analysis	3	0	3	2	4	UST23S01L	MS Excel for Statistical Analysis	0	0	2	2	1
UST23801J	Survival Analysis	3	0	2	2	4	UST23S02L	Statistical Data Analysis Using SPSS	0	0	4	2	2
	Total Learning Credits					80	UST23S03L	Statistical Analysis using Analytical tools	0	0	2	2	1
								Total Learning Credits					7

3. Generic Elective Courses (G)							5. Ability Enhancement Courses (AE)						
(9 Courses)							(4 Courses)						
Course Code	Course Title	Hours/ Week					Course Code	Course Title	Hours/ Week				
		L	T	P	O				C	L	T	P	
ULT23G01J	Tamil-I	2	0	2	2	3	ULE23AE1T	English	4	0	0	2	4
ULH23G01J	Hindi-I						UES23AE1T	Environmental Studies	3	0	0	2	3
ULF23G01J	French-I						ULT23AE1J	Applied Tamil-I	1	0	2	2	2
		ULH23AE1J	Applied Hindi-I										
		ULF23AE1J	French for Specific Purpose-I										
ULT23G02J	Tamil-II	2	0	2	2	3	ULT23AE2J	Applied Tamil-II	1	0	2	2	2
							ULH23AE2J	Applied Hindi-II					
							ULF23AE2J	French for Specific Purpose-II					
ULH23G02J	Hindi-II							Total Learning Credits					11
ULF23G02J	French-II												
UST23G01J	R Programming	3	0	2	2	4	6. Value Addition Course (V)						
UST23G02J	Database Management System and Statistical Tools	3	0	2	2	4	(4 Courses)						
UST23G03J	Python Programming	3	0	2	2	4	Course Code	Course Title	Hours/ Week				
UST23G04J	Numerical Methods	3	0	2	2	4			L	T	P	O	
UST23G05J	Statistical Data Mining Techniques	3	0	2	2	4	UCD23V01T	Universal Human Values	2	0	0	2	2
UST23G06J	Big Data Analytics	3	0	2	2	4	UEN23V01L	Communication Skills	0	0	4	2	2
UST23G07T	Biostatistics	4	0	0	2	4	UCD23V02T	Industry Oriented Employability Skills for Science	2	0	0	2	2
	Total Learning Credits					34	UCD23V05T	Career Readiness and Professional Skills	2	0	0	2	2
								Total Learning Credits					8

7. Internship/Apprenticeship / Project/ Community Outreach (IAPC)							8. Mandatory Courses (M)						
(6 Courses)							(2 Courses)						
Course Code	Course Title	Hours/ Week					Course Code	Course Title	Hours/ Week				
		L	T	P	O	C			L	T	P	O	C
UST23P01L	Internship - I	0	0	0	0	1	UNS23M01L	NSS	0	0	0	0	0
							UNC23M01L	NCC					
							UNO23M01L	NSO					
							UYG23M01L	YOGA					
UST23P02L	Internship - II	0	0	0	0	1	UMI23M01L	My India Project	0	0	0	0	0
UST23P03L	Internship - III	0	0	0	0	2							
UST23P04L	Mini Project	0	0	4	2	2							
UST23P05L	Project Phase-I	0	0	8	2	4							
UST23P06L	Project Phase-II	0	0	12	2	6							
	Total Learning Credits					16		Total Learning Credits					

8. Implementation Plan

Semester – I						
Course Code	Course Title	Hours/ Week				C
		L	T	P	O	
ULT23G01J	Tamil-I	2	0	2	2	3
ULH23G01J	Hindi-I					
ULF23G01J	French-I					
ULE23AE1T	English	4	0	0	2	4
UST23101J	Probability and Random Variables	2	0	5	2	4
UST23102J	Descriptive Statistics	2	0	5	2	4
UST23103T	Mathematics for Statistics - I	4	0	0	2	4
UCD23S01L	Quantitative Aptitude and Logical Reasoning	0	0	2	2	1
UCD23V01T	Universal Human Values	2	0	0	2	2
Total Learning Credits		16	0	14	14	22
Total number of hours/Week						30

Semester - II						
Course Code	Course Title	Hours/ Week				C
		L	T	P	O	
ULT23G02J	Tamil-II	2	0	2	2	3
ULH23G02J	Hindi-II					
ULF23G02J	French-II					
UES23AE1T	Environmental Studies	3	0	0	2	3
UST23201J	Distribution Theory - I	2	0	5	2	4
UST23202J	Sampling Techniques	3	0	3	2	4
UST23203T	Mathematics for Statistics - II	4	0	0	2	4
UCD23S02T	Verbal Ability and Skill Development	2	0	0	2	2
UEN23V01L	Communication Skills	0	0	4	2	2
UNS23M01L	NSS	0	0	0	0	0
UNC23M01L	NCC					
UNO23M01L	NSO					
UYG23M01L	YOGA					
Total Learning Credits		16	0	14	14	22
Total number of hours/Week						30

Semester - III						
Course Code	Course Title	Hours/ Week				
		L	T	P	O	C
UST23301J	Distribution Theory - II	2	0	5	2	4
UST23302J	Sampling Distributions	3	0	3	2	4
UST23303T	Real Analysis and Matrix algebra	4	0	0	2	4
ULT23AE1J	Applied Tamil - I	1	0	2	2	2
ULH23AE1J	Applied Hindi - I					
ULF23AE1J	French for Specific Purpose - I					
UST23G01J	R Programming	3	0	2	2	4
UST23S01L	MS Excel for Statistical Analysis	0	0	2	2	1
UST23P01L	Internship - I	0	0	0	0	1
UCD23V02T	Industry Oriented Employability Skills for Science	2	0	0	2	2
Total Learning Credits		15	0	14	14	22
Total number of hours/Week						29

Semester - IV						
Course Code	Course Title	Hours/ Week				
		L	T	P	O	C
UST23401J	Statistical Inference - I	3	0	3	2	4
UST23402J	Statistical Quality Control	3	0	3	2	4
UST23403T	Measures and Probability Theory	4	0	0	2	4
ULT23AE2J	Applied Tamil - II	1	0	2	2	2
ULH23AE2J	Applied Hindi - II					
ULF23AE2J	French for Specific Purpose - II					
UST23G02J	Database Management System and Statistical Tools	3	0	2	2	4
UST23S02L	Statistical Data Analysis Using SPSS	0	0	4	2	2
UCD23V05T	Career Readiness and Professional Skills	2	0	0	2	2
UMI23M01L	My India Project	0	0	0	0	0
Total Learning Credits		16	0	14	14	22
Total number of hours/Week						30

Semester - V						
Course Code	Course Title	Hours/ Week				C
		L	T	P	O	
UST23501J	Statistical Inference - II	3	0	3	2	4
UST23502J	Operations Research	3	0	3	2	4
UST23503J	Regression Analysis	3	0	3	2	4
UST23D01J	Applied Statistics	3	0	2	2	4
UST23D02J	Demography					
UST23G03J	Python Programming	3	0	2	2	4
UST23S03L	Statistical Analysis using Analytical tools	0	0	2	2	1
UST23P02L	Internship - II	0	0	0	0	1
Total Learning Credits		15	0	15	12	22
Total number of hours/Week						30

Semester – VI						
Course Code	Course Title	Hours/ Week				C
		L	T	P	O	
UST23601J	Stochastic Processes	3	0	3	2	4
UST23602J	Design of Experiments	3	0	3	2	4
UST23603T	Research Methodology	4	0	0	2	4
UST23D03J	Industrial Statistics	3	0	2	2	4
UST23D04J	Actuarial Statistics					
UST23G04J	Numerical Methods	3	0	2	2	4
UST23P04L	Mini Project	0	0	4	2	2
Total Learning Credits		16	0	14	12	22
Total number of hours/Week						30
Total Learning Credits				132		

Semester - VII						
Course Code	Course Title	Hours/ Week				C
		L	T	P	O	
UST23701J	Multivariate Analysis	3	0	3	2	4
UST23D05J	Time Series Analysis	3	0	3	2	4
UST23D06J	Queueing Theory and Inventory models					
UST23G05J	Statistical Data Mining Techniques	3	0	2	2	4
UST23G06J	Big Data Analytics	3	0	2	2	4
UST23P03L	Internship - III	0	0	0	0	2
UST23P05L	Project Phase-I	0	0	8	2	4
Total Learning Credits		12	0	18	10	22
Total number of hours/Week						30

Semester - VIII						
Course Code	Course Title	Hours/ Week				C
		L	T	P	O	
UST23801J	Survival Analysis	3	0	2	2	4
UST23D07J	Advance optimization techniques	3	0	2	2	4
UST23D08J	Statistical Quality Management and Reliability theory					
UST23D09T	Basic Econometrics	4	0	0	2	4
UST23D10T	Bayesian Inference					
UST23G07T	Biostatistics	4	0	0	2	4
UST23P06L	Project Phase-II	0	0	12	2	6
Total Learning Credits		14	0	16	10	22
Total number of hours/Week						30
Total Learning Credits				176		

Courses for earning Additional Credits

Course Code	Course Title	Hours/ Week				
		L	T	P	O	C
Semester – II						
UCD23P01L	Internship Report – I	0	0	8	0	4
UCD23P02L	Project Work – I					
UCD23P03L	Apprenticeship – I					
Semester – IV						
UCD23P04L	Internship Report – II	0	0	8	0	4
UCD23P05L	Project Work – II					
UCD23P06L	Apprenticeship – II					
Total Learning Credits		0	0	8	0	4

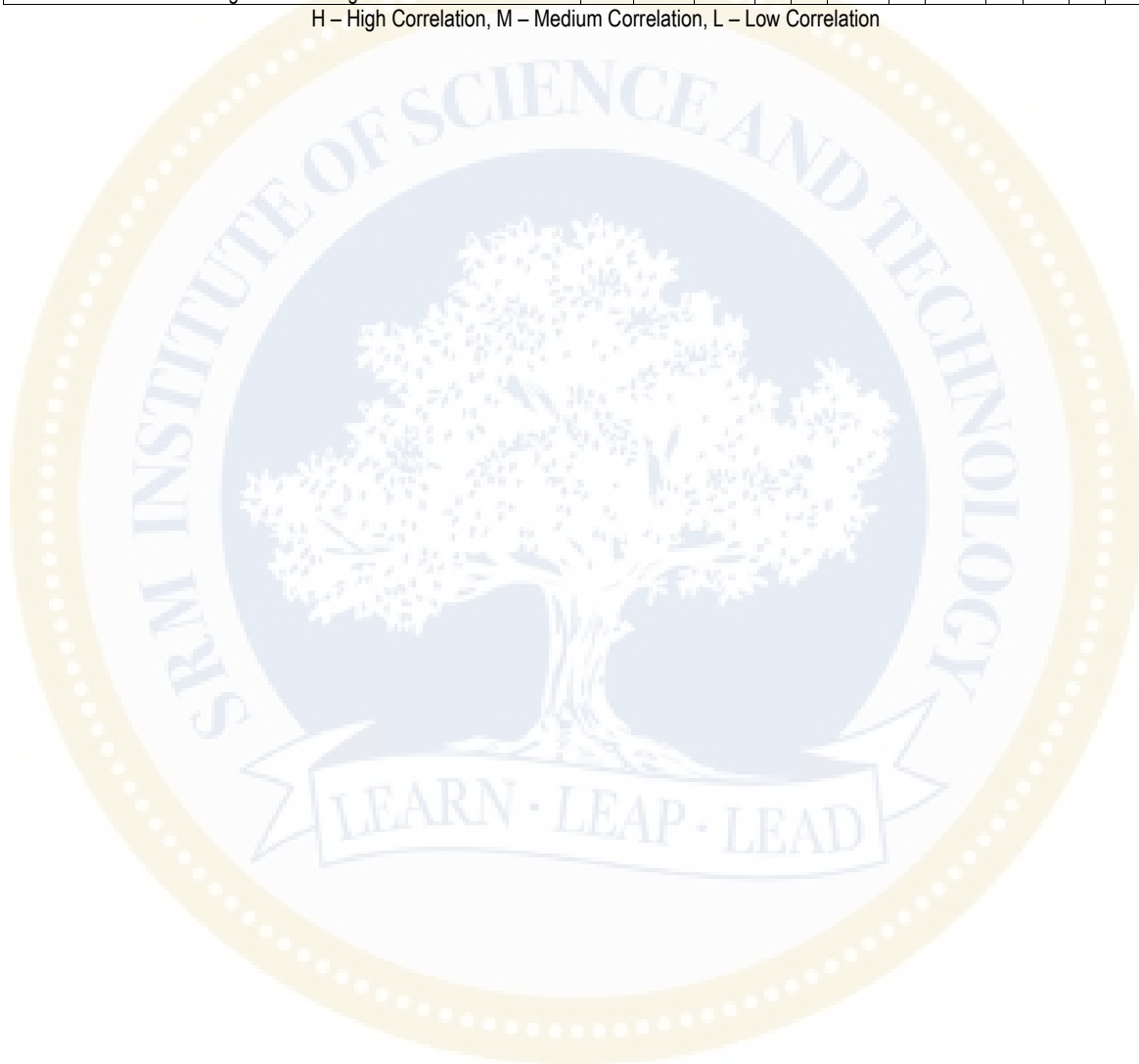
Note: Those students who decide to exit at the end of the First year shall register for any one of the courses mentioned under Semester – II; and decide to exit at the end of the Second year shall register for any one of the courses mentioned under Semester – IV in the above list.

9. Programme Articulation Matrix

Course Code	Course Name	Programme Learning Outcomes													
		Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior
UST23101J	Probability and Random Variables	M	H	H	M	H	M	M	M	L	M	L	M	L	M
UST23102J	Descriptive Statistics	H	M	H	H	M	M	M	M	M	M	L	M	L	M
UST23103T	Mathematics for Statistics - I	H	H	H	M	M	M	M	L	L	M	L	M	L	L
UST23201J	Distribution Theory - I	H	H	H	M	M	M	M	M	M	M	L	M	L	M
UST23202J	Sampling Techniques	H	H	M	M	M	M	M	L	M	M	L	M	L	M
UST23203T	Mathematics for Statistics - II	H	H	M	M	M	H	M	L	L	M	L	M	L	L
UST23301J	Distribution Theory - II	H	M	H	M	M	M	M	H	M	M	L	M	M	M
UST23302J	Sampling Distributions	H	H	M	M	M	M	M	H	M	M	L	M	M	M
UST23303T	Real Analysis and Matrix Algebra	M	M	H	H	M	H	M	M	M	M	L	M	L	L
UST23401J	Statistical Inference - I	H	H	H	M	M	M	M	M	M	M	L	M	L	M
UST23402J	Statistical Quality Control	H	H	M	M	M	M	M	H	M	M	L	M	L	M
UST23403T	Measures and Probability Theory	H	L	H	H	L	M	M	M	M	M	L	L	L	L
UST23501J	Statistical Inference - II	H	M	M	M	M	M	M	H	H	M	L	M	M	M
UST23502J	Operations Research	M	H	M	H	M	M	H	M	M	M	L	M	M	M
UST23503J	Regression Analysis	M	M	M	M	H	M	M	H	M	M	L	M	M	M
UST23601J	Stochastic Processes	H	H	M	M	M	M	M	M	H	M	L	M	M	M
UST23602J	Design of Experiments	M	H	H	M	M	M	M	M	H	M	L	M	M	M
UST23603T	Research Methodology	H	M	H	M	M	M	L	L	L	L	M	M	H	M
UST23701J	Multivariate Analysis	M	H	H	M	H	M	M	M	M	M	L	M	M	M
UST23801J	Survival Analysis	M	H	H	M	M	M	M	M	M	H	L	M	M	M
UST23D01J	Applied Statistics	M	H	H	M	M	H	M	M	M	M	L	M	M	M
UST23D02J	Demography	H	H	H	M	M	M	M	M	M	M	M	M	M	M
UST23D03J	Industrial Statistics	M	H	H	M	M	M	M	M	M	M	M	M	H	M
UST23D04J	Actuarial Statistics	H	H	M	M	M	M	M	M	H	M	L	M	M	M
UST23D05J	Time Series Analysis	H	H	M	M	H	M	M	M	M	M	L	M	M	M
UST23D06J	Queueing Theory and Inventory Models	H	H	M	M	M	H	M	M	M	M	L	M	M	M
UST23D07J	Advanced optimisation techniques	M	H	H	M	M	M	M	H	M	M	L	M	M	M
UST23D08J	Statistical quality management and reliability theory	M	H	M	M	M	M	M	H	M	H	L	M	M	M
UST23D09T	Basic Econometrics	H	H	H	M	M	M	M	M	M	M	L	M	M	M
UST23D10T	Bayesian Inference	H	H	M	M	H	M	M	M	M	M	L	M	M	M
UST23G01J	R Programming	H	H	H	M	M	M	M	M	M	M	L	M	M	M
UST23G02J	Database Management System and Statistical Tools	H	H	M	M	M	M	M	M	H	M	L	M	M	M
UST23G03J	Python Programming	H	H	H	M	M	M	M	M	M	H	L	M	M	M
UST23G04J	Numerical Methods	H	M	M	H	M	M	M	M	M	H	L	M	M	M
UST23G05J	Statistical Data Mining Techniques	M	H	M	M	H	M	H	M	M	H	L	M	M	M
UST23G06J	Big Data Analytics	M	H	M	M	H	M	M	M	M	H	L	H	M	M
UST23G07T	Biostatistics	M	H	M	M	H	M	M	M	H	M	L	M	M	M
UST23S01L	Ms Exce-I for statistical Analysis	M	H	M	M	H	M	M	H	M	M	L	M	M	M
UST23S02L	Statistical Data Analysis Using SPSS	M	H	H	M	H	M	M	M	M	M	L	M	M	M
UST23S03L	Statistical Analysis using Analytical tools	H	H	H	M	M	M	M	M	M	M	L	M	M	M
UST23P01L	Internship - I	H	H	M	H	M	M	M	M	M	M	L	M	M	M
UST23P02L	Internship - II	M	H	M	M	M	H	M	M	M	M	M	M	M	M
UST23P03L	Internship - III	M	M	H	L	M	M	M	M	H	M	M	M	M	H
UST23P04L	Mini Project	M	H	M	M	M	H	M	H	M	M	M	M	M	M
UST23P05L	Project Phase-I	M	M	H	L	M	M	M	M	H	M	M	M	M	H
UST23P06L	Project Phase-II	M	H	M	M	M	H	M	H	M	M	M	M	M	M
ULT23G01J	Tamil-I	H	M	H	H	H	H	M	H	H	M	H	H	M	H
ULH23G01J	Hindi-I	H	H	H	H	H	H	M	H	H	H	H	H	M	H
ULF23G01J	French-I	H	H	H	M	H	H	M	H	H	H	H	H	M	H
ULT23G02J	Tamil-II	H	M	H	H	H	H	M	H	H	M	H	H	M	H
ULH23G02J	Hindi-II	H	H	H	H	H	H	M	H	H	H	H	H	M	H
ULF23G02J	French-II	H	H	M	H	H	H	H	M	H	H	H	H	M	H
ULE23AE1T	English	H	M	L	M	M	M	M	M	M	H	H	L	-	-
UES23AE1T	Environmental Studies	M	H	L	M	L	H	L	M	L	H	L	M	-	M
ULT23AE1J	Applied Tamil-I	H	M	H	H	H	H	M	H	M	H	H	M	H	H
ULH23AE1J	Applied Hindi-I	H	H	H	H	H	H	M	H	H	H	H	M	H	H
ULF23AE1J	French for specific purpose-I	H	H	H	H	H	H	M	H	H	H	H	H	M	H
ULT23AE2J	Applied Tamil-II	H	M	H	H	H	H	M	H	H	M	H	M	H	H
ULH23AE2J	Applied Hindi-II	H	H	H	H	H	H	M	H	H	H	H	M	H	H
ULF23AE2J	French for specific purpose-II	H	H	M	H	H	H	H	M	H	H	H	M	H	H

UCD23V01T	Universal Human Values	M	M	L	H	L	L	M	L	L	-	L	L	M	H	H
UCD23S01L	Quantitative Aptitude and Logical Reasoning	H	M	M	M	L	M	M	H	M	H	M	M	H	H	H
UCD23S02T	Verbal Ability and Skill Development	M	H	M	L	M	M	L	M	M	H	H	H	M	M	M
UEN23V01L	Communication Skills	H	M	M	L	M	M	-	M	M	M	M	M	-	-	-
UCD23V02T	Industry Oriented Employability Skills for Science	M	M	H	M	M	H	L	-	-	-	H	M	M	-	H
UCD23V05T	Career Readiness and Professional Skills	H	M	M	M	H	M	M	H	L	M	H	H	M	H	H
UNS23M01L	NSS	H	H	M	M	L	L	L	L	L	L	L	H	M	M	M
UNC23M01L	NCC	H	H	M	M	L	L	L	L	L	L	L	H	M	M	M
UNO23M01L	NSO	H	M	M	M	M	L	M	L	M	M	M	H	M	M	M
UYG23M01L	YOGA	H	H	M	L	L	L	L	L	L	L	L	H	M	M	M
UMI23M01L	My India Project	H	H	M	M	M	L	L	L	M	M	M	H	M	M	M
Programme Average		H	H	M	H	M	L	L	L	M	M	M	H	M	M	M

H – High Correlation, M – Medium Correlation, L – Low Correlation



Structure of Bachelor of Science in Statistics / Bachelor of Science (Honours) in Statistics
Distribution of different Courses in each semester with their credits for Bachelor of Science in Statistics / Bachelor of Science (Honours) in Statistics

Semester	Compulsory Core Courses (CC)	Discipline Specific Elective (DSE)	Ability Enhancement Courses (AEC) Internship/ Apprenticeship/ Project/ Community Outreach (IAPC)	Skill Enhancement Course (SEC) Value Addition Course (VAC)	Generic Elective (GEC)	Total Credits	No. of Periods
Semester I	CC-1(4) CC-2(4) CC-3(4) [12]	--	AEC-1(4) [4]	SEC-1(1) VAC-1(2) [3]	GEC-1 (Language-I) (3) [3]	22	30
Semester II	CC-4(4) CC-5(4) CC-6(4) [12]	-	AEC-2(3) [3]	SEC-2(2) VAC-2(2) [4]	GEC-2 (Language-II) (3) [3]	22	30
Semester III	CC-7(4) CC-8(4) CC-9(4) [12]		AEC-2(2) IAPC-1(1) [3]	SEC-3(1) VAC-3(2) [3]	GEC-3 R-Programming (4) [4]	22	29
Semester IV	CC-10(4) CC-11(4) CC-12(4) [12]	-	AEC-3(2) [2]	SEC-4(2) VAC-4(2) [4]	GEC-4 Dtatbase Management system and statistical tools (4) [4]	22	30
Semester V	CC-13(4) CC-14(4) CC-15(4) [12]	DSE-1/DSE-2 (4) [4]	IAPC -2 (1) [1]	SEC-5(1) [1]	GEC-5 Python Programming (4) [4]	22	30
Semester VI	CC-16(4) CC-17(4) CC-18(4) [12]	DSE-3/DSE-4 (4) [4]	IAPC -3 (2) [2]	-	GEC-6 Numerical Methods (4) [4]	22	30
Semester VII	CC-19(4) [4]	DSE-5/DSE-6 (4) [4]	IAPC -4 (2) IAPC -5 (4) [6]	-	GEC-7 Statistical Data Mining Techniques (4) GEC-8 Big Data Analytics (4) [8]	22	30
Semester VIII	CC-20(4) [4]	DSE-7/DSE-8 (4) DSE-9/DSE-10 (4) [8]	IAPC -6 (6) [6]	-	GEC-9 Biostatistics (4) [4]	22	30
Total Credits	80	20	27	15	34	176	239

SEMESTER - I

Course Code	ULT23G01J	Course Name	Tamil - I	Course Category	G	Generic Elective Course	L	T	P	O	C
							2	0	2	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Tamil	Data Book / Codes/Standards			Nil

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)
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CLR-1:	மரபிலிருந்து மாற்றம் பெற்ற புதுக்கவிதை மரபின் சிந்தனைகளை அறியச் செய்தல்	1	2	3	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15					
CLR-2:	புதுக்கவிதையின் வழி மனித வாழ்வியல் விழுமியங்களைத் தெரியச் செய்தல்							Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning					
CLR-3:	சிற்றிலக்கியங்கள், காப்பியங்கள் கற்பிக்கும் தமிழ்ச் சமூகத்தின் வாழ்வியலை அறியச் செய்தல்																										
CLR-4:	நவீன தமிழ் இலக்கிய வளர்ச்சி வரலாற்றைப் புரியச் செய்தல்																										
CLR-5:	மொழிப் பயிற்சி வழி மொழியின் பல்வேறு நுட்பங்களைத் தெரியச் செய்தல்																										
Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:																									
CLO-1:	புதுக்கவிதை உருவாக்கித் தந்த புதிய சிந்தனைக் களங்களை அறிந்துகொள்ளுதல்	2	75	60				H	L	H	M	H	H	L	M	H	M	L	H	-	-	-					
CLO-2:	நவீன கவிதைகள் வழி மாற்றம் பெற்று வரும் மானுட விழுமியங்களைத் தெரிந்துகொள்ளுதல்	2	80	70				H	M	H	L	M	H	L	H	M	L	H	H	-	-	-					
CLO-3:	தமிழ்ச்சமூகத்தின் இடைக்கால வாழ்வியல் முறைகளை உணர்ந்துகொள்ளுதல்	2	70	65				H	L	H	M	H	H	M	H	L	H	M	H	-	-	-					
CLO-4:	நவீன இலக்கிய வரலாறு வழி தமிழ்க் கல்வி வரலாறு, சமூக வரலாறு பெற்ற வளர்ச்சி நிலைகளைத் தெரிந்துகொள்ளுதல்	2	70	70				H	M	H	L	H	M	M	H	H	L	H	H	-	-	-					
CLO-5:	மொழியின் நுட்பங்களை அறிந்து மொழி ஆளுமையோடு செயல்பட அறிந்துகொள்ளுதல்	2	80	70				H	M	H	H	M	H	L	M	H	L	H	H	-	-	-					

Duration (hour)	12	12	12	12	12
S-1	SLO-1	தமிழ் இலக்கியத்தின் வளர்ச்சிப் போக்குகள்	நவீன கவிதை தோற்றம்	தமிழரின் வீரமரபு	சிற்றிலக்கியத் தோற்றம்
	SLO-2	இலக்கிய உத்திகள்	நவீன கவிதை வரலாறு	போர் விழுமியங்கள்	சிற்றிலக்கிய வகைமை
					தமிழ் உரைநடை மரபில் உ.வே.சா.
					ராஜ வைத்தியம்

S-2	SLO-1	தமிழ்க் கவிதை மரபு	நவீன கவிதை செல்நெறிகள்	பரணி அறிமுகம்	சிறுநிலக்கியங்கள்	வைத்தியர்களின் சிறப்பு
	SLO-2	காலந்தோறும் கவிதையின் கரு	செல்நெறிகளில் கோட்பாடுகள்	பரணி இலக்கியங்கள்	முதன்மைச் சிறுநிலக்கியங்கள் -	கழனிபுரன் - அறிமுகம்
S-3	SLO-1	காலந்தோறும் கவிதையின் கட்டமைப்பு	கவிதை மொழி	கலிங்கத்துப்பரணி 477,490	பிள்ளைத்தமிழ் - உலா - தூது	சிறுதெய்வ வழிபாடு
	SLO-2	தற்கால இலக்கியம்	நவீன கவி ஆளுமைகள்	தலைவனின் வீரம்	புதுக்கவிதையில் சமூகம்	பொன் காத்த ஐயனார்
S-4	SLO-1	புதுக்கவிதை உருவாக்கம்	பெண் கவிஞர்கள்	தமிழ் இலக்கிய மரபில் தூது	புதுக்கவிதையும் இதழ்களும்	விருந்து - கள்ளர் செயல்கள்
	SLO-2	புதுக்கவிதை வளர்ச்சிநெறிகள்	கவிதையில் நாட்டுப்புற வடிவம்	தூது இலக்கியங்கள்	மணிக்கொடி இதழ்	பிழை நீக்கி எழுதுதல்
S-5	SLO-1	பாரதியார் - புதுக்கவிதையின் அடையாளம்	இளம்பிறை - அம்மா	தமிழ் விடு தூது (184 - 186)	எழுத்து இதழ்	எழுத்துப் பிழை
	SLO-2	பாரதியார் பன்முக ஆளுமைத்திறன்	பெண்களின் கல்வி நிலை	தமிழின் பெருமை	வானம்பாடி இதழ்	தொடர்பிழை
S-6	SLO-1	பாரத தேசம்	பெண் அடக்குமுறை	செய்யுள் மரபில் கலம்பகம்	சிறுகதை தோற்றம்	உயர்திணை, அஃறிணை
	SLO-2	பாரததேசத்தின் வளம்	ப. கல்பனா - கீறல் விழுந்த மாலைக் காலங்கள்	கலம்பக இலக்கியங்கள்	சிறுகதை வளர்ச்சி	பிறமொழிச் சொற்கள் வரலாறு
S-7	SLO-1	வெள்ளிப் பனிமலையின் மீதுலவுவோம்...	ஆண் பெண் சமத்துவம்	நந்திக் கலம்பகம்-வானுறு மதியை (110)	சிறுகதை - வரலாறு	பிறமொழிச் சொற்களை நீக்கி எழுதுதல்
	SLO-2	20 ஆம் நூற்றாண்டுக் கவிதை மரபில் பாரதிதாசன்	விளிம்புநிலை வாழ்வியல்	கையறுநிலை	சிறுகதை ஆசிரியர்கள்	ஷ, ஜ, ஸ, ஹ மாற்றொலிகள்
S-8	SLO-1	பாரதிதாசன் - அழகின் சிரிப்பு	திருநங்கை குணவதி - சமூகப்பார்வை	குறவஞ்சி அறிமுகம்	இதழ்களும் சிறுகதையும்	தமிழ் இலக்கண நுட்பங்கள்
	SLO-2	ஆல் - ஆயிரம் கிளைகள் கொண்ட அடிமரம்	திருநற்களும் சாதனைகளும்	குறவஞ்சி இலக்கியங்கள்	புதினம் தோற்றம்	இலக்கணமும் பயன்பாடும்
S-9	SLO-1	இயற்கையின் அழகியல்	புலம்பெயர் வாழ்வியல்	குற்றாலக் குறவஞ்சி - ஆடுமர வீணுமணி (3)	தொடக்கக்காலப் புதினங்கள்	தமிழில் சொல் வகைகள்
	SLO-2	வானம்பாடியில் மு.மேத்தா	ஸர்மிளா ஸெய்யித் - புராதன ஊர்	மலையும் வாழ்வும்	புதினம் வளர்ச்சி	சொல்லும் பயன்பாடும்
S-10	SLO-1	மு.மேத்தா - கவிதையின் தனித்தன்மைகள்	புலம் பெயர் வாழ்வின் வலியும் நம்பிக்கையும்	காப்பிய இலக்கணம்	புதினத்தின் வகைமை	பெயர்ச்சொற்கள்
	SLO-2	மனிதனைத்தேடி - கவிதை	காலந்தோறும் கவிதை வடிவில் மாற்றங்கள்	காப்பிய வகைமைகள்	புதின ஆசிரியர்கள்	பெயர்ச்சொற்கள் அறிதல்
S-11	SLO-1	மனிதநேயம்	ஹைக்கூ, லிமரைக்கூ, சென்ரியூ - தேர்ந்தெடுத்த கவிதைகள்	சிலப்பதிகாரம் - அறிமுகம்	தமிழ் இலக்கியத்தில் உரைநடைக்கூறுகள்	வினைச்சொற்கள்
	SLO-2	தமிழ்க் கவிதையில் சுற்றுச்சூழலியல்	ஹைக்கூ - மு.முருகேஷ்	கட்டுரைக்காதை	உரைநடையின் தோற்றம்	வினைச்சொற்கள் அறிதல்

S -12	SLO-1	பழனிபாரதியின் காடு	லிமரைக்கூ – ஈரோடு தமிழன்பன்	ஊழ்வினை	தமிழில் உரைநடை	தமிழில் பெயரடை, வினையடை
	SLO-2	இயற்கையும் சமூக சமத்துவ வாழ்வியலும்	சென்றியூ – மாமதயானை	கோவலனின் முற்பிறப்பு வரலாறு	உரைநடை வளர்த்த அறிஞர்கள்	பெயரடை, வினையடை அறிதல்

Learning Resources	- முல்லைக்காடு, தொகுப்பும் பதிப்பும் - தமிழ்த்துறை ஆசிரியர்கள், எஸ்.ஆர்.எம். அறிவியல் மற்றும் தொழில்நுட்பக் கல்விநிறுவனம், காட்டாங்குளத்தூர், 603203, 2023 - வல்லிக்கண்ணன், புதுக்கவிதை தோற்றமும் வளர்ச்சியும், ஆழி பதிப்பகம், சென்னை, 2018 - கா. சிவத்தம்பி, தமிழில் சிறுகதை தோற்றமும் வளர்ச்சியும், என்.சி.பி.எச்., சென்னை, 2013 - தமிழ் இணையக் கல்விக்கழகம் - http://www.tamilvu.org/ - மதுரை தமிழ் இலக்கிய மின் தொகுப்புத் திட்டம் - https://www.projectmadurai.org/
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	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#		Theory	Practice
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice		
Level 1	Remember Understand	30%	30%	30%	30%	20%	20%	20%	20%	30%	-
Level 2	Apply Analyze	40%	50%	50%	40%	50%	50%	50%	50%	50%	-
Level 3	Evaluate Create	30%	20%	20%	30%	30%	30%	30%	30%	20%	-
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
1. Dr. P.R.Subramanian, Director, Mozhi Trust, Thiruvannamiyur, Chennai – 600 041.	1. Dr. V. Dhanalakshmi, Associate Professor, Subramania Bharathi School of Tamil Language & Literature, Pondicherry University, Pondicherry	1. Dr. B.Jaiganesh, Associate Professor & Head, Dept. of Tamil, FSH, SRMIST, KTR.
		2. Dr. R. Ravi, Assistant Professor and Head, Dept. of Tamil, FSH, SRMIST, VDP.
		3. Mr. G. Ganesh, Assistant Professor, Dept. of Tamil, FSH, SRMIST, RMP.
		4. Dr. T.R.Hebzibah beulah Suganthi, Assistant Professor, Dept. of Tamil, FSH, SRMIST, KTR.
		5. Dr. S.Saraswathy, Assistant Professor, Dept. of Tamil, FSH, SRMIST, KTR.

Course Code	ULH23G01J	Course Name	HINDI-I	Course Category	G	Generic Elective Course	L	T	P	O	C
							2	0	2	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	HINDI	Data Book / Codes/Standards			Nil

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)
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CLR-1 :	To Communicate in Hindi without any inhibition	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	To appreciate the Hindi Language in its various forms	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-3 :	To analyze the different writing styles				H	H	H	M	L	H	L	M	L	L	H	M	-	-	-
CLR-4 :	To display moral and social values in the field of social Responsibility and Integrity				H	H	H	M	L	H	H	M	L	L	H	M	-	-	-
CLR-5 :	To be willing listeners and Translators-where need be				H	H	M	L	H	H	M	H	M	M	H	H	-	-	-

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1 :	To Understand the Philosophy of life and living through Stories	2	75	60	H	H	H	M	L	H	L	M	L	L	H	M	-	-	-
CLO-2 :	To Examine Travelogue writing and Sketch	2	80	70	H	H	H	M	L	H	H	M	L	L	H	M	-	-	-
CLO-3 :	To Identify Irony and essay based writing	2	70	65	H	H	M	L	H	H	M	H	M	M	H	H	-	-	-
CLO-4 :	Evaluate the various social issues depicted in the prose	2	70	70	H	H	L	H	M	H	L	H	H	M	H	H	-	-	-
CLO-5 :	To Understand the basic and fundamental principal of Translation	2	80	70	M	H	M	H	L	H	H	L	H	M	H	H	-	-	-

Duration (hour)	12	12	12	12	12
S-1	SLO-1 KAHANI	REKHACHITRA & YATRAVITRANT	NIBANDH	NATAK	ANUVAD& PARIBHASHIK SHABDAVALI
	SLO-2 AVDHARNA	AVDHARNA	NIBANDH KI AVDHARNA	AVDHARNA	ARTH
S-2	SLO-1 SWARUP	SWAROOP	SWARUP	NATAK KA SWARUP	PARIBHASHA
	SLO-2 PARIBHASHA	BHUMIKA	PARIBHASHA	PARIBHASHA	SWARUP
S-3	SLO-1 KAHANI KE TATVA	MAHATVA	MAHATVA	TATVA	PRAKAR
	SLO-2 KAHANI KA MAHATVA	UDDESHYA	UDDESHYA	PRAKAR	MAHATVA
S-4	SLO-1 PARIKSHA- PREMCHAND	GISHA-REKHACHITRA	KUTAJ- NIBANDH HAJARI PRASHAD Divedi	UDDESHYA	UDDESHYA
	SLO-2 KAHANI KA PARICHAY	LEKHIKA PARICHAY	LEKHIKA PARICHAY	RANGMANCH KA PARICHAY	ANUVAD KA PRAYOG
S-5	SLO-1 VISLESHAN	PATH KA VISHLESHAN	PATH KA MAHATVA	NATAK KA MAHATVA	ANUVAD KA PRAYOG
	SLO-2 EMANDARI KA MAHATVA	GURU SHISHYA KA SAMBANDH	VIPRIT PARISHTHITIYON ME JEEVAN KI ASH	PRAYOG	SHROT BHASHA KA GYAN
S-6	SLO-1 HONHARI KA PARICHAY	GURU KE PRATI SMARPAN BHAVANA	MANAV KI AKANKSHAYEN	ANDHER NAGRI-(NATAK) BHARTENDU HARISHCHAND	LAKSHYA BHASHA KA GYAN
	SLO-2 UDDESHYA	PATH KA MAHATVA	SHANGHARSHIL JEEVAN	LEKHAK PARICHAY	ANUVAD KA DAYITVA
S-7	SLO-1 MALBE KA MALIK- MOHAN RAKESH	THELE PAR HIMALAY (YATRAVITRANT)	SANGHARSH KA PARINAM	NATAK KA VISLESHAN	ANUVAD KA ABHYASH

	SLO-2	LEKHAK PARICHAY	LEKHAK PARICHAY	BHOLARAM KA JEEV-(VYANGYA) HARISHANKAR PARSHAI	NATAK ABHINAY	ANGREJI SE HINDI
S-8	SLO-1	BATWARE KA YATHARTH VARNAN	YATRAVITRANT KA MAHATVA	VYANGYA KI AVADHARNA	LALCH KA DUSHPARINAM	HINDI SE ANGREJI
	SLO-2	TATKALIN PARISHTHITI KA VARNAN	YATRA KA YATHARTH CHITRAN	MAHATVA	SHISHYA KI AGYANTA	ANUVAD PRIYOJNA KARYA
S-9	SLO-1	APNI MITTI SE LAGAV	PATH KA VISLESHAN	LEKHAK PARICHAY	GURU SHISHYA SAMBANDH	PUNRIKSHAN
	SLO-2	RAJNITIK VIDWESH KA PARINAM	HIMALAY KA VARNANA	PATH KA VIHLESHAN	HASHYA VYANGY SE AVAGAT KARANA	VIVIDH PRAYOG
S-10	SLO-1	PROPKAR KI BHAVANA	HIMALAY KA LOK JEEVAN	MADHYAVARGI PARIVAR KI STHITI	DURDRISHTIHIN	PARIBHASHIK SHABDAVALI
	SLO-2	KAHANI PATH	LOK SAMASYA	SARKARI TANTRA KA KHOKHLA RUP	MAHATTAKANKSHI KA DUSHPARINAM	ATI MAHTVAPURN SHABD
S-11	SLO-1	KAHANI KA VISHLESHAN	UDDESHYA	PAURANIK KATHA KA CHITRAN	GURU KI AVAGYA KA DUSHPARINAM	TAKANIKI SHABDAVALI KA MHATVA
	SLO-2	PRASHO KI CHARCHA	PRASHNA ABHYASH	SANVEDANSHIL BHAVANA	TATKALIN SAMAJIK VYAVASTHA KI CHARCHA	HINDI SE ANGREZI SHABD
S-12	SLO-1	PRASHN ABHYASH	PATH PRICHARCHA	PARICHARCHA	PARICHARCHA	ANGREZI SE HINDI SHABD
	SLO-2	KAHANI KA UDDESHYA	MAHATVAPURN BIBDUON KI CHARCHA	PRASHANA ABHYASH	PRASHNABHYASH	SHABDAVALI KI AVSHYAKTA

Learning Resources	Edited Book: ""SAMANYA HINDI", SRIJONLOK PUBLICATION, 2023, New Delhi. KABIR – HAZARI PRASAD DWEDI SURDAS – RAM CHANDRA SHUKL BHAKTI ANDOLAN AUR SURDAS KA KAVYA – MANAGER PANDEY	BIHARI – VISHVNATH PRASAD MISHR Aadhunik Vigyapan aur Jansampark – Taresh Bhatia
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Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	30%	30%	30%	20%	20%	20%	20%	30%	-
	Understand										
Level 2	Apply	40%	50%	50%	40%	50%	50%	50%	50%	50%	-
	Analyze										
Level 3	Evaluate	30%	20%	20%	30%	30%	30%	30%	30%	20%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Shri. Santosh Kumar Editor : Srijanlok Magazine Place: Vashishth Nagar, Ara – 802301	1. Prof.(Dr.) S.Narayan Raju, Head, Department of Hindi,CUTN, Tamilnadu	1. Dr.S Preeti. Associate Professor & Head, SRMIST
Alumni Ananya Singh Trainee Associate (Finance Operations) Cargill Business Services India Building 9,2nd and 3rd Floor, Cessna Business Park, Kaverappa Layout, Kadubeesanahalli, India, Bengaluru, Karnataka		2. Dr. Md.S. Islam Assistant Professor, SRMIST 3.Dr. S. Razia Begum, Assistant Professor, SRM IST 4. Dr.Nisha Murlidharan Assistant Professor, VDP,SRM IST

Course Code	ULF23G01J	Course Name	French-I	Course Category	G	Generic Elective Course	L	T	P	O	C
							2	0	2	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	French	Data Book / Codes/Standards			Nil

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)
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CLR-1 :	Extend and expand their savoir-faire through the acquisition of current scenario
CLR-2 :	Enable the students to overcome the fear of speaking a foreign language and take position as a foreigner speaking French
CLR-3 :	Make them learn the basic rules of French Grammar.
CLR-4 :	Develop strategies of comprehension of texts of different origin
CLR-5 :	Strengthen the language of the students both in oral and written

1	2	3
Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
2	75	60
2	80	70
2	85	75
2	70	80
2	80	70

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
H	M	H	H	M	H	H	L	M	M	H	L	-	-	-
M	H	L	H	H	M	H	M	L	L	H	M	-	-	-
H	H	L	M	H	M	L	H	M	M	H	H	-	-	-
H	L	M	H	M	H	H	M	L	H	M	L	-	-	-
M	H	H	L	M	M	H	H	M	L	H	M	-	-	-

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:
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CLO-1 :	To acquire knowledge about French language	2	75	60
CLO-2 :	To strengthen the knowledge on concept, culture, civilization and translation of French	2	80	70
CLO-3 :	To develop content using the features in French language	2	85	75
CLO-4 :	To interpret the French language into other language	2	70	80
CLO-5 :	To improve the communication, intercultural elements in French language	2	80	70

Duration (hour)	12	12	12	12	12
S-1	SLO-1 Contacts	Les verbes du premier groupe	Qu'est-ce qu'ils font ?	Portraits	Les verbes du deuxième groupe –
	SLO-2 Emma la championne	Les exemples	Les exemples	Un casting	Les exemples
S-2	SLO-1 Les nombres à partir de 31	La liaison –	Où est mon sac	Les exemples	Les pronoms personnels toniques
	SLO-2 Les activités	Les activités	Les exemples		Les exemples
S-3	SLO-1 Les pays	Entrer en contact	Quelques objets	Le Petit Spirou	Les verbes faire et lire
	SLO-2 les nationalités	Les activités	Les exemples	Les activités	Les exemples
S-4	SLO-1 Les jours de la semaine-	Présenter et se présenter	Les professions	L'aspect physique	Les Sons
	SLO-2 Les jours	Les activités	La fiche d'identité	Les activités	Les exemples
S-5	SLO-1 Les mois de l'année	Demander et dire la date –	La formation du féminin (2)	Le caractère	Décrire l'aspect physique
	SLO-2 Les activités	Les activités	La phrase interrogative partielle –	Les exemples	Décrire le caractère
S-6	SLO-1 Les animaux domestiques	une rencontre.	Qu'est-ce que c'est ?	les états d'âme	Demander et dire l'heure
	SLO-2 Les activités	Les activités	Qui est-ce ?	Les activités	Les exemples
S-7	SLO-1 La famille (1)	Contacts	C'est / Il est (1)	Les prépositions de lieu (1)	Elle est comment ?
	SLO-2 Les activités	Les activités	Les exemples	Les exemples	Les exemples
S-8	SLO-1 La formation du féminin (1)	Emma la Championne	La phrase négative (1)	La famille (2)	Portraits

	SLO-2	Les activités	Les activités	Les exemples	Les activités	Les exemples
S-9	SLO-1	Les adjectifs possessifs	Mots et expressions	Les verbes aller et venir	La formation du féminin	<i>Mots et Expressions</i>
	SLO-2	Les exemples	Les activités	L'élision	Les activités	Les activités
S-10	SLO-1	La phrase interrogative	Grammaire -	Les formules de politesse	La formation du pluriel (2)	<i>Grammaire.</i>
	SLO-2	Les exemples	Les exemples	Demander des informations personnelles	Les activités	Les exemples
S-11	SLO-1	Les activités	Communication	C'est qui ?	<i>Il y a</i>	Les activités
	SLO-2	Les nombres	Les activités	Qu'est-ce qu'ils font ?	Les activités	<i>Communication</i>
S-12	SLO-1	intonation et est-ce que	<i>Les verbes du ER –groupe</i>	Mots et Expressions	Les articles contractés	Les activités
	SLO-2	Les exemples	Les exemples	Grammaire – Communication	Les exemples	Les exemples

Learning Resources	Theory: 1. “‘ Nouvelle Génération-AI” Méthode de français, Marie-Noëlle COCTON, P.DAUDA, L.GIACHINO, C.BARACCO, Les éditions Didier, Paris, 2018. 2. <i>Cahier d'activités avec deux discs compacts.</i> 3. https://www.fluentu.com/blog/french/french-grammar 4. https://www.elearningfrench.com/learn-french-grammar-online-free.html 5. https://www.lawlessfrench.com/grammar https://blog.gymglish.com/2022/12/15/basic-french-grammar.
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Learning Assessment												
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Attendance (5%)	Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (5%)#			Theory	Practice
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice			
Level 1	Remember Understand	30%	30%	30%	30%	20%	20%	20%	20%	30%	-	
Level 2	Apply Analyze	40%	50%	50%	40%	50%	50%	50%	50%	50%	-	
Level 3	Evaluate Create	30%	20%	20%	30%	30%	30%	30%	30%	20%	-	
	Total	100 %		100 %		100 %		100 %		100 %		

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
1. Mr. Kavaskar Danasegarane Process Expert Maersk Global Service Center Pvt. Ltd	1. Dr. C.Thirumurugan Professor, Department of French, Pondicherry University	1. Mr. Kumaravel K. Assistant Professor & Head, SRMIST, KTR
2.Mr. Sharath Raam Prasad Character Designer, Animaker Company Pvt.		2. Mrs. Abigalai Assistant Professor, SRMIST, VDP

Course Code	ULE23AE1T	Course Name	ENGLISH	Course Category	AE	Ability Enhancement Course	L	T	P	O	C
							4	0	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Department of English, FSH, SRMIST	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)
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CLR-1 :	Develop an understanding and sensibility of human consciousness through gender inclusive curriculum	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Enhance the abilities of deeper understanding to stay with integrity with the fellow human beings																		
CLR-3 :	Develop the overall language competency of the learner																		
CLR-4 :	Develop proficient language skills																		
CLR-5 :	Learn to express the thoughts clearly, develop logical arguments and enhance the overall communication skills.																		

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	Analyze different literary texts to identify the representation of issues related to gender, and class	2	75	60	H	M	M	L	-	M	-	M	H	L	H	L	-	-	-
CLO-2 :	Apply critical thinking skills to analyze and respond to academic texts.	2	80	70	M	H	L	-	-	-	-	M	M	H	H	M	-	-	-
CLO-3 :	Critically evaluate and discuss contemporary issues through online articles.	2	70	65	M	M	M	-	L	L	-	H	M	H	H	L	-	-	-
CLO-4 :	Refine their general writing skills	2	70	70	H	M	L	-	M	H	-	-	-	-	H	L	-	-	-
CLO-5 :	Improve their language application skills	2	80	70	H	H	-	M	-	M	-	L	L	M	H	M	-	-	-

Duration (hour)	12	12	12	12	12	12
S-1	SLO-1	Introduction to the poetry and the poet- Sukirtharani	Introduction to Short stories. Introducing the short story writer Katherine Mansfield.	Introduction to Creative Writing. Explaining the elements of creative writing.	Building the discourse- The significance of conversation and the key elements of discourse are the points of discussion in this class hour.	Reflecting the learning. -Review writing
	SLO-2	Reading and recitation of the poem -Debt	Reading the story- The Doll's House	Stand-up comedy show -translate the audio content in English. (any regional language)	Art of conversation in digital and verbal discourse- Lee Mockobe's A Powerful Poem of what it means to be a Transgender. TEDX TALK- POEM RECITATION	Choosing the subject for reviewing.
S-2	SLO-1	Analysis and Critical interpretation of the poem.	Explaining the story through depiction of characters and representation of injustices.	Students- groups -Students belonging to States other than Tamilnadu	Reflecting on the style and the tone of the poem.	Planning to choose.

	SLO- 2	Introduction to the poet Kalki Subramaniam.	Analysis and critical interpretation of the short story Doll's House.	Practice the writing activity -creative ways of engaging in translation.	Practicing conversation	Understand the review process how effectively a review of any work can be done.
S-3 – S-4	SLO-1	Reading and recitation of the poem Phallus I cut.	Introduction to the writer Haruki Murakami.	Correction of errors- attempting to translate.	Introducing Content writing in Social Media- the importance of content writing.	Introducing the students to the review of the various works.
	SLO- 2	Analysis and Critical interpretation of the poem.	Reading the Confessions of a Shinawaga monkey.	Identifying equivalent terms to certain regional words - learn the art of translation.	.BLOG WRITING - Subtleties Of Workplace Inclusion: Mental Health And Queer Community- Salik Ansari.	Reviewing -recorded -posted in the social media pages of SRMIST
S-5	SLO-1	Introduction to the poet Imtiaz Dharker	Discussion and analysis of the Confessions of a Shinawaga monkey.	Introducing famous art works and the contexts of creation. Salvador Dali- The Face of War Pablo Picasso- Guernica Edward Munch- The Scream Pieter Bruegel- The Tower of Babel	writer's conversation with the readers - the blog in other blog articles..	Thoughtful conversation with your team member post the same in the official social media page of SRMIST.
	SLO- 2	Reading and reciting the poem Purdah 1	Introduction to Crystal Wilkinson	creative and/ or thoughtful writing - contemporary themes of modern day relevance	Practice blog writing	Choosing the team based on the abilities that are comfortable to match the peer members
S-6	SLO-1	Analysis and Critical interpretation of the poem- Purdah 1	Reading Endangered Species: Case 47401.	Students -writing abilities- building stories- a visual treat of variety of pictures.	Apprehending Life by reading the texts of influence- Chimamanda Ngozi Adiche's Notes on Grief- A BRIEF NOTE, We should all be Feminists- An Essay.	Choosing the topics for a thoughtful conversation
	SLO- 2	Reading and reciting the poem Purdah 2	Discussion and analysis of Endangered Species: Case 47401.	Elements of writing	Discussion- essay by the author - subjective depiction of life. Understand -subjective opinions - perspectives -	Planning and preparation for the script of conversation with a team member
S-7 –S-8	SLO-1	Analysis and Critical interpretation of the poem- Purdah 2	Introduction to C.S Lakshmi also known as Ambai.	Incorporate the elements of story in story writing.	Class discussion	Drafting , editing and revising the script of conversation and enacting the conversation with the team members
	SLO- 2	Introduction to the poet Arundathi Subramanian	Reading the short story- In a Forest, A Deer.	Practice -write stories -pictures given or shown .	Practising the task multiple times with all the students in the classroom.	Enactment -proper rehearsal -final performance -conversation- whole performance should be recorded.

S-9	SLO-1	Reading and reciting the poem- Home	Discussion and Analysis of In a Forest, A Deer.	A writing task to write a script is introduced in the classroom.	Interposing opinions in famous interviews-	The recording should be posted in the official media page and social handles of SRMIST.
	SLO- 2	Analysis and Critical interpretation of the poem- Home	Retrospecting the writing styles of the authors- Katherine Mansfield, Haruki Murakami, Crystal Wilkinson and Ambai.	creative scripts inspiring from the dialogues of their favourite films by changing the scenario to their own wish according to their own whims and fancies.	Interposing opinions in famous interviews- FII Interviews: Tasveer Co-Founder And Filmmaker Rita Meher On The Seattle Legislation, Minority Rights And The Fight Against Oppression- INTERVIEW	work for this social post - reflect on their experience of learning communicative English course and the testimonial has to be recorded and posted in the social media pages of SRMIST..
S-10	SLO-1	Recollection of study of the writing styles and intentions of the poets prescribed in the syllabus.	Revision- The Doll's House	Creative writing -writing news reports. recreated with new characters, places, scenes, incidents.	Students -enact as interviewer and interviewee and practice building the discourse.	Involving the students for the project work. Introducing what is project work and inculcating the interest -Giving instructions to do the project works -
	SLO- 2	Revision of the poems Debt and Phallus I cut	Revision- Confessions of a Shinawaga Monkey	Watch debate shows - summarising the arguments Enhance -descriptive writing skill.	Certain role plays like celebrity personalities, political personalities -conduct the interview and be the interviewer and interviewee.	Discussion of ideas and generation of creative ideas
S 11-S 12	SLO-1	Revision of the poems Purdah 1 and 2	Revision- Endangered Species: Case 47401	Practice the improvement of writing skill.	The art of conversation and the ability to build a discourse	1. Assignment on any piece of creative writing (OR) 2. Presentation- Mastering the art of Public Speaking. (OR) 3. Project on compiling the real life influential events on gender inclusive issues and a presentation of the same. Interview Scripting /Blog writing.
	SLO- 2	Revision of the poem Hiome.	Revision- In a Forest, A Deer.	Repetitive practice and continuous assessment -writing skills-master the writing skill.	The evaluation and assesment of the conversation -constructive feedbacks to the students.	Students can opt any of the project from the given choice.

Learning Resources	Text Books: 1. Horizon- English Text Book – Compiled and Edited by the faculty of English Departement, FSH, SRMIST, 2020 2. English Grammar in Use by Raymond Murphy 3. Raymond Murphy, Intermediate English Grammar, Cambridge University Press, 2007	References: 1. R.P. Bhatnagar, English for Competitive Examinations, Trinity Press, 3 rd Edition, 2016 2. http://www.apptitudetests.org/verbal-reasoning-test

Learning Assessment										Final Examination (50% weightage)	
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)									
		CLA-1 (10%)		CLA-2 (10%)		CLA-3 (20%)		CLA-4 (10%)		Theory	Practice
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice		
Level 1	Remember Understand	30%	-	30%	-	30%	-	30%	-	30%	-
Level 2	Apply Analyze	40%	-	40%	-	40%	-	40%	-	40%	-
Level 3	Evaluate Create	30 %	-	30%	-	30%	-	30 %	-	30%	-
	Total	100%		100%		100%		100%		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
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Ann Mariya Thomson RA2232105010015 II M.A English Literature CSH, SRM IST az1160@srmist.edu.in	Dr. K S Antonysamy Associate Professor and Head, Dept. of English Loyola College, Chennai antonysamyks@loyolacollege.edu	2. Dr. Pushpanjali Sampathkumar, Assistant Professor, Department of English, FSH, SRMIST

Course Code	UST23101J	Course Name	Probability and Random Variables	Course Category	C	Discipline Specific Core Course	L	T	P	O	C
							2	0	5	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards		Statistical Table and Graph sheet	

Course Learning Rationale (CLR):	<i>The purpose of learning this course is to:</i>	Learning			Program Learning Outcomes (PLO)														
CLR-1 :	<i>To introduce the basic concepts in probability.</i>	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	<i>To develop the logical basis of probability theory</i>	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-3 :	<i>To demonstrate the skills necessary to solve practical problems in probability and random variables</i>																		
CLR-4	<i>To solve the problems using distributions</i>																		
CLR-5	<i>To gain knowledge about the random variables and Distribution functions</i>																		
Course Learning Outcomes (CLO):	<i>At the end of this course, learners will be able to:</i>																		
CLO-1 :	<i>Understand the concept of probability and related terminology</i>	3	85	80	H	H	H	M	M	L	M	M	L	M	L	M	L	L	M
CLO-2 :	<i>Differentiate discrete and continues random variables and its distribution</i>	3	80	75	M	H	H	M	H	L	M	M	L	M	L	M	L	L	M
CLO-3 :	<i>Illustrate the probability mass function, density function and distribution function</i>	3	85	80	H	M	M	M	H	H	L	M	M	M	L	M	L	L	L
CLO-4 :	<i>Compute expectations of random variables</i>	3	85	80	M	H	H	M	H	M	M	M	M	M	L	M	L	L	L
CLO-5 :	<i>Examine the relationship between two-dimensional random variable</i>	3	85	80	M	H	M	M	M	M	H	M	H	M	L	M	L	L	M

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		21	21	21	21	21
S-1	SLO-1	<i>Random experiment, sample point, sample space</i>	Random Variable(RV) – definition, types of random variables	Moments – definition, raw moments about origin - discrete random variable	Bivariate random variables - definition	Expectation of two-dimensional RV- definition
	SLO-2	<i>Events</i>	events defined on random variables	raw moments about origin – continuous random variable	<i>Joint distribution functions - definition</i>	Formula for discrete and continuous RV
S-2	SLO-1	<i>Sample Space – finite and infinite with examples</i>	Cumulative Distribution Functions (CDF) and its properties	Central moments - discrete	<i>Properties of joint distribution function</i>	Properties of two-dimensional RV
	SLO-2	<i>Mutually exclusive events, Independent, Exhaustive events</i>	Determination of probabilities from the CDF	Central moments - continuous	<i>Properties of joint distribution function</i>	Properties of two-dimensional RV
S-3	SLO-1	<i>Practical – Introduction to Independent, Exhaustive events with examples.</i>	Practical - Graphical representation of CDF. Discrete Random variable. Probability Mass Function and properties	Practical – relationship between raw moments and central moments	Practical – two dimensional discrete random variables, joint probability mass functions, Marginal probability function	Practical – variance and Covariance of two-dimensional RV
	SLO-2	<i>Operations on events with examples and problems. Classical approach to probability</i>				
S-4	SLO-1	<i>Practical – introduction to Relative frequency approach</i>	Discrete random variable - Finite - problems	Practical – raw moments discrete and central random variable	Practical – two dimensional continuous random variables, joint probability mass	Practical – variance and Covariance of two-dimensional RV

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		21	21	21	21	21
		to probability and subjective approach with examples and problems			functions, Marginal probability function and conditional distribution	
	SLO-2	Definition-axiomatic approach to probability, Sigma field and its properties with examples	Discrete random variable - Countably infinite problems			Practical – variance and Covariance of two-dimensional RV
S-5-S-7	SLO-1	Practical – Random experiments, Sample Space, mutually exclusive, Independent, Exhaustive events with examples. Operations on events	Practical – discrete random variable	Practical – central moments for discrete and continuous random variable	Practical – two dimensional continuous random variables and conditional distribution	Practical – variance and covariance
	SLO-2					
S-8	SLO-1	Elementary properties of probability – statement and proof	Continuous random variable and probability density function	Moment Generating Function (MGF) – definition, formula	Marginal distribution of 2D continuous RV	Correlation of 2-dimensional discrete RV
	SLO-2	Elementary properties of probability	Properties of probability density function	Probability Generating Function (PGF) – definition, formula	Joint probability value of 2D RV	Correlation of 2-dimensional continuous RV
S-9	SLO-1	Proof of elementary properties of probability	Expectation of a function of random variables	Properties of MGF	Independence of two-dimensional discrete random variables	Regression of 2-dimensional discrete RV
	SLO-2	Proof of elementary properties of probability	Properties of random variables, variance and standard deviation of a random variable	Properties of MGF	Independence of two-dimensional discrete random variables	Regression of 2-dimensional continuous RV
S-10	SLO-1	Practical – introduction to addition theorem of probability with problems	Practical - variance of a linear combination of random variables	Practical – MGF	Practical - Independence of two-dimensional discrete random variables	Practical - Correlation of 2-dimensional discrete RV
	SLO-2					
S-11	SLO-1	Practical – meaning of dependent events- Conditional probability with independence with problems	Practical - properties of random variables	Practical – MGF and PGF	Practical - Independence of two-dimensional discrete random variables	Practical - Correlation of 2-dimensional continuous RV
	SLO-2					
S-12-S-14	SLO-1	Practical – classical, relative frequency, subjective approach and axiomatic approach.	Practical – mean and variance of discrete and continuous random variable	Practical – MGF and its properties	Practical – frame a joint pmf using random experiment	Practical - Regression of 2-dimensional discrete and continuous RV
	SLO-2					
S-15	SLO-1	Inclusion and exclusion principles on addition theorem for n events	Function of a one dimensional discrete random variable	Cumulants-Cumulant Generating Function (CGF) – definition, formula	Transformation of two-dimensional random variables	Properties of regression coefficients
	SLO-2	Properties of Conditional probability	Function of a one dimensional continuous random variable	Properties of CGF	One function of two random variables $Z=f(X,Y)$. Marginal function of Z	Properties of regression coefficients
S-16	SLO-1	Multiplication theorem - statement	Cauchy Schwartz inequality – statement and proof	Characteristics function – definition, formula	Two functions of two random variables $U=f(X,Y)$ $V=g(X,Y)$	Convergence in probability - definition
	SLO-2	Proof of multiplication theorem using conditional probability	Cauchy Schwartz inequality – statement and proof	Properties of characteristics function	Joint pdf of UV and marginal of U and V	Difference between convergence of sequence and convergence in probability

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		21	21	21	21	21
S-17	SLO-1	<i>Practical - Bayes theorem – statement and proof. Applications of Bayes theorem</i>	Function of a one dimensional random	<i>Practical – CGF</i>	Practical – one function of two random variable	Chebychev's theorem statement
	SLO-2					
S-18	SLO-1	<i>Practical - Bayes theorem</i>	Function of a one dimensional random variables	<i>Practical – CGF and its properties</i>	Practical – one function of two random variable	<i>Practical – regression coefficients</i>
	SLO-2					
S-19-21	SLO-1	<i>Practical – conditional and multiplication probability</i>	Problems on Function of a one dimensional random variables	<i>Practical – Characteristics function</i>	Practical - Two functions of two random variables $U=f(X,Y)$ $V=g(X,Y)$	<i>Practical – regression lines are given find mean, variance and correlation of X and Y</i>
	SLO-2					

Learning Resources	Text Books:			References:		
	1. Hogg, R.V., McKean, J.W. and Craig, A.T. (2006): Introduction to Mathematical Statistics, Sixth Edition, Pearson Education, India. 2. Lipshutz, S., Lipson, M & Jain, K. (2017): Schaum's Outlines Series on Probability and Random variables			1. Gupta, S. and Kapoor, V.K. (2002): Fundamentals of Mathematical Statistics, Sultan Chand & Sons Pvt. Ltd., New Delhi. 2. A.M. Mood, F.A. Graybill and D.C. Boes (1974): Introduction to the theory of Statistics, International student ed. McGraw Hill.		

Learning Assessment											
Bloom's Level of Thinking		Continous Learning Assessment(50% Weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4# (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M. Vasantha, ICMR, Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M. Kalaivani, SRMIST

Course Code	UST23102J	Course Name	DESCRIPTIVE STATISTICS	Course Category	C	Discipline Specific Core Course	L	T	P	O	C
							2	0	5	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Statistical Table and Graph sheet		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning			Program Learning Outcomes (PLO)														
CLR-1 :	To provide an insight about the origin and application of statistics in various fields along with its limitations.	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	To provide in depth knowledge about types of data, data collection methods, organizing data and presentation of data.	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-3 :	To explain various descriptive measures for extracting meaningful information from the data and the interpretation.				H	M	H	H	M	M	M	M	M	L	L	M	L	L	M
CLR-4	To solve Regression equations.				L	M	H	H	L	H	M	M	M	M	L	M	L	L	L
CLR-5	To gain knowledge about association of attributes.				H	M	M	M	M	H	M	M	M	M	H	L	L	L	L
					L	M	H	M	L	M	L	M	H	H	L	M	L	L	M
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	3	85	80	H	L	M	H	M	M	L	M	L	M	L	L	H	L	M
CLO-1 :	Explain various sources of Collecting data and discuss applications, scope & limitations of statistics.	3	85	80	L	M	H	H	L	H	M	M	M	M	L	M	L	L	L
CLO-2 :	Organize data in frequency distribution tables and compare different datasets using appropriate diagrams and graphs.	3	80	75	H	M	M	M	M	H	M	M	M	M	H	L	L	L	L
CLO-3 :	Explain, compare and interpret various measures of central tendency, dispersion, skewness and kurtosis.	3	85	80	L	M	H	M	L	M	L	M	H	H	L	M	L	L	M
CLO-4 :	Define correlation coefficient between two variables and prove its properties. Derive regression line sand prove the properties of regression coefficients	3	85	80	H	L	M	H	M	M	L	M	L	M	L	L	H	L	M
CLO-5 :	Explain association between attributes using various measures of association.	3	85	80	H	L	M	H	M	M	L	M	L	M	L	L	H	L	M

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		21	21	21	21	21
S-1	SLO-1	Definitions- Scope of statistics	Measures of central tendency-Uses- Properties	Correlation – definition, uses, properties	Regression Equations- properties of regression equations	Association of attributes – Notations
	SLO-2	limitations of Statistics	Types of Measures of central tendency – definition, merits and demerits	types of correlation	Regression Equations- formulas	Classes and class frequencies
S-2	SLO-1	Collection of data - Methods	Arithmetic mean, Median, Mode - Problems(raw data)	Scatter diagram	Regression Equations- calculation	Order of Classes and Class Frequencies
	SLO-2	Census and Sampling surveys	Arithmetic mean, Median, Mode - Problems(discrete data)	Karl pearson's co-efficient and its properties	Regression lines-formulas	Relation between Class Frequencies

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		21	21	21	21	21
S-3-S4	SLO-1	Practical -Classification definition and its types with examples	Practical – Problem on Arithmetic mean, Median, Mode (continuous data)	Problem on Karl pearson's co-efficient of correlation	Problems on Regression lines	Class Symbols as Operators
	SLO-2	Practical -Tabulation definition and its types with examples	Practical – Geometric mean- Harmonic mean- problems	Problem on spearman's rank correlation	Problems on Regression coefficients	Consistency of data coefficient of colligation.
S-5-S-7	SLO-1	Frequency distribution –discrete distribution sum	Practical - Measures of Dispersion- range -problem on Quartile deviation	Problem on Repeated Ranks without ranks	concept of error in regression	Conditions for Consistency of Data
	SLO-2	continuous Frequency distribution sum	Problem on mean deviation	Problem on Repeated Ranks with ranks	Regression Coefficients – Properties	Examples
S-8	SLO-1	Types of data – Nominal, Ordinal, Ratio, Interval scale data	Measures of Dispersion- definition, types, uses	Sums on Karl pearson's co-efficient of correlation	Sum on regression line	Problems on class frequencies
	SLO-2	Graphical representation of data- definition and uses	Problem on standard deviation	Sums on Karl pearson's co-efficient of correlation	Sum on regression coefficient	Problems on coefficient
S-9	SLO-1	Types of graphs	Problem on comparison of coefficient of variation	Sums on spearman's rank correlation	Regression Equations- sums	Independence of Attributes- definition
	SLO-2	Procedure for the types of graphs	Combined standard deviation	Sums on spearman's rank correlation	Regression lines - Sums	Independence of Attributes- properties
S10 – S-11	SLO-1	Practical – problem on Histogram	Practical – Problems on standard deviation and coefficient of variation	Sums on spearman's rank correlation for repeated ranks	Regression Coefficients - Sums	Independence of Attributes- method
	SLO-2	Frequency polygon, Frequency curve	Measures of skewness- definition , types, uses	Sums on spearman's rank correlation with original data	principle of least squares - sums	Examples
S-12-S-14	SLO-1	Box plot sum	Karl pearson's coefficient of skewness	Partial correlation- definition, uses	Formula, explanation	Symbols (AB) ₀ and 0
	SLO-2	Problem on Ogive curve	Bowley's coefficient of skewness	Properties, formulas on Partial correlation	Different methods of estimation regression equations	Criterion of Independence
S – 15	SLO-1	Framing a questionnaire	Kelly's coefficient of skewness	Problems on partial correlation	principle of least squares - Sums	Independence of Attributes - Examples
	SLO-2	Practice for Framing a questionnaire	Moments- concepts , formulas	Multiple correlation- definition, uses	Problems on principle of least squares	Independence of Attributes - Examples
S-16	SLO-1	Diagrammatic representation of data- definition and uses	Measures of skewness, Measures of kurtosis	Properties, formulas on Multiple correlation	fitting of first order and second order degree	Problems on association
	SLO-2	Types of diagrams	Raw moments for raw data	Problems on multiple correlation	Formulas, definition	problems on association
S -17-S-18	SLO-1	Practical- Problem on Bar diagram	central moments for raw data	Practice sums on karl pearson's correlation	Problems on fitting of first order degree	Examples
	SLO-2	Problem on Multiple bar diagram	Problems on central moments for raw data	Practice sums on rank correlation	Problems on fitting of first order degree	Yule's coefficient of association- definition
S – 19-S-21	SLO-1	Sub - divided bar diagram	Problem on First four moments and skewness and kurtosis (using Raw moments)	Bi-variate frequency distribution	Fitting of second order degree	Yule's coefficient of association- formula, properties
	SLO-2	Problem on percentage sub – divided bar diagram, Pie diagram	Problem on First four moments and skewness and kurtosis (using central moments)	Problem on Bi-variate frequency distribution	Fitting of Exponential curve	Coefficient of colligation

Learning Resources	Text Books:	References:
	1. Hooda.R.P.(2003): Statistics for Business and Economics , 3/e, Mac Millan .	1. Anderson.R, Sweeney.J and Williams.A (2002): Statistics for Business and Economics, 8/e, Thomson.
	2. Medhi.J. (1992): Statistical Methods an Introductory Text , Wiley Eastern Ltd.	2. Guide to current Indian Official statistics – Central Statistical Organisation. Govt. of India.

Learning Assessment											
Bloom's Level of Thinking		Continous Learning Assessment(50% Weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4# (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasantha, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani,SRMIST

Course Code	UST23103T	Course Name	Mathematics for Statistics – I	Course Category	C	Discipline Specific Core Course	L	T	P	O	C
							4	0	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):		The purpose of learning this course is to:		Learning			Program Learning Outcomes (PLO)															
CLR-1 :	To learn about Binomial Theorem, Exponential and Logarithmic series			1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
CLR-2 :	Obtain the knowledge on polynomial equations			Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning	
CLR-3 :	Gain knowledge on various function of differentiation and its application																					
CLR-4 :	To learn about partial differentiation and homogenous functions																					
CLR-5 :	To solve algebraic equations by Newton's and Horner's method																					
CLR-6 :	Learn the concept of integration by means of various methods																					
Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:																				
CLO-1 :	Gain knowledge about Binomial Theorem, Exponential and Logarithmic series			3	85	80	L	M	H	H	M	L	M	L	H	M	L	M	L	L	M	
CLO-2 :	Appreciate the concepts of polynomial equations in real life situations			3	80	75	H	H	H	M	L	M	M	L	L	M	L	M	L	L	L	
CLO-3 :	Understand the basic ideas about differentiation with various functions			3	85	80	L	H	M	H	L	H	M	L	M	L	L	M	L	L	L	
CLO-4 :	Acquire the knowledge on Partial differentiation of homogenous function and Jacobian concept			3	85	80	H	H	M	M	M	M	L	H	L	M	L	L	M	L	L	
CLO-5 :	Understand and solve problems on Newton and Horner method			3	85	80	H	M	H	M	M	M	H	M	L	L	M	L	L	M	L	

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		12	12	12	12	12
S-4	SLO-1	Approximation using binomial theorem	Transformation of equation by increasing the roots by a constant	simple examples	Introduction to partial differentiation	Integration of irrational functions
	SLO-2	Approximation using binomial theorem	Problem based on the transformation of the equation by increase the root	Continuous function explained the concepts	Successive partial differentiation	Integration of irrational functions based problems
S-5	SLO-1	Simple problems	Transformation of equation by decreasing the roots by a constant	Continuous function	Introduction to Homogeneous function	Integration by the method of substitution
	SLO-2	Exponential series	Problem based on the transformation of the equation by Diminish the root	Derivative of x^n	Euler's theorem on Homogenous functions	Integration by the method of substitution
S-6	SLO-1	Exponential Theorem	Reciprocal equations-Definition	Derivative of x^n	Homogenous function of degree n	Integration by the method of substitution
	SLO-2	Exponential Theorem based simple problems	Solving Reciprocal equation of degree four with like and unlike signs for its coefficients-Type I	Derivative of e^x	Problems based on verification of Euler's theorem	Integration by the method of substitution
S-7	SLO-1	Summation of series using Exponential series	Solving reciprocal equation of odd degree with like signs for its coefficients-Type II	Problems solved on the Derivative of e^x	Problems based on verification of Euler's theorem	Integration by using Trigonometric substitution
	SLO-2	Summation of series using Exponential series	Solving reciprocal equation of odd degree with like signs for its coefficients-Type II	Differentiation of $\log x$	Introduction to total differential coefficient	Integration by using Trigonometric substitution
S-8	SLO-1	Summation of series using Exponential series	Solving reciprocal equation of odd degree with unlike signs for its coefficients-Type III	Differentiation of $\sin x$	Problems based on total differential coefficient	Integration by using Trigonometric substitution
	SLO-2	Some important results based on exponential series	Solving reciprocal equation of odd degree with unlike signs for its coefficients-Type III	Differentiation of $\cos x$	The total differential of the function of three variables x, y, z .	Integration of Rational Algebraic functions
S-9	SLO-1	More problems solved on the above concepts	Solving reciprocal equation of even degree with unlike signs for its coefficients and the middle term is absent-Type IV	Differentiation of $\tan x$	Introduction for differentiation from implicit function	Integration of Rational Algebraic functions
	SLO-2	Simple problems	Solving reciprocal equation of even degree with unlike signs for its coefficients and the middle term is absent-Type IV	product rule- simple problems only	Problems based on implicit functions of two variables x, y	Integration of Rational Algebraic functions
S-10	SLO-1	Summation of series using Exponential series	Newton-Raphson method concept and formula explained	Differentiation of Quotient rule	Problems based on implicit functions of three variables x, y, z	Integration of Rational Algebraic functions
	SLO-2	Simple problems	More Problems on Newton-Raphson method..	Differentiation of Quotient rule	Definition of Jacobian and its properties	Integration using partial fractions Type - I
S-11	SLO-1	Logarithmic series based some important results	More Problems on Newton-Raphson method.	Functions of function	Problems based on Jacobian's functions of the two independent variables x and y	Integration using partial fractions Type - II
	SLO-2	Logarithmic series -simple problems.	Problems on Horner's method	Functions of function based problems solved	Problems based on Jacobian properties	Integration using partial fractions Type - III

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		12	12	12	12	12
S-12		Summation of series using logarithmic series -simple problems.	Problems on Horner's method concept explained	Functions of function-simple problems only	Simple problems based on Jacobian properties	Integration using partial fractions Type - IV

Learning Resources	Text Books:			References:		
	1. Dr. A. Singaravelu (2015): Allied Mathematics, 7 th edition, A. R. Publications. 2. P.R. Vittal (2000): Mathematical Foundation, 2 nd edition, Margham Publication.			1. Narayanan, S., Hanumantha Rao and T.K. Manicavachagom Pillay (2008): Ancillary Mathematics, Volume I, S. Viswanathan Pvt. Ltd, Chennai		

	Learning Assessment										
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	-	30%	-	30%	-	30%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	30%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
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		2. Dr. L. Sivakami, SRMIST

Course Code	UCD23S01L	Course Name	Quantitative Aptitude and Logical Reasoning	Course Category	S	Skill Enhancement Course				
						L	T	P	O	C
						0	0	2	2	1

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Career Guidance Cell	Data Book / Codes/Standards	-		

Course Learning Rationale (CLR):		Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-1 : Demonstrate various principles involved in solving mathematical concepts					H	M	-	M	-	M	-	H	M	H	-	M	-	-	-
CLR-2 : Critically evaluate basic mathematical concepts related to profit, loss, interest calculations, average and interpret data					H	M	-	M	L	M	-	H	M	H	-	M	-	-	-
CLR-3 : Enable students to understand reasoning skills					-	H	-	-	-	M	M	H	-	H	-	H	-	-	-
CLR-4 : Use the basic mechanics of Grammar					H	-	-	-	-	-	M	M	-	-	-	H	H	-	M
CLR-5 : Acquire time management skills and expose students to the requirements of the job market					-	-	M	-	-	M	-	-	M	-	H	M	-	H	H

Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:		
CLO-1 :	Understand the concepts of LCM, HCF, ratio and proportions, percentages and approach questions in a simpler and innovative method	3	80	70
CLO-2 :	Develop, solve, analyze, and use simple mathematical models that are relevant to daily life.	3	80	75
CLO-3 :	Solve problems on reasoning	3	85	70
CLO-4 :	Understand the different parts of speech and use them in sentences appropriately	3	85	80
CLO-5 :	Instill confidence in students and develop skills necessary to face the audience	3	85	75

Duration (hour)	6	6	6	6	6
S-1	SLO-1 Speed Maths and Simplification	Profit and Loss-Introduction	Number Series	Most Logical Choice	Self-Introduction - Introduction
	SLO-2 Simplification Techniques and Tricks	Profit and Loss- Basic Problems	Number Series – Solving Problems	Most Logical Choice – solving problems	Self-Introduction - Session 1
S-2	SLO-1 Divisibility	Simple Interest-Introduction, Formulas & Problems	Word Series	Logical Order	Self-Introduction - Session 2
	SLO-2 Power cycle, Reminder cycle	Compound Interest-Introduction, Formulas & Problems	Word Series – Solving Problems	Logical Order – tips and tricks	Self-Introduction - Session 3
S-3	SLO-1 Problems On H.C.F and L.C.M	Averages-Introduction & Basics	Odd man out	Synonyms	Self-Introduction - Session 4
	SLO-2 Problems On H.C.F and L.C.M Solving problems	Averages-Tricky Problems	Missing number and wrong number	Antonyms	Self-Introduction - Session 5
S-4	SLO-1 Linear and Simultaneous Equation	Algebra –Introduction	Image Based Problems- Introduction	Essential Part	Self-Introduction - Session 6
	SLO-2 Linear and Simultaneous Equation – solving problems	Algebraic Expressions Concepts	Image Based Solving Problems	Parts of Speech - Worksheets	Self-Introduction - Session 7
S-5	SLO-1 Ratio and Proportions-Introduction	Data Interpretation – Bar chart, Pie Chart	Inequalities	Spotting Error	Basics of Written Communication
	SLO-2 Ratio and Proportions-Basics Problems	Data Interpretation – Table, Line Graph	Inequalities - methods	Spotting Error –Concord, Prepositional usage, Usage of Articles	Basics of Written Communication Methods
S-6	SLO-1 Percentage -Introduction	Quadratic Equations	Coding – Decoding-Introduction	Sentence Correction – Vocabulary based	Time Management Skills

SLO-2	Percentage- Basic problems	Quadratic Equations – Formulas and Methods	Coding – Decoding-Different types	Sentence Correction – Grammar Based	Time Management Skills - Activity
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Learning Resources	Text Books:		References:		
	1. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Tata McGraw Hill, 5th Edition 2. Dr. Agarwal.R.S, Quantitative Aptitude for Competitive Examinations, S. Chand and Company Limited, 2018 Edition 3. Archana Ram, PlaceMentor: Tests of Aptitude for Placement Readiness, Oxford University Press, Oxford, 2018		1. Edgar Thrope, Test of Reasoning for Competitive Examinations, Tata McGraw Hill, 6th Edition 2. Singh O.P., Art of Effective Communication in Group Discussion and Interview, S Chand & Company, 2014 3. Bhatnagar R P, English for Competitive Examinations, Trinity Press, 2016		

Learning Assessment					
Level	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)			
		CLA – 1 (20%)	CLA – 2 (20%)	CLA – 3 (30%)	CLA – 4 (30%)#
		Practice	Practice	Practice	Practice
Level 1	Remember	30%	30%	30%	10%
	Understand				
Level 2	Apply	30%	30%	30%	50%
	Analyze				
Level 3	Evaluate	40%	40%	40%	40%
	Create				
	Total	100 %	100%	100%	100%

CLA-1, CLA-2 and CLA-3 can be from any combination of these: Online Aptitude Tests, Classroom Activities, Case Studies, Poster Presentations, Power-point Presentations, Mini Talks, Group Discussions, Extempore, etc.
 # CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Mr. M. Ponmurugan , Executive PMOSS, Cognizant Technology Solutions India Pvt. Limited, Chennai	Dr. G. Saravana Prabu, Asst. Professor, Department of English, Amrita Vishwa Vidyapeedam, Coimbatore	Dr. Sathish K, HOD, Department of Career Guidance, FSH, SRMIST
		Ms. Deepalakshmi S, Assistant Professor, Department of Career Guidance, FSH, SRMIST

Course Code	UCD23V01T	Course Name	Universal Human Values	Course Category	V	Value Addition Course				
						L	T	P	O	C
						2	0	0	2	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Career Guidance Cell	Data Book / Codes/Standards	-		

Course Learning Rationale (CLR):		The purpose of learning this course is to:			Learning			Program Learning Outcomes (PLO)														
CLR-1 :	Help the students to understand need of value education, appreciate the essential complementarity between 'values' and 'skills' and to ensure sustained happiness and prosperity which are the core aspirations of all human beings,	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
CLR-2 :	Help students initiate a process of dialog within themselves to know what they really want to be' in their life and profession.	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning			
CLR-3 :	Help students to understand the meaning of happiness and prosperity for a human being. understanding holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.																					
CLR-4 :	Help students on right understanding of the Human reality and the rest of existence, harmony at all the levels of human living, and live accordingly.																					
CLR-5 :	Highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.																					
Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:																				
CLO-1 :	Evaluate the significance of value inputs in formal education and start applying them in their life and profession	3	80	70	M	-	-	H	-	-	-	-	-	-	M	-	-	H	H			
CLO-2 :	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.	3	80	75	-	M	-	H	-	L	-	-	-	-	-	-	-	H	H			
CLO-3 :	Analyze the value of harmonious relationship based on trust and respect in their life and profession	3	85	70	-	-	-	H	-	-	-	M	L	-	-	-	-	H	H			
CLO-4 :	Examine the role of a human being in ensuring harmony in society and nature.	3	85	80	-	-	-	H	-	-	L	-	L	L	-	L	M	H	H			
CLO-5 :	Apply the understanding of ethical conduct to formulate the strategy for ethical life and profession.	3	85	75			L	H	L	-	-	-	-	-	-	-	M	H	H			

Duration (hour)	6	6	6	6	6
S-1	SLO Right Understanding, Relationship and Physical Facility	Understanding Human being as the Co-existence of the Self and the Body	Harmony in the Family – the Basic Unit of Human Interaction	Understanding Harmony in the Nature	Natural Acceptance of Human Values
S-2	SLO Understanding Value Education	Distinguishing between the Needs of the Self and the Body	Trust – the Foundational Value in Relationship	Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature	Definitiveness of (Ethical) Human Conduct
S-3	SLO Self-exploration as the Process for Value Education	The Body as an Instrument of the Self	Respect – as the Right Evaluation	Exploring the Four Orders of Nature	A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
S-4	SLO Continuous Happiness and Prosperity – the Basic Human Aspirations	Understanding Harmony in the Self	Other Feelings, Justice in Human-to-Human Relationship	Realizing Existence as Co-existence at All Levels	Competence in Professional Ethics

S-5	SLO	<i>Happiness and Prosperity – Current Scenario</i>	<i>Harmony of the Self with the Body</i>	<i>Understanding Harmony in the Society</i>	<i>The Holistic Perception of Harmony in Existence</i>	<i>Holistic Technologies, Production Systems and Management Models-Typical Case Studies</i>
S-6	SLO	<i>Method to Fulfill the Basic Human Aspirations</i>	<i>Programme to ensure self-regulation and Health</i>	<i>Vision for the Universal Human Order</i>	<i>Exploring Co-existence in Existence</i>	<i>Strategies for Transition towards Value-based Life and Profession</i>

Learning Resources	Text Books:			References:		
	1. Gaur R.R., Sangal R., Bagaria G.P., 2019 (2nd Revised Edition), <i>A Foundation Course in Human Values and Professional Ethics</i> , Excel Books, New Delhi. 2. E.F. Schumacher, 1973, <i>Small is Beautiful: a study of economics as if people mattered</i> , Blond & Briggs, Britain.			1. A Nagraj, 1998, <i>Jeevan Vidya EkParichay</i> , Divya Path Sansthan, Amarkantak. 2. A N Tripathy, 2003, <i>Human Values</i> , New Age International Publishers.		

Learning Assessment						
Level	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)				#
		CLA – 1 (20%)	CLA – 2 (20%)	CLA – 3 (30%)	CLA – 4 (30%)	
		Practice	Practice	Practice	Practice	
Level 1	Remember	30%	30%	30%	30%	
	Understand					
Level 2	Apply	40%	40%	40%	40%	
	Analyze					
Level 3	Evaluate	30%	30%	30%	30%	
	Create					
	Total	100 %	100%	100%	100%	

CLA-1, CLA-2 and CLA-3 can be from any combination of these: MCQ Tests, Classroom Activities, Case Studies, Poster Presentations, Power-point Presentations, Mini Talks, Group Discussions, Extempore, etc.

CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
-	-	Dr. Supraja P, UHV University Coordinator, SRMIST
		Dr. Sathish K, HOD, Department of Career Guidance, FSH, SRMIST
		Dr. Sweety Bakyarani E, Department of Computer Science, FSH, SRMIST

SEMESTER - II

Course Code	ULT23G02J	Course Name	Tamil – II	Course Category	G	Generic Elective Course	L	T	P	O	C
							2	0	2	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Tamil	Data Book / Codes/Standards			Nil

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)
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CLR-1 :	சங்க இலக்கியங்கள் வழி தொன்மை அக, புற வாழ்வியலை அறியச் செய்தல்	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	தமிழ்ச்சமூகத்தின் அறவியல் குறித்து தெரியச் செய்தல்																		
CLR-3 :	பக்தி இலக்கியங்கள் போதித்த மனித மாண்புகளை உணரச் செய்தல்																		
CLR-4 :	பண்டைத் தமிழ்ச்சமூகத்தின் தொல் இலக்கியங்கள் வளர்ச்சி பெற்ற வரலாற்றைப் புரியச் செய்தல்																		
CLR-5 :	சிறுகதைகள் சொல்லும் வாழ்வியல் நெறி, மொழியின் துட்பங்கள் ஆகியவற்றைத் தெரியச் செய்தல்																		

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	பண்டைத் தமிழ்ச் சமூகத்தின் அக, புற வாழ்வியல் இன்றைய சமூக மேம்பாட்டிற்கு வழிகாட்டி நிற்பதை அறிந்துகொள்ளுதல்	2	75	60	H	L	H	M	H	H	L	M	H	M	L	H	-	-	-
CLO-2 :	தமிழ்ச் சமூகம் அறத்தை வலியுறுத்திய சமூகம் என்பதன் வழி மானுட அறத்தைத் தெரிந்துகொள்ளுதல்	2	80	70	H	M	H	L	M	H	L	H	M	L	H	H	-	-	-
CLO-3 :	பக்தி இலக்கியம் மூலம் இறைத் தந்துவங்களை அறிந்து மானுட ஒற்றுமை மேம்பாட்டை அறிந்துகொள்ளுதல்	2	70	65	H	L	H	M	H	H	M	H	L	H	M	H	-	-	-
CLO-4 :	தொல் தமிழ்ச்சமூகம் இலக்கியம், அரசியல், அறம், பக்தி ஆகியவற்றில் தழைத்தோங்கியதைத் தெரிந்துகொள்ளுதல்	2	70	70	H	M	H	L	H	M	M	H	H	L	H	H	-	-	-
CLO-5 :	வாழ்வியலின் நெறிகளைச் சொல்லும் கதைகளைப் படைக்கும் திறனோடு மொழி ஆளுமையையும் அறிந்துகொள்ளுதல்	2	80	70	H	M	H	H	M	H	L	M	H	L	H	H	-	-	-

Duration (hour)	12	12	12	12	12
S-1	SLO-1	காலந்தோறும் தமிழ் அகத்திணை மரபு	சங்க மருவிய காலம்	பல்லவர் காலம்	பண்டைக்காலத் தமிழகம்
	SLO-2	அக இலக்கியத்தின் கட்டமைப்பு/ உள்ளடக்கம்	அறமும் வாழ்வியலும்	பல்லவர் கால இலக்கியங்கள்	சங்ககால மக்களின் வாழ்வியல்
					தமிழ்ச் சிறுகதைப் போக்குகள்
					தமிழ்ச் சிறுகதையும் தமிழ்ச் சமூக வாழ்வியலும்

S-2	SLO-1	எட்டுத்தொகை நூல்களும் பகுப்புமுறையும்	உலகப்பொதுமறை - திருக்குறள்	பக்தியும் தமிழும்	முச்சங்கம் - அறிமுகம்	புதுமைப்பித்தன் - சங்குத்தேவனின் தர்மம்
	SLO-2	ஐங்குறுநூறு (375)	திருக்குறளின் கட்டமைப்பு	பக்தி இலக்கியத் தோற்ற நிலை	முச்சங்க வரலாறு	கள்வனின் தர்மம்
S-3	SLO-1	உடன்போக்கும் நற்றாய் புலம்பலும்	திருக்குறள் வான்சிறப்பு (2)	சைவ சமய இலக்கியங்கள்	பத்துப்பாட்டும் எட்டுத் தொகையும்	ந.பிச்சமூர்த்தி - வேப்பமரம்
	SLO-2	ஐங்குறுநூறு (391)	மழையும் வாழ்வும்	சைவக்குரவர் நால்வர்	சங்க கால மக்களின் வாழ்வியல்	மரபும் நம்பிக்கைகளும்
S-4	SLO-1	உடன் போக்கும் தமிழர் பறவையியல் அறிவும்	திருக்குறள் - புலவி நுணுக்கம்	தேவாரம் - திருஞான சம்பந்தர் - பாடல் - 2834	எட்டுத்தொகை நூல்களின் வரலாறு	தமிழருவி மணியன் - ஒற்றைச் சிறகு
	SLO-2	குறுந்தொகை (02)	ஊடலின் அழகியல்	தேவாரம் - திருநாவுக்கரசர் - பாடல் - 4262	எட்டுத்தொகை நூல்களின் கட்டமைப்பு	உறவின் மேன்மை
S-5	SLO-1	இயற்கைப் புணர்ச்சியும் தலைவி நலம் பாராட்டலும்	நீதி இலக்கியங்கள்	திருவாசகம் அறிமுகம்	பத்துப்பாட்டு நூல்களின் வரலாறு	ஆர். சூடாமணி - மூடநம்பிக்கை
	SLO-2	குறுந்தொகை (03)	நாலடியார்	மாணிக்கவாசகர் பாடல் - ஆனந்த பரவசம் - பாடல் 10	பத்துப்பாட்டும் தமிழர் வாழ்வியலும்	சமூகத்தில் மூடநம்பிக்கைகள்
S-6	SLO-1	தலைவனின் மேன்மைத் தன்மையும் இயற்கையும்	வைகலும் - பாடல் (39)	வைணவ சமயம்	பதினெண் கீழ்க்கணக்கு நூல்கள்	மூடநம்பிக்கைகளின் சிக்கல்கள்
	SLO-2	அகநானூறு (238)	நிலையாமையும் அறமும்	வைணவ சமய வளர்ச்சிப்போக்கு	பதினெண் கீழ்க்கணக்கும் தமிழர் அற மரபும்	கிருஷ்ணா டாவின்ஸி - காலா அருகே வாடா
S-7	SLO-1	இயற்கையும் அகவாழ்வுச் சித்திரிப்பும்	தமிழர் மருத்துவம்	நாலாயிரத் திவ்யப் பிரபந்தம்	நீதி இலக்கியங்கள்	மனித வாழ்வில் மருத்துவம்
	SLO-2	நள்ளியின் கொடைத்திறம்	நீதி இலக்கியத்தில் மருந்து நூல்கள்	குலசேகராழ்வார் பாடல் - 678	நீதி இலக்கியங்களின் பன்முகத் தன்மைகள்	பாரம்பரிய மருத்துவம்
S-8	SLO-1	கலித்தொகைப் பாடல் - (11)	சிறுபஞ்சமூலம் (64)	ஆண்டாள் பாடல் - 574.	காப்பிய இலக்கணம்	மொழிப்பயிற்சி
	SLO-2	அறம் பொருள் இன்பம் சிறப்பு	ஈகையின் சிறப்பு	திருமழிசை ஆழ்வார் பாடல் - கணிகண்ணன்	காப்பியத்தின் போக்குகள்	சொற்களை உருவாக்குதல்
S-9	SLO-1	குழலியலும் மனித வாழ்வும்	பழமொழி நானூறு அறிமுகம்	தமிழில் இஸ்லாமிய இலக்கியங்கள்	காப்பியங்களின் வகைமை	எழுத்துகளில் இருந்து சொற்களைக் கண்டுபிடித்தல்
	SLO-2	தமிழர் புறமரபு	பழமொழி நானூறு - தனித்தன்மைகள்	இஸ்லாமிய இலக்கியங்களின் கொடை	ஐம்பெருங்காப்பியங் களின் தனித்தன்மைகள்	படம் பார்த்துக் கதை எழுதுதல்
S-10	SLO-1	புறநானூறு (107) பாரியும் மாரியும்	பழமொழி நானூறு (184)	சீறாப்புராணத்தின் அமைப்பு	தமிழ்ச் சமூகமும் சமயத் தத்துவங்களும்	படம் பார்த்துக் கவிதை எழுதுதல்
	SLO-2	புறநானூறு (110) பாரியின் வள்ளல் தன்மை	பழமொழியும் அறிவுரையும்	விடமீட்டப் படலம் (10 பாடல்கள்)	சமயத் தத்துவங்களும் வாழ்வியல் விழுமியங்களும்	கற்பனைத்திறன் - வளர்த்தல்
S-11	SLO-1	புறநானூறு (112) கையறுநிலை	பண்டைக்காலப் போரும் வாழ்வும்	கிறித்தவ சமய இலக்கியங்கள்	சைவத் திருமுறை - அறிமுகம்	கற்பனையும் படைப்பும்

	SLO-2	சிறுபாணாற்றுப்படை (84-115)	புற இலக்கியங்கள்	கிறித்தவ இலக்கியங்களின் தமிழ்க் கொடை	பன்னிரு திருமுறை - வரலாறு	தமிழில் வாசகம்
S-12	SLO-1	கடையெழு வள்ளல்களின் சிறப்புகள்	களவழி நாற்பது (40)	கிறித்துவின் அருள்வேட்டல் - திரு.வி.க	நாலாயிரத் திவ்வியப் பிரபந்தம் - அறிமுகம்	விளம்பரத்திற்கு வாசகம் எழுதுதல்
	SLO-2	பட்டினப்பாலை (40-50) அட்டில் சாலைகளின் நிலை	போர்க்களமும் யானைப்படையும்	அலகிலொளி - 5 பாடல்கள்	வைணவ ஆழ்வார்கள் வரலாறு	வாசகம் எழுது முறைகள்

Learning Resources	1. கொன்றை, தொகுப்பும் பதிப்பும் - தமிழ்த்துறை ஆசிரியர்கள், தமிழ்த்துறை, எஸ்.ஆர்.எம். அறிவியல் மற்றும் தொழில்நுட்பக் கல்விநிறுவனம், காட்டாங்குளத்தூர், 603203, 2023 2. தமிழண்ணல், புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு, மீனாட்சி புத்தக நிலையம், மதுரை, 2017 3. மு. அருணாசலம், தமிழ் இலக்கிய வரலாறு, நூற்றாண்டு முறை (9ஆம் நூ. முதல் 16 வரை), தி பார்க்கர், சென்னை, 2005 4. தமிழ் இணையக் கல்விக்கழகம் - http://www.tamilvu.org/ 5. மதுரை தமிழ் இலக்கிய மின் தொகுப்புத் திட்டம் - https://www.projectmadurai.org/
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Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA - 1 (10%)		CLA - 2 (10%)		CLA - 3 (20%)		CLA - 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	30%	30%	30%	20%	20%	20%	20%	30%	-
Level 2	Understand	40%	50%	50%	40%	50%	50%	50%	50%	50%	-
Level 3	Apply	30%	20%	20%	30%	30%	30%	30%	30%	20%	-
	Analyze										
	Evaluate										
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA - 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
1. Dr. P.R.Subramanian, Director, Mozhi Trust, Thiruvanniyur, Chennai - 600 041.	1. Dr. V. Dhanalakshmi, Associate Professor, Subramania Bharathi School of Tamil Language & Literature, Pondicherry University, Pondicherry	1. Dr. B.Jaiganesh, Associate Professor & Head, Dept. of Tamil, FSH, SRMIST
		2. Dr. R. Ravi, Assistant Professor and Head, Dept. of Tamil, FSH, SRMIST, VDP.
		3. Mr. G. Ganesh, Assistant Professor, Dept. of Tamil, FSH, SRMIST, RMP.
		4. Dr. T.R.Hebzibah beulah Suganthi, Assistant Professor, Dept. of Tamil, FSH, SRMIST, KTR.
		5. Dr. S.Saraswathy, Assistant Professor, Dept. of Tamil, FSH, SRMIST, KTR.

Course Code	ULH23G02J	Course Name	HINDI-II	Course Category	G	Generic Elective Course	L	T	P	O	C
							2	0	2	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	HINDI	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)
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CLR-1 :	They get to learn Ancient ,Medieval,and Modern poetry	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	To understand the Significance of poems of great poets like Kabir,Tulsidas,Bihari and Dhananand	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-3 :	To Enhance and Enrich their knoeledge through poetry				H	H	H	M	L	H	L	M	L	L	H	M	-	-	-
CLR-4 :	Media based understanding for employability				H	H	M	L	H	H	M	H	M	M	H	H	-	-	-
CLR-5 :	Job Oriented writing skills				H	H	L	H	M	H	L	H	H	M	H	H	-	-	-

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	To provide a brief Introduction of Hindi poetry(Bhaktikal,Reetikal and Aadhunikkal)	2	75	60	H	H	H	M	L	H	L	M	L	L	H	M	-	-	-
CLO-2 :	To Discuss the origin and development of various forms of poetry in Hindi	2	80	70	H	H	H	M	L	H	H	M	L	L	H	M	-	-	-
CLO-3 :	Focus on Evaluating the social changes through poetry	2	70	65	H	H	M	L	H	H	M	H	M	M	H	H	-	-	-
CLO-4 :	To Examine Transcreation in advertisement	2	70	70	H	H	L	H	M	H	L	H	H	M	H	H	-	-	-
CLO-5 :	To guide the students in the learning of the technical aspect of the Hindi Languge,this would help them in the field administration	2	80	70	M	H	M	H	L	H	H	L	H	M	H	H	-	-	-

Duration (hour)	12	12	12	12	12
S-1	SLO-1	BHAKTI KALIN KAVITA	RITI KALIN KAVITA	ADHUNIK KAVITA	VIGYAPAN
	SLO-2	BHAKTIU KALIN KAITA KI AVADHARNA	AVADHARNA	AVADHARNA	AWADHARNA
S-2	SLO-1	SWARUP	SWARUP	SWARUP	ARTH
	SLO-2	MAHATVA	RITI KAL VIBHAJAN	MAHATVA	PARIBHASHA
S-3	SLO-1	UDDESHYA	MAHATVA	UDDESHYA	SWARUP
	SLO-2	BHAKTIKAL KI PRASANGIKTA	UDDESHYA	MATHLI SHARAN GUPT- NAR HO NA NIRASH KARO MAN KO	VIGYAPAN KE PRAKAR
S-4	SLO-1	DOHE- KABIRDAS	DOHE- BIHARI	KAVI PARICHAYA	VIGYAPAN KI VISHESHTAYEN
	SLO-2	SANT PARICHAY	KAVI PARICHAYA	KAVITA KA VISLESHAN	VIGYAPAN MANG
S-5	SLO-1	DOHE KA VISLESHAN	DOHE KA VISLESHAN	ASHAVADI DRISHTIKON	VIGYAPAN KA PRABHAV
	SLO-2	GURU KA MAHATVA	KANAK KA MAHATVA	SANGHARSH KI AOR PRERNA	VIGYAPAN MAHATVA
S-6	SLO-1	GURUTVA SE ISHVARATVA KI AOR	VIPRIT SWABHAV KI CHARCHA	SURYAKANT TRIPATHI NIRALA- VAR DE	VIGYAPAN KI BHASHA
	SLO-2	GURUTVA SE ISHVARATVA KI AOR	PRAKRITI KA ATAL RUP	KAVI PARICHAYA	VIGYAPAN AUR BAZAR
S-7	SLO-1	BAHYA ADAMBAR KA VIRODH	YAMAK ALANKAR KA PRAYOG	KAVITA KA VISLESHAN	VIGYAPAN AUR ROZGAR
	SLO-2	MURTI POOJA KA VIRODH	SNEH KE MAHATVA KI CHARCHA	SARSHWATI KE PATRI SAMARPAN	PRINT VIGYAPAN

S-8	SLO-1	GHARELU VASHTUON KI UPYOGITA	BIHARI KI KAVYA SHAILI KA MAHATVA	BHAKTI KI BHAVANA	ELECTRONIC VIGYAPAN	PARIBHASHIK SHABDAVALI
	SLO-2	AHNKAR KA PARITYAG	DOHE- GHANANAND	NAGARJUN-- AKAL AUR USKE BAD	VIGYAPAN PARIYOJANA	AVADHARNA
S-9	SLO-1	DOHE- TULSHIDAS	KAVI PARICHAYA	AKAL KA VASHTAVIK CHITRAN	VIGYAPAN AUR SAMAJ	SHABDAVALI KI AVSHYAKTA
	SLO-2	PAROPKAR KI BHAVANA	DOHE KA VISLESHAN	AKAL KE PURVA KA CHITRAN	VIGYAPAN KI VYAPAKTA	KARYALYN SHABDAVALI
S-10	SLO-1	DAYA KA MAHATVA	SNEH KI SARLTA KA VARNAN	AKAL KE BAD KA CHITRAN	VIGYAPANLEKHAN KALA	EK DIN EK SHABD
	SLO-2	ISHVAR KI MHATTA	PREM KA MAHATVA	KATTIS- BADRINARAYAN	VIGYAPAN AUR JAGRUPA	HINDI SE ANGREJI SHABD
S-11	SLO-1	MADHUR VAHAN KI UPYOGITA	NAYIKA KE PRATI SMARPAN	SAMBAND VICCHED KI PARICHARCHA	UDDESHYA	ANGREJ SE HINDI SHABD
	SLO-2	RAM KI MAHIMA	GHANANAND KI KAVYA SHAILI KA MAHATVA	SWARTH NIHIT BHAVANA	VIGYAPAN KI SPASTTA	ABHYASH KARYA
S-12	SLO-1	DHOHA PARICHARCHA	DHOHA PARICHARCHA	KAVYA PARICHARCHA	VIGYAPANPARICHARCHA	PARICHARCHA
	SLO-2	PRASHNAABHYASH	PRASHNAABHYASH	PRASHNAABHYASH	PRASHNAABHYASH	PRASHNAABHYASH

Learning Resources	Edited Book: ""SAMANYA HINDI", SRIJONLOK PUBLICATION, 2023, New Delhi.					
	1. KABIR – HAZARI PRASAD DWEDI 2. SURDAS – RAM CHANDRA SHUKL 3. BHAKTI ANDOLAN AUR SURDAS KA KAVYA – MANAGER PANDEY 4. BIHARI – VISHVNATH PRASAD MISHR 5. Aadhunik Vigyapan aur Jansampark – Tareh Bhatia					

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	30%	30%	30%	30%	20%	20%	20%	20%	30%	-
Level 2	Apply Analyze	40%	50%	50%	40%	50%	50%	50%	50%	50%	-
Level 3	Evaluate Create	30%	20%	20%	30%	30%	30%	30%	30%	20%	-
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Shri. Santosh Kumar, Editor : Srijanlok Magazine Place: Vashishth Nagar, Ara – 802301	1. Prof.(Dr.) S.Narayan Raju, Head, Department of Hindi,CUTN, Tamilnadu	1. Dr.S Preeti. Associate Professor & Head, SRMIST
		2. Dr. Md.S. Islam Assistant Professor, SRMIST
		3.Dr. S. Razia Begum, Assistant Professor, SRM IST
		4. Dr.Nisha Murlidharan Assistant Professor, VDP,SRM IST

Course Code	ULF23G02J	Course Name	French-II	Course Category	G	Generic Elective Course	L	T	P	O	C
							2	0	2	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	French	Data Book / Codes/Standards			Nil

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)
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CLR-1 :	Strengthen the language of the students both in oral and written	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Express their sentiments, emotions and opinions, reacting to information, situations	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-3 :	Make them learn the basic rules of French Grammar.																		
CLR-4 :	Develop strategies of comprehension of texts of different origin																		
CLR-5 :	Enable the students to overcome the fear of speaking a foreign language and take position as a foreigner speaking French																		

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	To acquire knowledge about French language	2	75	60	H	M	H	H	M	H	H	H	H	M	H	H			
CLO-2 :	To strengthen the knowledge on concept, culture, civilization and translation of French	2	80	70	M	H	M	H	H	M	H	M	L	H	H	M			
CLO-3 :	To develop content using the features in French language	2	70	65	H	H	H	M	H	L	H	H	M	H	H	H			
CLO-4 :	To interpret the French language into other language	2	70	70	H	H	M	H	M	H	H	M	H	H	M	H			
CLO-5 :	To improve the communication, intercultural elements in French language	2	80	70	M	H	H	M	M	M	H	H	M	H	H	M			

Duration (hour)	12	12	12	12	12
S-1	SLO-1 Temps libre	Le pronom indéfini on	Vendre	Il faut	Les gallicismes
S-1	SLO-2 Les activités quotidiennes	Les activités	Les exemples	C'est / Il est	Les activités
S-2	SLO-1 Les exemples	Les adjectifs interrogatifs	Acheter	Le verbe devoir	Les pronoms personnels COI
S-2	SLO-2 Les activités	Les activités	Les exemples	Les activités	Les exemples
S-3	SLO-1 Les moments de la journée	Les prépositions avec les noms géographiques	Les aliments	Le verbe pouvoir	Le pronom y
S-3	SLO-2 Les exemples	Les activités	Les exemples	Le verbe savoir	Les exemples
S-4	SLO-1 Les matières scolaires	Les verbes prendre et sortir	Les emballages	Le verbe vouloir	Des pronoms compléments
S-4	SLO-2 Les exemples	Les activités	Les exemples	Les sons	Les activités
S-5	SLO-1 Les activités	Les sons	Les quantités	Demander et dire le prix	Les nombres ordinaux
S-5	SLO-2 Les loisirs	Les activités	Les exemples	Les activités	Les exemples
S-6	SLO-1 Les exemples	Parler de ses goûts	Les commerces	Faire des achats	Les verbes écrire et voir
S-6	SLO-2 Les activités	Les activités	Les activités	Expliquer une recette de cuisine	Les activités
S-7	SLO-1 La fréquence	Parler de ses préférences	Les commerçants	Les activités	Le E caduc ou instable
S-7	SLO-2 Les exemples	Les activités	Les exemples	Les courses	Les exemples
S-8	SLO-1 Les activités	Parler de sa routine	L'impératif	Les activités	Présenter ses vœux
S-8	SLO-2 Les verbes pronominaux	Les activités	Les activités	Vendre et acheter	Présenter ses souhaits
S-9	SLO-1 Les exemples	A la recherche d'un cadeau –.	Les articles partitifs	Mots et expressions	Présenter ses félicitations

	SLO-2	Les activités	Les activités	Les exemples	Grammaire	inviter à une invitation
S-10	SLO-1	Les pronoms personnels COD	Temps libre	<i>Très ou beaucoup (de)</i>	Communication	répondre à une invitation
	SLO-2	Les exemples	Les activités	Les exemples	Tout le monde s'amuse	Les exemples
S-11	SLO-1	Les activités	Mots et expressions	Le pronom en (la quantité)	Les sorties	Écrire un message amical
	SLO-2	Les adjectifs démonstratifs	Les activités	Les exemples	Les saisons	Les exemples
S-12	SLO-1	Les exemples	Grammaire –Communication	La phrase négative (2)	Les fêtes	Parler au téléphone
	SLO-2	Les activités	Les activités	Les exemples	Les messages	Un coup de fil

Learning Resources	Theory:
	1. “Nouvelle Génération-AI” Méthode de français, Marie-Noëlle COCTON, P.DAUDA, L.GIACHINO, C.BARACCO, Les éditions Didier, Paris, 2018.
	2. Cahier d'activités avec deux discs compacts.
	3. https://www.fluentu.com/blog/french/french-grammar
	4. https://www.elearningfrench.com/learn-french-grammar-online-free.html
	5. https://www.lawlessfrench.com/grammar
	6. https://blog.gymglish.com/2022/12/15/basic-french-grammar

Learning Assessment												
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Attendance (5%)	Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (5%)#			Theory	Practice
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice			
Level 1	Remember Understand	30%	30%	30%	30%	20%	20%	20%	20%	30%	-	
Level 2	Apply Analyze	40%	50%	50%	40%	50%	50%	50%	50%	50%	-	
Level 3	Evaluate Create	30%	20%	20%	30%	30%	30%	30%	30%	20%	-	
	Total	100 %		100 %		100 %		100 %		100 %		

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
1. Mr. Kavaskar Danasegarane Process Expert Maersk Global Service Center Pvt. Ltd	1. Dr. C.Thirumurugan Professor, Department of French, Pondicherry University	1. Mr. Kumaravel K. Assistant Professor & Head, SRMIST, KTR
2.Mr. Sharath Raam Prasad Character Designer, Animaker Company Pvt.		2. Mrs. Abigalai Assistant Professor, SRMIST, VDP

Course Code	UES23AE1T	Course Name	ENVIRONMENTAL STUDIES		Course Category	AE	Ability Enhancement Courses		L	T	P	O	C									
									3	0	0	2	3									
Pre-requisite Courses		Nil	Co-requisite Courses		Nil		Progressive Courses		Nil													
Course Offering Department		Bio Technology		Data Book / Codes/Standards		Nil																
Course Learning Rationale (CLR):		The purpose of learning this course is to:			Learning			Program Learning Outcomes (PLO)														
CLR-1 :	To create awareness on Environment and Renewable and Non-renewable resources				1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	To understand about ecosystem and Biodiversity							Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-3 :	To understand the natural and anthropogenic impact of the environmental pollution							L	H	L	M	L	H	L	L	L	H	L	M	-	-	M
CLR-4 :	To create awareness on different environmental problems							M	H	L	M	L	H	M	M	M	H	L	M	-	-	M
CLR-5 :	To create awareness on various Environment Protection acts and the impact of human population on environment							M	H	L	M	L	H	M	M	M	H	L	M	-	-	M
Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:			Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	L	H	L	M	L	H	L	L	L	H	L	M	-	-	M
CLO-1 :	Applying knowledge on Renewable and Non-renewable resources				2	80	65	M	H	L	M	L	H	L	L	L	H	L	M	-	-	M
CLO-2 :	Understanding about ecosystem and Biodiversity				2	80	70	L	H	L	M	L	H	M	M	M	H	L	M	-	-	M
CLO-3 :	Gathering knowledge on impact of environmental pollution				2	80	70	M	H	L	M	L	H	M	M	M	H	L	M	-	-	M
CLO-4 :	Understanding of different environmental problems				2	80	70	M	H	L	M	L	H	M	M	M	H	L	M	-	-	M
CLO-5 :	Having knowledge on various Environment Protection acts and the impact of human population on environment problems				2	80	65	M	H	L	M	L	H	L	M	L	H	L	M	-	-	M
Duration (hour)		9		9		9		9		9		9										
S-1	SLO-1	Multidisciplinary nature of environmental studies	Energy flow in the ecosystem	Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity	Disaster management- Nature Floods, Earthquakes		Environment Protection Act															
	SLO-2	Definition, Scope and Importance of Environmental Studies	Energy flow in the ecosystem	Environmental Pollution- Definition			Air (Prevention and Control of Pollution) Act															
S-2	SLO-1	Need for public awareness.	Ecological succession	Causes, Effects and Control Measures of Air Pollution	Cyclones Landslides		Water (Prevention and control of Pollution) Act															
	SLO-2	Institutions in Environment	Food chains, Food webs and Ecological pyramids		Wildlife Protection Act																	
S-3	SLO-1	People in Environment	Ecosystem, Introduction, Types, Characteristic features, Structure and functions	Causes, Effects and Control Measures of Water Pollution	Social Issues and the Environment: From Unsustainable to Sustainable Development		Forest Conservation Act															
	SLO-2	Introduction to natural resources- Associated Problems	Forest ecosystem		Issues involved in enforcement of environmental legislation																	

S-4	SLO-1	Renewable and Nonrenewable resources	Grassland ecosystem	Causes, Effects and Control Measures of Soil Pollution	Urban problems related to energy	Public awareness
	SLO-2	Forest resources	Desert ecosystem		Water Conservation	
S-5	SLO-1	Water Resources	Aquatic ecosystems (ponds, lakes, streams)	Causes, Effects and Control Measures of Marine pollution	Rain Water Harvesting, Watershed	Human Population and the Environment: Population growth, variation among nations
	SLO-2	Mineral Resources	Aquatic ecosystems (rivers, estuaries, oceans)			
S-6	SLO-1	Food Resources	Biodiversity and its conservation-genetic, species and ecosystem diversity	Causes, Effects and Control Measures of Noise Pollution	Environmental Ethics: Issues and Possible Solutions	Population explosion – Family Welfare Programme
	SLO-2	Energy Resources	Biogeographical classification of India			Environment and human health
S-7	SLO-1	Land Resources	Value of Biodiversity	Causes, Effects and Control Measures of Thermal Pollution	Climate change & Global warming	Human Rights
	SLO-2	Role of an individual in conservation of natural resources	Biodiversity at Global, National and Local Levels			Value Education
S-8	SLO-1	Equitable use of resources for sustainable lifestyles	India as a Mega Diversity Nation	Causes, Effects and Control Measures of Nuclear hazards	Acid rain & Ozone layer depletion	HIV/AIDS
	SLO-2	Concept of an ecosystem	Hot-spots of biodiversity			
S-9	SLO-1	Structure and Functions of an ecosystem	Threats to biodiversity: habitat loss, poaching of wildlife man-wildlife conflicts	Solid Waste Management Causes, Effects and Control Measures of Urban and Industrial Waste	Nuclear Accidents and Nuclear Holocaust	Women and Child Welfare
	SLO-2	Producers, consumers and decomposers	Endangered and endemic species of India	Role of Individuals In Pollution Prevention	Wasteland Reclamation	Role of Information Technology in Environment and human health

Learning Resources	Text Books:	- Bharucha Erach, (2013), Textbook of Environmental Studies for Undergraduate Courses (Second edition). Telangana, India: Orient BlackSwan. - Basu Mahua, Savarimuthu Xavier, (2017), SJ Fundamentals of Environmental Studies. Cambridge, United Kingdom: Cambridge University Press	References:	- R.Jeyalakshmi (2014), Text book of Environmental Studies, Devi publications, Chennai. - Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380013, India, Email:mapin@icenet.net (R)

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40%	-	40%	-	40%	-	40%	-	40%	-
	Understand										
Level 2	Apply	30%	-	30%	-	30%	-	30%	-	30%	-
	Analyze										
Level 3	Evaluate	30%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	Dr.N.Banu, Assistant Professor Bharathi Womens College (Autonomous), Chennai	1. Dr. P. Parthipan, Assistant Professor, Department of Biotechnology, FSH, SRMIST
		2.Dr. D. Sankari, Professor and Head, Department of Biotechnology, FSH, SRMIST

Course Code	UST23201J	Course Name	Distribution Theory - I	Course Category	C	Discipline Specific Core course	L	T	P	O	C
							2	0	5	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Statistical Table and Graph sheet		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning			Program Learning Outcomes (PLO)														
CLR-1 :	To introduce basic discrete as well as continuous probability distributions and notions of probability models for data.	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	To apply the knowledge of probability and random variables course to study the properties of these probability distributions.	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-3 :	To familiarize students with genesis & applications of these basic probability distributions.																		
CLR-4 :	To understand the concepts o various distributions																		
CLR-5 :	To compute moments for various distributions.																		
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1 :	Identify suitable probability distribution of a random variable from its description	3	85	80	H	H	H	M	M	M	M	M	M	L	L	M	L	M	M
CLO-2 :	Write down the probability function, support and parameter space of the basic distributions	3	80	75	H	H	H	M	L	M	L	M	L	M	L	M	M	M	L
CLO-3 :	Derive & compute moments of basic probability distributions.	3	85	80	M	H	H	L	M	M	L	H	M	M	L	M	L	M	M
CLO-4 :	Derive generating functions for basic probability distributions and derive moments using generating functions.	3	85	80	M	H	H	M	M	L	M	M	L	M	H	L	L	L	L
CLO-5 :	Prove various properties relating to basic probability distributions	3	85	80	H	M	H	L	L	H	M	L	M	L	M	L	L	L	M

Duration (hour)	Learning Unit / Module 1 21	Learning Unit / Module 2 21	Learning Unit / Module 3 21	Learning Unit / Module 4 21	Learning Unit / Module 5 21
S-1	SLO-1 Introduction – Discrete distribution.	Definition of Poisson distribution	Definition of Negative Binomial distribution - assumptions	Definition of Geometric distribution - assumptions	Introduction of continuous distributions
	SLO-2 Definition of Bernoulli distribution, assumptions and properties	Assumptions, applications	Assumptions	Memoryless property of Geometric distribution	Definition of Uniform distribution, pdf and cdf
S-2	SLO-1 <i>Derivation of mean and variance</i>	Derivation of Poisson as a limiting case of Binomial distribution	MGF of Negative Binomial – derivation about origin	Expectation of Geometric distribution	Mean and variance of uniform distribution
	SLO-2 <i>Derivation of mean and variance</i>	Derivation of Poisson as a limiting case of Binomial distribution	MGF of Negative Binomial – derivation about origin	Variance of Geometric distribution	MGF of uniform distribution
S-3	SLO-1 Definition of Binomial distribution assumptions	<i>Recurrence relation for the moments of Poisson distribution</i>	<i>First four Moments</i>	<i>Problems on Geometric distribution</i>	rth moment of uniform distribution
	SLO-2 <i>Properties of Binomial distribution</i>	Derivation of Poisson as a limiting case of Binomial distribution	<i>First four Moments</i>	<i>Problems on Geometric distribution - First four Moments</i>	First four moments of uniform distribution
S 4	SLO-1 <i>Frequency distribution of Binomial distribution</i>	<i>Moments – derivation of first four moments of Poisson</i>	<i>Mean using MGF</i>	<i>MGF of Geometric distribution</i>	Normal distribution – definition, characteristics

Duration (hour)	Learning Unit / Module					
	21	21	21	21	21	
	SLO-2	Derivation of first four moments	Moments – derivation of first four moments of Poisson	Variance using MGF	First four moments of Geometric using MGF	Importance of normal distribution
S-5 - S-7	SLO	Problems on Bernoulli and Binomial distribution	Problems on Poisson distribution	Problems on Negative Binomial distribution	Problems on Geometric distribution using MGF	problems on uniform distribution
S-8	SLO-1	Moments – derivation of first four moments	Recurrence relation for the moments of the Poisson	Cumulant Generating Function of Negative Binomial distribution	Definition of Hyper Geometric Distribution (HGD)	Standard normal distribution - definition
	SLO-2	Moments – derivation of first four moments	Recurrence relation for the moments of the Poisson	Cumulant Generating Function of Negative Binomial distribution	Remarks on HGD	Area properties of standard normal distribution
S-9	SLO-1	Moment Generating Function (MGF) - derivation	Moment Generating Function (MGF) – derivation - Poisson	First four central moments using CGF	Mean of HGD – derivation	Fitting of normal distribution
	SLO-2	Moment Generating Function (MGF) - derivation	Moment Generating Function (MGF) – derivation - Poisson	First four central moments using CGF	Variabce of HGD - derivation	Mean and variance of Normal distrobution
S-10	SLO-1	Mean and variance using MGF	PGF of Poisson distribution derivation	Coefficeint of Skewness and Kurtosis	Factorial momdnts of HGD	MGF of Normal distribution
	SLO-2	Mean and variance using MGF	PGF of Poisson distribution derivation	Coefficeint of Skewness and Kurtosis	Factorial momdnts of HGD	MGF of Normal distribution
S-11	SLO-1	Cumulant of Binomial distribution - derivation	Cumulants of Poisson I distribution - derivation	PGF of Negative Binomial	Recurrence formula in proability for HGD	Moments of normal distribution
	SLO-2	Cumulant of Binomial distribution - derivation	Cumulants of Poisson I distribution - derivation	Characteristics function of Negative binomial	Recurrence formula in proability for HGD	Recurrence relation for the moments of normal distribution
S-12 - S-13	SLO	Problems on Binomial distribution – mean and variance	MGF and PGF of Poisson I distribution - problems	Problems on NegativeBinomial distribution	Problems on HGD	Fitting of Normal distribution
S-14	SLO-1	Probability Generating Function (PGF) of Binomial – derivation, properties	Additive property of Poisson distribution	Poisson distribution as a limiting case on Negative Binomial	Recurrence formula in proability for HGD	Limiting form of Binomial distribution
	SLO-2	PGF of Binomial – derivation, properties	Additive property of Poisson distribution	Poisson distribution as a limiting case on Negative Binomial	Recurrence formula in proability for HGD	Limiting form of Binomial distribution
S-15	SLO-1	Fitting of Binomial distribution - derivation	Fitting of Poisson distribution	Properties of Negative Binomial	Multinomial distribution – definition, formula	Linear combination of in indepentent normal variates is also a normal variate
	SLO-2	Fitting of Binomial distribution - derivation	Fitting of Poisson distribution	Negative Binomial	General form of multinomial distribution	Linear combination of in indepentent normal variates is also a normal variate
S-16	SLO-1	Recurrence relation for central moments of binomial distribution	Recurrence relation for central moments of Poisson distribution	Problems on Negative Binomial	Joint distribution of multinomial variates	Cumulants of normal distribution
	SLO-2	Recurrence relation central moments of binomial distribution	Recurrence relation for central moments of Poisson distribution	Problems on Negative Binomial	Conditional distribution of two multinomial variate	Cumulants of normal distribution
S-17	SLO-1	Recurrence relation for probabilities of Binomial distribution	Recurrence relation for probabilities of Poisson distribution	Problems on Negative Binomial	Mean and variance of mulinomial variates	Bivariate normal distribution and its properties
	SLO-2	Recurrence relation for probabilities of Binomial distribution	Recurrence relation for probabilities of Poisson distribution	Problems on Negative Binomial	Covariance and correlation of of two multinomial variate	Bivariate normal distribution and its properties
S-18 - S-21	SLO	MGF, PGF and Fitting of Binomial distribution - problems	MGF, PGF and Fitting of Poisson distribution - problems	Problems based on Fitting of Negative Binomial distribution	Problems on multinomial distribution	Problems on normal distribution using properties

Learning Resources	Text Books:	References:
	1. Parimal Mukhopadhyay,(1996), Mathematical Statistics, New Central Book Agency 2. Goon, AM., Gupta M.K and .Dasgupta B (1991): Fundamentals of Statistics, Vol.1, World Press, Calcutta	1. Hogg, R. V and Craig, A. T (2002), Introduction to Mathematical Statistics, Pearson Education Asia, India. 2. A.M.Mood, F.A. Graybill and D.C. Boes (1974): Introduction to the theory of Statistics, International student ed. McGraw Hill.

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA_1 (10%)		CLA_2 (10%)		CLA_3 (20%)		CLA_4 (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasantha, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani,SRMIST

Course Code	UST23202J	Course Name	Sampling Techniques	Course Category	C	Discipline Specific Core Course	L 3	T 0	P 3	O 2	C 4
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Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning			Program Learning Outcomes (PLO)														
CLR-1 :	Introduce various statistical sampling schemes such as simple, stratified, systematic, and probability proportional to size (pps) sampling.	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2:	To provide an outline of conducting the sample surveys.	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-3:	To synthesize appropriate sampling technique & sample size for a survey.																		
CLR-4:	To classify and compare different sampling techniques.																		
CLR-5:	To differentiate different types of sampling.																		

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1:	Discuss, organize and execute the sample survey.	3	85	80	H	H	M	M	H	M	M	L	L	M	L	M	L	M	L
CLO-2:	Identify a sample size & estimate the parameters of the population using simple random sampling with & without replacement.	3	80	75	H	M	M	M	H	L	M	H	L	M	L	H	L	M	M
CLO-3:	Identify a sample size & estimate the parameters of the population using stratified random sampling and classify optimum and proportional allocations.	3	85	80	H	H	M	M	H	M	M	L	M	M	L	L	L	M	M
CLO-4:	Identify a sample size & estimate the parameters of the population using Systematic sampling and compare simple & stratified with systematic random sampling	3	85	80	H	H	L	L	H	L	L	L	M	L	L	L	L	L	M
CLO-5:	Inspect Ratio estimators & Regression estimator and discuss PPS sampling.	3	85	80	H	H	L	L	H	M	L	L	M	L	L	M	L	L	L

Duration (hour)		Learning Unit / Module 1 18	Learning Unit / Module 2 18	Learning Unit / Module 3 18	Learning Unit / Module 4 18	Learning Unit / Module 5 18
S-1	SLO-1	Sampling	SRSWR Definition, Notations	Stratified Random sampling – Description and notations	Systematic sampling - Proof	Cluster sampling
	SLO-2	Census	Derivation of SRSWR	Principles of stratification	Systematic sampling - Examples	Reasons for cluster sampling
S-2	SLO-1	Basic Concepts of Sampling	SRS without replacement - Definition, Notations	Properties of estimates	Systematic sampling - Derivation	Real life situations where cluster sampling is appropriate
	SLO-2	Population- parameter- statistic	Derivation of SRSWOR	The estimated variance and confidence limits	Systematic sampling - Problems	Techniques of drawing a sample using cluster sampling
S-3	SLO-1	Examples on sampling	Population mean and population total as parameters	Construction of strata	Variance of the estimated mean	Single stage cluster sampling – clusters of equal size
	SLO-2	Examples on census	Inclusion probabilities	Number of strata	Relation to cluster sampling	Variance function

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		18	18	18	18	18
S-4 to S-6	SLO-1	Methods of sampling	Problems on SRSWR	Allocation techniques	Problem based on circular method	A cost function
	SLO-2	Methods of census	Problems on SRSWOR	Estimation of gain due to stratification	Problem based on linear method	Problems on cluster sampling
S-7	SLO-1	Mean Square error	Advantages of SRSWR	Neymans Allocation	Population in random order	Cluster sampling for proportions
	SLO-2	Sampling Vs Census	Disadvantages of SRSWR	proof of the theorem under optimum allocation with a fixed sample size	Population with linear trend	Single stage cluster sampling – Clusters of unequal size
S-8	SLO-1	Advantages of sampling	Advantages of SRSWOR	Derivation of V_{opt}	Populations with periodic variation	Sampling with probability proportional to size
	SLO-2	Disadvantages of sampling	Disadvantages of SRSWOR	Derivation of V_{prop}	Systematic sampling as a particular case of stratified sampling	Selection with unequal probabilities with replacement
S-9	SLO-1	Advantages of census	Sample mean as estimator of population mean	Derivation of V_{srs}	Derivation, Examples	Selection with unequal probabilities without replacement
	SLO-2	Disadvantages of census	Sample proportion as an estimator of population proportion	comparison of V_{opt} , V_{prop} and V_{srs} .	Comparison of Systematic with stratified random sampling	The optimum measure of size
S-10 to S-12	SLO-1	Framing the questionnaire	Derivation of sample mean and its expectations	Estimation of sample size with Continuous data	Comparison of systematic sampling with simple random sampling	Problems on Selection with unequal probabilities with replacement
	SLO-2	Real time - data	Derivation of sample proportion and its expectations	Stratified sampling for proportions	Problems for the Comparison of systematic sampling with simple random sampling	Problems on Selection with unequal probabilities without replacement
S – 13	SLO-1	Questionnaire definition	Properties of the estimates	Effects of deviation from the optimum allocation	Comparisons for populations with one-dimensional linear trend	The Horvitz-Thompson Estimator
	SLO-2	Questionnaire characteristics	Variances of the estimates	Effects of errors in the stratum sizes	Derivation, Example	Brewer's Method
S-14	SLO-1	Elementary units	Estimation of ratio	Two-way stratification with small samples		Murthy's Method
	SLO-2	Sampling frame	Confidence Limits	Stratification after selection of the sample	Merits of systematic sampling	Estimation of population mean with equal size clusters
S-15	SLO-1	Random Sampling	Determination of sample size	Quota sampling	Demerits of systematic sampling	Estimation of population total with equal size clusters
	SLO-2	Non random sampling	The Formula for n in Sampling for Proportions	Examples on Quota sampling		Non-Probability sampling
S-16 to S-18	SLO-1	Example on random sampling	The Formula for n with Continuous Data	Estimation of variance with one unit per stratum	Estimation of variance from a single sample	Judgement sampling or convenient sampling
	SLO-2	Example on non-random sampling	Sample Size in Decision Problems	Relative precision of stratified random and simple random sampling	Systematic sampling in two dimensions	Problems on non-probability sampling

Learning Resources	Text Books:		References:	
	1.	Cochran,W.G.(2009), Sampling Techniques, Wiley Eastern Company Ltd.	1.	Sampath, S. (2000), Sampling theory and methods, Narosa publishing house.
	2.	Murthy,M.N.(1983), Sampling theory and methods, Statistical publishing society, Calcutta.	2.	Daroga Singh and Chaudhary, F.S. (1986): Theory and Analysis of Sample Survey Designs.,Wiley Eastern.

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasantha, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani, SRMIST

Course Code	UST23203T	Course Name	Mathematics for Statistics - II	Course Category	C	Disciple Specific Core Course	L	T	P	O	C
							4	0	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)
CLR-1 :	To understand the concepts of second-order differential equations.	1 2 3	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
CLR-2 :	To learn the basic concepts of differentiation, successive differentiation and partial differentiation		
CLR-3 :	Gain knowledge on Demoivre's theorem		
CLR-4 :	To understand the properties of Laplace transform		
CLR-5 :	To learn the different types of inverse Laplace transforms and properties.		
CLR-6 :	To understand the evaluation of Multiple integrals		

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	Gain knowledge on solving second order differential equations.	3	85	80	H	H	M	M	M	H	M	L	L	L	L	M	L	L	L
CLO-2 :	Be familiar with Homogeneous functions	3	80	75	H	H	M	L	M	H	M	L	L	M	L	M	L	L	L
CLO-3 :	Understanding Demoivre's theorem and applications	3	85	80	L	H	M	H	M	H	M	L	L	L	L	M	L	L	L
CLO-4 :	Acquire the knowledge of Pascal triangle concept	3	85	80	H	L	L	M	L	H	L	H	L	L	L	L	L	L	L
CLO-5 :	Understanding shifting property in Laplace transformation and Inverse Laplace transformation and their application	3	85	80	H	H	L	M	H	L	L	L	L	L	M	L	L	L	L

Duration (hour)	Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
	12	12	112	12	12
S-1	SLO-1 General term for the Second order Differential Equations with constant coefficients	Demoivre's theorem basic definition and concept explained	Introduction to Laplace Transforms	Introduction of Inverse Laplacetransforms	Introduction to multiple integrals
	SLO-2 Second order Differential Equations with constant coefficients	Demoivre's theorem	Definitions and Basic properties explained	Simple problems	Definitions double integrals
S-2	SLO-1 To find the auxiliary equation concepts	Simple problems	Problems on Laplace Transforms	Basic problems on Inverse LaplaceTransforms	basic properties in double integral
	SLO-2 Cases for finding the auxiliary equation concepts	Expansion of sinnθ definition given	Formulas based problems L[f(t)]	Basic problems solved on Inverse Laplace Transforms	Evaluation of double integrals
S-3	SLO-1 Cases for finding the auxiliary equation concepts	Expansion of sinnθ basedproblems solved	Definition for linearity property	Finding inverse Laplace transformsby the method of partial fractions	Special cases on double integrals
	SLO-2 Simple problems	Expansion of cosnθ	Problems based on L[f (t ₁) + f (t ₂)]	Finding inverse Laplace transformsby the method of partial fractions	Results on double integrals
S 4	SLO-1 Particular Integral of e ^{ax}	Expansion of cosnθ	Problems on L[cos h at]	Finding inverse Laplace transformsby the method of partial fractions	Limits introduction in double integrals

Duration (hour)	Learning Unit / Module 1		Learning Unit / Module 2		Learning Unit / Module 3		Learning Unit / Module4		Learning Unit / Module 5	
		12		12		112		12		12
S-5	SLO-2	Particular Integral of e^{ax}		Simple problems		Problems on $L[\sin h at]$		Finding inverse Laplace transformsby the method of partial fractions		Limits based problems in double integrals
	SLO-1	Particular Integral of x^2		Expansion of $\tan^n\theta$		Problems on $L[\cos^2 at]$		inverse Laplace Transform of $\log[F(s)]$		Double integrals – Algebraic function based Problems
	SLO-2	Problems solved on the Particular Integral of x^2		problems solving based on the Expansion of $\tan^n\theta$		Problems on $L[\sin^3 at]$		inverse Laplace Transform of $\log[F(s)]$		Double integrals – Trigonometry function based Problems
S –6	SLO-1	Particular Integral of $\sin ax$,		Expansion of $\sin^n\theta$		Definition for shifting property		simple problems		Double integrals – Exponential function based Problems
	SLO-2	Particular Integral of $\sin ax$,		Expansion of $\cos^n\theta$		Problems based on shifting property		inverse Laplace Transform of $\log[F(s)]$		Double integrals – Logarithmic function based Problems
S-7	SLO-1	Simple problems solved on the conceptof the above		Pascal's triangle concepts		Problems on $L[e^{at} f(t)]$		Integral function		Definitions on triple integrals
	SLO-2	Simple problems		simple problems		Problems on $L[t^n f(t)]$		Integral function based problemsolved		Basic properties on triple integrals
S -8	SLO-1	Particular Integral of $\cos ax$,		In terms of sines and cosines of multiples of θ		Problems on $L[t f(t), \cos^2 t]]$		simple problems		Evaluation of triple integrals
	SLO-2	Particular Integral of $\cos ax$		In terms of sines and cosines of multiples of θ		Problems on $L[f (T^n, e^{at}, \sin at)]$		convolution of two function		Results on triple integrals
S –9	SLO-1	Particular Integral of $\sin ax, \cos ax$		In terms of sines and cosines of multiples of θ		Problems on $L[f(t)] = F(s)$		convolution of two function based problems solved		Special cases on triple integrals
	SLO-2	Particular Integral of $e^{ax}\cos ax$		simple problems		Problems on $L[f(t)/t]$		convolution of two function		Limits introduction in triple integrals
S-10	SLO-1	Particular Integral of $e^{ax}\cos ax$		Expansion of $\sin^n\theta\cos^n \theta$		Laplace transform of partial fraction method		Application of Laplace Transformation for solving Differential Equationsconcept explained		Limits based problems in triple integrals
	SLO-2	$e^{ax}\cos ax$ based Simple problems		More problems solved on the Expansion of $\sin^n\theta\cos^n \theta$		Laplace transform of partial fraction method type I		Application of Laplace Transformation for solving Differential Equations		Triple integrals – Algebraic function based Problems
S-11	SLO-1	Particular Integral of $e^{ax}x^n$		Expansion of $\sin^4\theta\cos^3\theta$		Laplace transform of partial fraction method type I		Application of Laplace Transformation for solving Differential Equations		Triple integrals – Trigonometry function based Problems
	SLO-2	Particular Integral of $e^{ax}x^n$		By using Pascal triangle methodExpansion of $\sin^n\theta\cos^n \theta$ solved		Laplace transform of partial fraction method type II		Application of Laplace Transformationfor solving Differential Equations		Triple integrals – Exponential function based Problems
S-12	SLO-1	Particular Integral of $e^{ax}x^n$		Expansion of $\sin^n\theta\cos^n \theta$		Laplace transform of partial fraction method type II		simple problems for solving Differential Equations		Triple integrals – Logarithmic function based Problems
	SLO-2	$e^{ax}x^n$ based Simple problems		simple problems		simple problems		simple problems solved		Simple problems

Learning Resources	Text Books: 1. Dr. A. Singaravelu (2015): Allied Mathematics, 7th edition, A. R. Publications. 2. P.R. Vittal, Mathematical Foundation (2000), 2nd edition, Margham Publication.
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	Learning Assessment										
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	-	30%	-	30%	-	30%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	30%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasantha, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1.Dr.S.Lakshmipriya, SRMIST
		2. Dr.L.Sivakami, SRMIST

Course Code	UCD23S02T	Course Name	Verbal Ability and Skill Development	Course Category	S	Skill Enhancement Course					L	T	P	O	C
											2	0	0	2	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Career Guidance Cell	Data Book / Codes/Standards	-		

Course Learning Rationale (CLR):		The purpose of learning this course is to:			Learning			Program Learning Outcomes (PLO)														
CLR-1 :	Critically evaluate basic mathematical concepts related to mixtures and alligations, Numbers, time and work				1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Use their logical thinking and analytical abilities to solve reasoning problems				Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-3 :	Develop soft skills relating to the need for job recruitment																					
CLR-4 :	Provide students with the necessary skills to generate and interpret data sufficiency, problems on Chain Rule, Pipes and Cisterns, Boats and streams,																					
CLR-5 :	Enable students to understand problems on graphs and also increase their ability in language skills																					
Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:																				
CLO-1 :	Understand the concepts of mixtures and alligations, Numbers, time and work and to approach questions in a simpler and innovative method				3	80	70	M	H	-	L	-	M	-	M	M	H	-	H	-	-	-
CLO-2 :	Establish a student's interest and awareness in seating arrangements, mathematical operations, logical reasoning				3	80	75	M	H	-	L	-	M	-	M	M	H	-	H	-	-	-
CLO-3 :	Acquire soft skills that will help for applying jobs				3	85	70	-	-	M	H	M	-	L	-	-	-	H	-	M	M	H
CLO-4 :	Demonstrate various principles involved in aptitude problems				3	85	80	-	-	-	-	M	-	L	H	-	H	-	H	-	-	L
CLO-5 :	Ability to solve problems on reasoning and to interpret english language				3	85	75	-	H	-	L	-	H	-	M	M	-	H	-	M	-	M

Duration (hour)	6	6	6	6	6
S-1	SLO-1	Time and Distance – Introduction	Seating Arrangements (Circular and table) Introduction	Resume Building - Introduction	Chain Rule, Pipes and Cistern – Introduction
	SLO-2	Time and Distance – Problems	Seating Arrangements (Circular and table) – Problems	Resume Building	Chain Rule, Pipes and Cistern – Problems
S-2	SLO-1	Time & Work- Introduction	Mathematical Operations – Basic Problems	Group Discussions - Introduction	Data Sufficiency – Introduction
	SLO-2	Time & Work – Problems	Mathematical Operations – Tricky Problems	Group Discussions – Mock GD	Data Sufficiency – Problems
S-3	SLO-1	Alligation or Mixture – Introduction	Data Arrangements - Introduction	Group Discussions - Activity 1	Logarithms – Introduction
	SLO-2	Alligation or Mixture - Problems	Data Arrangements – Problems	Group Discussions - Activity 1	Logarithms – Problems
S-4	SLO-1	Numbers – Basic Problems	Logical Deductions – Introduction	Group Discussions - Activity 2	Boats and Streams – Basic Problems
	SLO-2	Numbers – Tricky Problems	Logical Deductions – Problems	Group Discussions - Activity 2	Boats and Streams – Tricky Problems

S-5	SLO-1	Problems on Trains – Introduction	Letter and Symbol Series – Basic Problems	Leadership Skills Introduction	True Discount – Introduction	Theme detection – Introduction
	SLO-2	Problems on Trains – Problems	Letter and Symbol Series – Tricky Problems	Leadership Skills	True Discount – Problems	Theme detection – Activity
S-6	SLO-1	Races and Games – Basic Problems	Input Output Tracing Introduction	How to Handle Criticism and Feedback	Geometry and Mensuration Introduction	Ordering of words _ Introduction
	SLO-2	Races and Games – Tricky Problems	Input Output Tracing – Problems	How to Handle Criticism and Feedback	Geometry and Mensuration – Problems	Ordering of words – Practise Session

Learning Resources	Text Books:	References:
	- James Barrett & Tom Barrett - Ultimate aptitude tests: over 1000 practice questions for abstract visual, numerical, verbal, physical, spatial and systems tests, Kogan Page, London, 2018. Fourth edition - Kathy A. Zahler & Over Drive, Inc (Distributor) Conquering GRE verbal reasoning and analytical writing, McGraw-Hill Education, New York, 2020 Second Edition - Archana Ram, Place Mentor: Tests of Aptitude for Placement Readiness, Oxford University Press, Oxford, 2018	- David Bartlett, The art of general practice: soft skills to survive and thrive, Scion, Banbury, 2018, eBook, 2018 Zsolt Nagy, Soft skills to advance your developer career: actionable steps to help maximize your potential, A press, Berkeley, CA, 2019, eBook, 2022

Learning Assessment					
Level	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)			
		CLA – 1 (20%)	CLA – 2 (20%)	CLA – 3 (30%)	CLA – 4 (30%)#
		Theory	Theory	Theory	Theory
Level 1	Remember Understand	30%	20%	30%	30%
Level 2	Apply Analyze	30%	50%	30%	30%
Level 3	Evaluate Create	40%	30%	40%	40%
	Total	100%	100%	100%	100%

CLA-1, CLA-2 and CLA-3 can be from any combination of these: Online Aptitude Tests, Classroom Activities, Case Studies, Poster Presentations, Power-point Presentations, Mini Talks, Group Discussions, Mock interviews, etc.
 # CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Mr. M. Ponmurugan, Executive PMOSS, Cognizant Technology Solutions India Pvt. Limited, Chennai	Dr. G. Saravana Prabu, Asst. Professor, Department of English, Amrita Vishwa Vidyapeedam, Coimbatore	Dr. Sathish K, HOD, Department of Career Guidance, FSH, SRMIST
		Dr. Muthu Deepa M, Assistant Professor, Department of Career Guidance, FSH, SRMIST

Course Code	UEN23V01L	Course Name	Communication Skills	Course Category	V	Value Addition Course	L	T	P	O	C
							0	0	4	2	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Department of English, FSH, SRMIST	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)
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CLR-1 :	Develop fluency in spoken English by practicing and engaging in various speaking activities.	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Improve pronunciation and intonation to enhance clarity and effectiveness in oral communication.																		
CLR-3 :	Expand vocabulary and idiomatic expressions to communicate more accurately and expressively.																		
CLR-4 :	Enhance listening skills to understand and respond appropriately to spoken English in different situations.																		
CLR-5 :	Employ effective communication strategies, such as active listening, summarizing, paraphrasing, and asking clarifying questions, to enhance interpersonal and intercultural communication.																		

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	Demonstrate improved fluency in spoken English by expressing ideas and thoughts confidently and coherently.	2	75	60	H	M	M	L	-	M	-	M	H	L	H	L	-	-	-
CLO-2 :	Pronounce English words and phrases accurately, using appropriate intonation and stress patterns.	2	80	70	M	H	L	-	-	-	-	M	M	H	H	M	-	-	-
CLO-3 :	Expand and effectively use a range of vocabulary and idiomatic expressions to enhance communication.	2	70	65	M	M	M	-	L	L	-	H	M	H	H	L	-	-	-
CLO-4 :	Understand and comprehend spoken English in various contexts, including informal conversations, lectures, and presentations.	2	70	70	H	M	L	-	M	H	-	-	-	-	H	L	-	-	-
CLO-5 :	Deliver well-structured and engaging oral presentations, incorporating effective body language and visual aids.	2	80	70	H	H	-	M	-	M	-	L	L	M	H	M	-	-	-

Duration (hour)	12		12		12	
S-1	SLO-1	Introduction to Listening Skills.	Introduction to Reading Skills. Discussion of techniques of Reading Skill	Introduction to Speaking Skills. Explaining the importance of phonetics and vocabulary	Introduction to Writing Skills Importance of writing skills	Introduction to appreciation of texts.
	SLO- 2	Exploring Effective Ways of Listening. Barriers of Listening. Active and Passive Listening.	Identifying common reading problems in students after making them read a few passages.	Explaining the usage of the Oxford Learner's Dictionary to learn phonetics of the words at the fundamental level.	Explaining various forms of writing with examples:.	Encouraging the students to share a few of their favourite lines from any sources they have read or sharing a few lines from paditthadhil piditthadhu.
S-2	SLO-1	Introduction to Digital language lab/ usage of mobile applications	Learners are enabled to record their speech and listen to it in order to correct their problematic areas	The right enunciation of certain words to be taught through phonetic representation and decoding the phonetic symbols by learning to use the dictionary..	Introduction to letter writing. Types of letters- Formal and Informal letters with examples. Learning E-mail etiquette.	Explaining why appreciating texts creates a good reader.

	SLO- 2	Equipping the listening skill of the learners	repetitive practices of reading select paragraphs from web resources, their standard will be measured.	Observe and repeat and learn the phonetic pronunciation of words by practicing continuously.	Class Assignment - write a formal letter and informal letter and check for e-mail etiquettes in writing.	Enabling the students to reflect in the classroom about any of their favourite books/ articles or magazines.
S-3 – S-4	SLO-1	Introducing google podcasts.	The speed, fluency, pronunciation, comprehension of the words in the paragraph	Teaching the usage of Thesaurus to understand and develop various words and improve vocabulary.	Enabling the students to unleash their potentials in creative writing through writing transcripts for advertisements of any product.	Introducing the text of Letters by Mathrubootham published in the Hindu.
	SLO- 2	Task to write down the words from the audio they have listened to. This activity should be done in two steps. 1. Jotting down the words simultaneously as they listen to the speaker. 2. Writing the transcript of the audio through repetitive play and pause.	hints and tricks to follow where the pauses are to be followed. 1.	Identifying common errors in concord, preposition, direct speech and indirect speech.	write a review of any book or a movie or an interview or a debate.	Reading and recitation of the text of the first letter-Enjoy within limits, says Mr. Mathrubootham Understanding characters by analyzing the usage of their style of language
S-5	SLO-1	Imitating the speakers by listening to them and attempting to learn the pronunciation of the words uttered in the audio.	Students group 1- reads – group 2 identifies the flaws in reading.	Identifying common errors in tenses, punctuation, and syntactical errors..	Mechanics of writing like capitalization, punctuation, spelling, correct pronoun, preposition, concord usage can be taught.	Reading of the second letter- Nobel? What Nobel, asks Mr. Mathrubootham.
	SLO- 2	Repetitive listening to enhance pronunciation skills	The roles have to be exchanged between the two groups and the activity should be practiced.	Rectifying the common errors and instructing the learners about the right usage in order to avoid common errors.	meachnaics of writing - assessed and evaluated.	Mathrubootham's humour and the language of code switching from Tamil to English and vice –versa.
S-6	SLO-1	Introducing to the audios of TED TALK American Speakers. Listening to the native speakers of English Language through TED TALKS.	Identify the key arguments in a passage - introductory point, lead point, supportive argument statement, concluding point and the common connecting word between all the key words in the passage.	Practicing how to avoid common errors.	Teaching effective writing by learning to avoid common errors in concord, preposition, conjunction, relative pronouns, question tags.	Reading of the third letter -Mr. Mathrubootham is fully supporting all new technologies
	SLO- 2	Introducing to the audios of TED TALK British Speakers. Listening to the native speakers of English Language through TED TALKS.	encouraged to identify the key arguments in other passages on their own.	The learners are introduced to collocations for quick choice of learning how to speak in short time and how to speak effectively.	Practicing effective writing by learning to avoid common errors in concord, preposition, conjunction, relative pronouns, question tags.	Mathrubootham's frustration over the failure of technologies and the language that he positively uses to denote hopelessness over technologies.
S-7 – S-8	SLO-1	American and British styles can be differentiated.	Guiding the act of reading through scanning and skimming by model reading of the passages by the instructor.	Practice collocations	common errors in tenses, direct and indirect speech and syntax structure.	Reading of the fourth letter in the classroom and discussion Pizza maavu: Welcome to Mr. Mathrubootham food recipe website,
	SLO- 2	The recognition of different accents should be practiced by speaking after listening.	scanning and skimming activities	Idioms and phrases	Practicing effective writing by learning to avoid common errors in tenses, direct and indirect speech and syntax structure.	Mathrubootham's love for food and the miscommunication about food.

S-9	SLO-1	Learning advanced pronunciation and vocabulary through various computer applications like Woodpecker.	Loud reading and slow mind reading	A speaking task to learn- collocations, idioms and phrases, vocabulary and phonetic pronunciation	Teaching how to write statement of purpose for admission to higher educations, and practicing the same.	Analysing the text for regional relevance and National significance.
	SLO- 2	imitate the different sounds and accents - repeat it after listening to any of the videos from the library based on individual interest.	Pauses, pronunciation, comprehension and fluency can be checked for improvement at this stage through repetitive practices.	Their speaking activity is to be recorded and played again to rectify the errors and highlight the problematic areas in speaking.	Teaching how to write a story by looking at a picture. Developing the writing skill through word ladders.	Appreciating the aesthetics of the comic element and the embodiment of humour in the narrative in the letter
S-10	SLO-1	Repeat listening to the same time frames and move from 02.01 to 03.00	Students -groups -checking the comprehension skills. Analyse the text of a passage.	Automating vocabulary through engaging the students in various activity games like solving crossword puzzle and playing scattergories.	Introduction to blog writing and steps to become an effective blog writer.	importance of bringing in the Indianized way of speaking the English Language in order to depict the character called Mathrubootham.
	SLO- 2	Choosing any particular time frame and practicing it.	Brainstorming the comprehension skills- questioning the key points in the passage.	Engaging the students to play the games in order to learn the vocabulary.	Encourage the readers to create their own blogs and post articles on a regular basis.	relatable characters of both formal and informal everyday life experiences.
S 11 - S 12	SLO-1	Interested students can complete listening and reflecting the complete audio listening practice and speaking.	Cross check with misunderstanding if any and rectify- match the question and answers.	Spur of the moment speech.:	Selecting any news article and learning the writing style in it.	Talk about their favourite letter from the letters of Mathrubootham by recollecting the appreciation of the text according to their perception and understanding.
	SLO- 2	Group activities and games can be conducted to test the listening skills by responding to the speech given by other students	Passages for reading comprehension are to be given for practice that tests their reading skills.	Prepared speech : Giving a speaking task to the students to speak on their own choice	Students are given chances to write reports on various topics.	Enabling the students to share their appreciation of any of their favourite lines from the books they have read.

Learning Resources	Text Books: 1. Horizon- English Text Book – Compiled and Edited by the faculty of English Departement, FSH, SRMIST, 2020 2. English Grammar in Use by Raymond Murphy 3. Raymond Murphy, <i>Intermediate English Grammar</i> , Cambridge University Press, 2007	References: 1. R.P. Bhatnagar, <i>English for Competitive Examinations</i> , Trinity Press, 3 rd Edition, 2016 2. http://www.apitudetests.org/verbal-reasoning-test 3. https://www.assessmentday.co.uk/apitudetests_verbal.htm

Learning Assessment					
Level	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)			
		CLA – 1 (20%)	CLA – 2 (20%)	CLA – 3 (30%)	CLA – 4 (30%) #
		Practice	Practice	Practice	Practice
Level 1	Remember	10%	10%	30%	15%
	Understand				
Level 2	Apply	50%	50%	40%	50%
	Analyze				
Level 3	Evaluate	40%	40%	30%	35%
	Create				
	Total	100 %	100 %	100 %	100 %

CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Krishna Raj Sutherland Krishna.Raj1@sutherlandglobal.com	Dr. J Mangayarkarasi Associate Professor and Head, Dept. of English Ethiraj College for Women Chennai jmbwilson97@gmail.com	1. Dr. Shanthichitra, Professor, & Head, Department of English, FSH, SRMIST
Ann Mariya Thomson RA2232105010015 II M.A English Literature CSH, SRM IST az1160@srmist.edu.in	Dr. K S Antonysamy Associate Professor and Head, Dept. of English Loyola College Chennai antonysamyks@loyolacollege.edu	2. Dr. Pushpanjali Sampathkumar, Assistant Professor, Department of English, FSH, SRMIST

Course Code	UNS23M01L/ UNC23M01L/ UNO23M01L/ UYG23M01L	Course Name	NSS/NCC/NSO/YOGA	Course Category	M	Mandatory Course	L	T	P	O	C
							0	0	0	0	0

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	NSS/NCC/NSO/YOGA	Data Book / Codes/Standards	Nil		

Assessment is Fully Internal

Learning Assessment	
Assessment Tools	Marks
Continuous Learning Assessment –I (CLA-I)	20 Marks
Continuous Learning Assessment –II (CLA-II)	30 Marks
Continuous Learning Assessment –III (CLA-III)	30 Marks
Continuous Learning Assessment –IV (CLA-IV)	20 Marks
Total Marks	100 Marks

SEMESTER - III

Course Code	UST23301J	Course Name	Distribution Theory – II	Course Category	C	Discipline Specific Core Course	L	T	P	O	C
							2	0	5	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Statistical Table and Graph sheet		

Course Learning Rationale (CLR):		The purpose of learning this course is to:		
CLR-1 :	To introduce important continuous probability distributions and their properties.			
CLR-2 :	Derive & compute moments of various continuous probability distributions using pdfs and generating functions.			
CLR-3 :	To exhibit the relationship between the distributions			
CLR-4:	To know the difference of each distributributions on their applications.			
CLR-5:	To apply distributions to any part of the problems			

Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:		
CLO-1 :	Identify various continuous probability distributions and their probability density function			
CLO-2 :	Derive & compute moments of various continuous probability distributions using pdfs and generating functions.			
CLO-3 :	Continuous probability distributions with their properties			
CLO-4 :	Use various distributions for variety of real life situations			
CLO-5 :	Gain the knowledge of truncated continuous distributions			

Learning		
1	2	3
Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
3	85	80
3	80	75
3	85	80
3	85	80

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
H	M	H	M	M	M	M	H	M	L	L	M	M	M	M
H	M	M	M	M	M	M	H	M	H	L	M	M	M	M
H	M	H	M	H	M	M	M	M	M	L	M	L	M	M
M	H	M	L	H	M	M	H	L	M	L	L	M	M	M
M	H	H	L	M	L	L	H	L	M	L	L	M	L	L

Duration (hour)		Learning Unit / Module 1 21	Learning Unit / Module 2 21	Learning Unit / Module 3 21	Learning Unit / Module 4 21	Learning Unit / Module 5 21
S-1	SLO-1	Exponential distribution – definition, assumptions and its application	Definition of Erlang distribution	Definition of 2 parameter Weibull distribution	Logistic distribution – definition, assumptions	Introduction to truncated distributions
	SLO-2	Exponential distribution – graph of pdf and cdf	2 parameter Gamma distribution - Definition	Weibull distribution - pdf and cdf properties	Cdf and pdf Properties of Logistic distribution	Uses of truncated distributions
S-2	SLO-1	Exponential distribution – properties – memoryless property	Gamma distribution – Graph of cdf and pdf	Standard Weibull distribution - definition	MGF of Logistic distribution	Truncated exponential distribution – definition
	SLO-2	Mean and variance of exponential distribution	Additive property of gamma distribution	Standard Weibull distribution -- pdf and cdf properties	MGF of Logistic distribution	Properties of truncated exponential distribution
S-3	SLO-1	Problem: Definition, MGF of Exponential distribution	Problem: Definition, Moment generating function (MGF) of gamma distribution	Problem: Definition, Moments of standard Weibull distribution	Problem: Mean and variance using MGF	Problem: Mean of truncated exponential distribution
	SLO-2	Four moments of exponential distribution	Mean and variance using MGF	Mean and variance of Weibull	Mean and variance using MGF	Variance of truncated exponential distribution
S-4 to S-7	SLO-1	problems on Exponential distribution	Problems on Mean and variance using MGF	Problems on Weibull distribution	Logistic distribution – problems	Problems on truncated exponential distribution
	SLO-2					

Duration (hour)		Learning Unit / Module 1 21	Learning Unit / Module 2 21	Learning Unit / Module 3 21	Learning Unit / Module 4 21	Learning Unit / Module 5 21
S-8	SLO-1	Laplace distribution (double exponential) – definition and its applications	Cumulants of gamma distribution	Characterization of Weibull distribution	Pareto distribution - definition	Introduction to truncated double exponential distribution
	SLO-2	Laplace distribution - properties	Cumulants of gamma distribution	Characterization of Weibull distribution	Cdf and pdf Properties of Pareto distribution	Pdf of truncated double exponential distribution
S-9	SLO-1	Generalised laplace distribution	First four central moments using cumulants	Relationship between Weibull and exponential distribution	Applications of Pareto distribution	Truncated cauchy distribution – definition
	SLO-2	Generalised laplace distribution	First four central moments using cumulants	Relationship between Weibull and exponential distribution	Applications of Pareto distribution	Properties of truncated cauchy distribution
S-10	SLO-1	Problem: rth moment of double exponential distribution	Limiting form of gamma and Additive property – gamma distribution	Relationship between Weibull and Rayleigh distribution	Limitations of Pareto distribution	Mean and variance of truncated cauchy distribution
	SLO-2	Mean and variance of double exponential distribution	Beta distribution of first kind – definition	Applications of Weibull distribution	Relationship between Pareto and other distributions	Applications of truncated cauchy distribution
S-11 to S-14	SLO-1	Problems on double exponential distribution	Problems on Gamma distribution	Problems on Weibull distribution	Problems on Pareto distribution	Problems on cauchy distribution
S-15	SLO-1	Cauchy distribution – definition and its applications. Characteristic function of Cauchy distribution	Beta distribution of first kind – definition Constants of Beta distributions of First kind	Lognormal distribution - definition	Rayleigh distribution - definition	Introduction to truncated normal distribution
	SLO-2	Remarks of Cauchy distribution	Constants of Beta distributions of first kind	Cdf and pdf Properties of lognormal	Cdf and pdf properties of distribution	Pdf of truncated normal distribution
S-16	SLO-1	Additive property of Cauchy distribution	Constants of Beta distributions of second kind	Mean of lognormal distribution	Moments of Rayleigh distribution	Problems on truncated cauchy distribution
	SLO-2	Additive property of Cauchy distribution	Constants of Beta distributions of second kind	Variance of lognormal distribution	Moments of Rayleigh distribution	Properties of truncated normal distribution
S-17	SLO-1	Moments of Cauchy distribution	Relationship between other distribution	Applications of lognormal distribution	Applications of Rayleigh distribution	Properties of truncated normal distribution
	SLO-2	Moments of Cauchy distribution	Relationship between other distribution	Association between normal and lognormal distribution	Relationship between Rayleigh and other distributions	Applications of truncated normal distribution
S-18 to S-21	SLO-1	Problems on cauchy distribution	Beta distributions of First and second kind - problems	Problems on lognormal distribution	Problems on Rayleigh distribution	Applications of truncated normal distribution
	SLO-2					Problems on truncated normal distribution

Learning Resources	Text Books:			References:		
	1. Parimal Mukhopadhyay, (1996), Mathematical Statistics, New Central Book Agency 2. Goon, A.M., Gupta M.K and .Dasgupta B (1991): Fundamentals of Statistics, Vol.1, World Press, Calcutta			1. Hogg, R. V and Craig, A. T (2002), Introduction to Mathematical Statistics, Pearson Education Asia, India. 2. A.M.Mood, F.A. Graybill and D.C. Boes (1974): Introduction to the theory of Statistics, International student ed. McGraw Hill.		

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA_1 (10%)		CLA_2 (10%)		CLA_3 (20%)		CLA_4 (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr. M.Vasanth, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani,SRMIST

Course Code	UST23302J	Course Name	Sampling Distributions	Course Category	C	Dicipline Specific Core Course	L 3	T 0	P 3	O 2	C 4
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Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):		The purpose of learning this course is to:		
CLR-1 :	Explains the basic concepts of pgf, mgf and characteristic functions			
CLR-2 :	Understand central and Non-central χ^2 , t and F distributions.			
CLR-3 :	Finding the Distribution of empirical distribution function			
CLR-4 :	Examine the various properties of probability distribution.			
CLR-5 :	Find the joint distribution of two order statistics			

Learning			
1	2	3	
Bloom)	y (%)	t (%)	

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Knowledge	Concepts	Disciplines	Edge	Innovation	Knowledge									
Data														
Skills														
Prior														

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	Examine various types of discrete and continuous distributions and articulate their properties	3	85	80	H	H	M	M	M	M	M	H	M	M	L	M	M	M	M
CLO-2 :	Explains different sampling distributions	3	80	75	H	M	M	H	H	M	M	M	M	M	L	M	L	M	L
CLO-3 :	Find expressions for probability density function of sampling distribution	3	85	80	H	H	M	M	H	M	M	M	M	M	L	M	M	M	M
CLO-4 :	Solving problems related to several distributions	3	85	80	M	M	H	M	M	H	M	H	M	M	L	M	M	L	M
CLO-5 :	Explain the concept of order statistics	3	85	80	M	H	H	M	M	M	M	H	M	M	L	L	L	L	M

Duration (hour)	Learning Unit / Module 1 18	Learning Unit / Module 2 18	Learning Unit / Module 3 18	Learning Unit / Module 4 18	Learning Unit / Module 5 18
S-1	SLO-1 Sampling distribution - Introduction	Exact sampling distribution – Definition	Exact sampling distribution – Introduction	Derivation of snedecor's F – Distribution pdf	Introduction to order statistics
	SLO-2 Sampling Distribution of statistic	Derivation of pdf of Chi-Square with n degrees of freedom (d.f) using mgf	Students's t distribution - derivation	Constants of F- Distribution	Distribution of the r^{th} order statistic
S-2	SLO-1 Statistic Vs Parameter	Nature of pdf curve for different degrees of freedom	Fisher's t	Mode of F – Distribution	Smallest and largest order statistics
	SLO-2 Derivation of the sampling distribution of sample mean	Different mean	Distribution of Fisher's t	Point of inflexion of F - Distribution	Joint, marginal and conditional distributions of order statistics (Discrete and continuous)
S-3	SLO-1 Derivation of the sampling distribution of variance	Different variance	Nature of pdf curve with different degrees of freedom, Mean, variance, moments	Nature of pdf curve with different degrees of freedom, Mean, variance, mode	Functions of order statistics and Applications of order statistics
	SLO-2 Derivation of sampling distribution of proportion	mgf of chi- square distribution	Properties of student's t distribution	Distribution of /F (n1, n2)	General Properties
S-4 to S-6	SLO-1 Example for Sample Mean	Cumulant generating function of chi square distribution	Test for single mean	Chief features of F=F (n1, n2) Distribution	Conditional distribution of order statistics
	SLO-2 Example for sample variance	Limiting form of chi square distribution	t-test for difference of means	Applications of F- Distribution	Order statistics as a markov chain

Duration (hour)		Learning Unit / Module 1 18	Learning Unit / Module 2 18	Learning Unit / Module 3 18	Learning Unit / Module 4 18	Learning Unit / Module 5 18
S-7	SLO-1	Example for sample proportion	Characteristic function of chi-square distribution	Limiting form of t distribution	F test for equality of two population variances	Joint distribution of r^{th} and s^{th} order statistics
	SLO-2	Comparison of sample mean, variance and proportion	Mode and Skewness of chi square	Graph of t – distribution	F test for testing the significance of an observed sample correlation ratio	Distribution free confidence intervals for population quantiles
S-8	SLO-1	Standard errors of sample mean	Additive property of chi square variates	Critical value of t	F test for testing the significance of an observed multiple correlation coefficient	Distribution free tolerance intervals
	SLO-2	Standard errors of variance	Chi square probability curve	Applications of t- distribution	F test for testing the linearity of regression	Distribution free bounds for moments of order statistics and of range
S-9	SLO-1	Standard errors of sample proportion	Theorems on chi square distribution	Paired t-test for difference of means	F test for equality of several means	Approximations to moments in terms of quantile function and its derivatives
	SLO-2	Problems on Sampling distribution of sample mean	Applications of chi-square distribution	t test for testing the significance of an observed sample correlation coefficient	Other uses of F - Distribution	Lemma, uniformly most powerful tests
S-10 to S-12	SLO-1	Problems on Sampling distribution of sample mean	Problem on chi square test of goodness of fit	Example and Problems	Procedure for different F – tests	Moments of order statistics
	SLO-2	Problems on Sampling distribution of sample Variance	Problem on chi square test for independence of attributes	T test for testing the significance of an observed regression coefficient	Problems for F -distributions	Recurrence relation and identities for moments of order statistics.
S – 13	SLO-1	Problems on Sampling distribution of sample Variance	Degrees of freedom	Example problems	Confidence interval based on t distribution	Distribution of sample median and sample range
	SLO-2	Problems on Sampling distribution of sample proportion	2 X 2 contingency table	t test for testing the significance of an observed Partial correlation coefficient	Confidence interval based of F distribution	Large sample approximations to mean and variance of order statistics
S-14	SLO-1	Problems on Sampling distribution of sample proportion	Example for 2 X 2 contingency table	Example problems	Test of significance based on t distribution	Asymptotic distributions of order statistics
	SLO-2	Theorems on sampling distribution	Chi square test for the population variance	Confidence interval for difference of means (small samples) - procedure	Test of significance based on F distribution	Order statistics for independently and not identically distributed variates
S-15	SLO-1	Central limit theorem	Yates correction	Problem using confidence interval	Relation between t and F distributions	Concomitants of order statistics
	SLO-2	Applications	Test for equality of several population proportion	Sawkin's method - introduction	Relation between F and Chi square distributions	Random division of an interval and its applications
S-16 to S-18	SLO-1	Problem on central limit theorem	Problem on Chi square test for the population variance	Distribution of sample correlation coefficient when population correlation coefficient is zero (sawkin's methods)	Problems on t and F distributions	Order statistics from a sample containing a single outlier
	SLO-2	Properties of central limit theorem	Problem on Test for equality of several population proportion	Example problem – Sawkin's method	Problems on F and Chi square Distributions	Concepts of record values and generalized order statistics

Learning Resources	Text Books:			References:		
	- Goon, A.M., Gupta, M.K. and Dasgupta, B. (2003). An Outline of Statistical Theory, Vol. I, 4th Ed., World Press, Kolkata. - Hogg, R.V. and Tanis, E.A. (2009). A Brief Course in Mathematical Statistics. Pearson Education.			- Mood, M.A., Graybill, F.A. and Boes, C.D. (2007). Introduction to the Theory of Statistics, 3rd Ed., (Reprint).Tata McGraw-Hill Pub. Co. Ltd. - Rohatgi, V. K. and Saleh, A.K. Md. E. (2009). An Introduction to Probability and Statistics, 2nd Ed., (Reprint) John Wiley and Son		

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasantha, ICMR, Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani, SRMIST

Course Code	UST23303T	Course Name	Real Analysis and Matrix Algebra	Course Category	C	Dicipline Specific Core Course	L	T	P	O	C
							4	0	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):		The purpose of learning this course is to:			Learning			Program Learning Outcomes (PLO)														
CLR-1 :	Understand the concept of types of sequence.				1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Learn the Cauchy's general principle of convergence.				Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-3 :	Understand the role of mean value theorem in series.																					
CLR-4 :	Calculate the Taylor's series and Maclaurin's series.																					
CLR-5 :	Learn the concept of vector spaces and matrices.																					
CLR-6 :	Understand the concept of eigen values and eigen vectors and Cayley Hamilton Theorem.																					
Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:																				
CLO-1 :	Gain an insight on real field.				3	80	75	M	L	H	H	M	H	M	M	M	M	L	M	L	L	L
CLO-2 :	Be familiar with limits and bounds of sequence				3	85	80	M	M	H	H	M	H	M	M	M	L	L	M	L	L	L
CLO-3 :	Improve the knowledge in convergence of series				3	85	80	M	H	M	H	M	M	H	L	L	M	L	M	L	L	L
CLO-4 :	Apply the derivatives in Taylor series expansion of various functions				3	85	80	M	H	M	H	M	M	H	L	L	M	L	M	L	L	L
CLO-5 :	Gain knowledge in Vector spaces.				3	85	80	L	H	M	H	L	H	M	L	L	M	L	M	L	L	L

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module4	Learning Unit / Module 5
		12	12	12	12	12
S-1	SLO-1	Definition of a sequence	Infinite series	Review of limit	Vector spaces	Characteristic equation
	SLO-2	limit Representation of real numbers as points on the line	positive termed series and their convergence	Review of limit	Vector spaces	Characteristic equation
S-2	SLO-1	limit Representation of real numbers as points on the line	comparison test	continuity and differentiability	subspaces	Characteristic equation, problems
	SLO-2	the set of real numbers as complete ordered field.	simple problems	Differentiability of limit	subspaces	Characteristic equation, problems
S-3	SLO-1	set of real numbers as complete ordered field.	D'Alembert's ratio test	uniform continuity	linear independence and dependence	eigen values, eigen vectors
	SLO-2	Simple problems	D'Alembert's ratio test based problems solved	simple problems based on the above concepts	linear independence and dependence	Problems based on distinct eigen values,
S-4	SLO-1	Bounded and unbounded sets,	Cauchy's nth root test,	bounded ness of a function	basis and dimension of a vector space	Problems based on distinct eigen values

Duration (hour)	Learning Unit / Module 1		Learning Unit / Module 2		Learning Unit / Module 3		Learning Unit / Module 4		Learning Unit / Module 5	
	12		12		12		12		12	
	SLO-2	simple problems on Bounded and unbounded sets,		Cauchy's n th root test,		bounded ness of a function		basis and dimension of a vector space		Problems based on repeated eigen values
S-5	SLO-1	neighbourhoods and limit points		Rabies test definition given and concept explained		Roll's theorems definition given and concept explained		orthogonal and orthonormal bases		Problems based on repeated eigen values
	SLO-2	simple problems		Rabies test based problems solved		Roll's Theorems based problems		orthogonal and orthonormal bases		Simple properties
S-6	SLO-1	neighbourhoods and limit points		Gauss test		Problems based on Roll's theorems		examples of vector spaces over real and complex fields		Cayley - Hamilton theorem
	SLO-2	simple problems		definition given and concept explained Gauss test		Lagrange's Mean Value theorems		examples of vector spaces over real and complex fields		Problems based on order 2 -Verification of CHT
S-7	SLO-1	definition given and concept explained Supremum and infimum, derived sets,		Definition given and concept explained Cauchy's condensation test		Lagrange's Mean Value Theorems based problems		linear equations and their solutions		Problems based on order 3 -Verification of CHT
	SLO-2	Supremum and Infimum, derived sets,		Cauchy's condensation test simple problems		Lagrange's Mean Value Theorems based problems		linear equations and their solutions		Problems based on order 3 -Verification of CHT
S-8	SLO-1	definition given and concept explained open and closed sets		Absolute convergence of series		Taylor's theorem		Elementary matrices		Finding the inverse of matrix using Cayley - Hamilton theorem
	SLO-2	open and closed sets		definition given and concept explained, Absolute convergence of series		Taylor's Theorem based problems		special types of matrices		Finding the inverse of matrix using Cayley - Hamilton theorem, order 2 problems
S-9	SLO-1	sequences and their convergence		integral (statements and Examples only)		lagrange's and Cauchy's form of remainder (without proof)		transpose of a matrix		Finding the inverse of matrix using Cayley - Hamilton theorem, order 3 problems
	SLO-2	limits of some special sequences		Absolute convergence of series, problems		lagrange's and Cauchy's form of remainder based problems		trace of a matrix and its properties		Finding the inverse of matrix using Cayley - Hamilton theorem, order 3 problems
S-10	SLO-1	limits of some special sequences such as Cauchy's general principle of convergence		simple problems		lagrange's and Cauchy's form of remainder based problems		determinants and their properties		Diagonalization by orthogonal transformation
	SLO-2	Cauchy's first theorem on limits		Leibnitz's test for the convergence of alternating series		Simple problems on Lagrange's and Cauchy's form of remainder problems		determinants and their properties-problems		Definition and Formulas
S-11	SLO-1	monotonic sequences		Leibnitz's test for the convergence of alternating series		Meclaurin's series expansion of $\sin x$, $\cos x$, of one variable only		rank and inverse of a matrix		Diagonalization by orthogonal transformation, - order 2 problems
	SLO-2	limit superior and limit inferior of a bounded sequence		Conditional convergence, Indeterminate form, L'Hospital's rule		Meclaurin's series expansion of e^x ,		rank and inverse of a matrix-problems		Diagonalization by orthogonal transformation, order 2 problems
S-12	SLO-1	limit superior and limit inferior of a bounded sequence.		L'Hospital's rule, definition given and concept explained L'Hospital's rule		Meclaurin's series expansion of $\log(1+x)$		rank and inverse of a matrix-problems		Diagonalization by orthogonal transformation, order 3 problems
	SLO-2	simple problems		simple problems		simple problems		Elementary properties		Diagonalization by orthogonal transformation, order 3 problems

Learning Resources	Text Books:		References:
	1. Shanti Narayan and Dr. M.D. Raisinghania, Elements of Real Analysis, S. Chand publications, Reprint 2017		
	2. Shanti Narayann (1991). A Text books of Matrices. S. Chand & Co. Delhi.		
			1. Rao, C.R. & Bhimasankaran, P. (1992): Linear algebra, Tata McGraw Hill Pub. Co. Ltd.

	Learning Assessment										
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	-	30%	-	30%	-	30%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	30%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasanth, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani,SRMIST

Course Code	ULT23AE1J	Course Name	Applied Tamil – I	Course Category	AE	Ability Enhancement Course	L	T	P	O	C
							1	0	2	2	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Tamil	Data Book / Codes/Standards			Nil

Course Learning Rationale (CLR): The purpose of learning this course is to:

CLR-1 :	தமிழின் எழுத்து, சொல் வளர்ச்சி வரலாற்றை அறியச் செய்தல்
CLR-2 :	மொழியைப் பிழையின்றி எழுதும் ஆற்றலை அடையச் செய்தல்
CLR-3 :	வாய்மொழி வழக்காறுகளின் நுட்பங்களைத் தெரியச் செய்தல்
CLR-4 :	கடிதம் எழுதும் முறை, கட்டுரை வரையும் முறை அறியச் செய்தல்
CLR-5 :	படைப்பாற்றல் திறனை வளரச் செய்தல்

Learning

1	2	3
Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
2	75	60
2	80	70
2	70	65
2	70	70
2	80	70

Program Learning Outcomes (PLO)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
H	L	H	M	H	H	L	M	H	M	L	H	-	-	-
H	M	H	L	M	H	L	H	M	L	H	H	-	-	-
H	L	H	M	H	H	M	H	L	H	M	H	-	-	-
H	M	H	L	H	M	M	H	H	L	H	H	-	-	-
H	M	H	H	M	H	L	M	H	L	H	H	-	-	-

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:

CLO-1 :	சொற்களைச் சரியான பொருண்மையில் பயன்படுத்தும் திறன் பெறுதல்
CLO-2 :	மொழியைப் பிழையின்றி எழுதுவதன் வழி மொழி ஆளுமை பெறுதல்
CLO-3 :	வாய்மொழி மரபின் கூறுகள் வழி, மக்களின் வாழ்வியல் விழுமியங்களை அறிந்துகொள்ளுதல்
CLO-4 :	அலுவலகப் பயன்பாடு, திறன் மேம்பாடு ஆகியவற்றை நுட்பமாகத் தெரிந்துகொள்ளுதல்
CLO-5 :	கவிதை, கதை படைக்கும் ஆற்றலை அறிந்துகொள்ளுதல்

Duration (hour)	9	9	9	9	9
S-1	SLO-1	தமிழின் தொன்மை	மெய்யெழுத்துகளின் வகைகள்	வாய்மொழி மரபு, எழுத்து மரபு	தொடர் அமைப்பு
	SLO-2	தமிழின் சிறப்புகள்	மூவினம்	வாய்மொழி மரபில் அனுபவம்	எளிய தொடர்
S-2	SLO-1	கருத்து - பரிமாற்றம்	ஒற்று இடுதல்	வாழ்வியல் தத்துவம்	நெடுந்தொடர்
	SLO-2	பயன்பாட்டுத்தமிழ்	வல்லினம் மிகும் இடங்கள்	பழமொழிகள்	பத்தி எழுதுதல்
S-3	SLO-1	காலந்தோறும் தமிழ்	வல்லினம் மிகா இடங்கள்	பழமொழியும் மனித வாழ்வியலும்	ஒரு பொருளை மையமாகக் கொண்டு எழுதுதல்
	SLO-2	எழுத்துகள் - அறிமுகம்	எழுத்துப்பிழை நீக்கம்	பழமொழியின் வடிவம்	காலந்தோறும் கடிதங்கள்

S-4	SLO-1	தமிழ் எழுத்து வரலாறு	பிழை நீக்கி எழுதுதலின் அவசியம்	வட்டார மொழி	தமிழில் கடித இலக்கியம்	கவிதை உள்ளடக்கம்
	SLO-2	எழுத்துகளின் வரிவடிவம்	பிழைகளும் மொழிச் சிக்கல்களும்	வட்டார மொழியில் சொல்வடை	கடித வகைகள்	கவிதை எழுதும் முறை
S-5	SLO-1	எழுத்துகளின் பிறப்பு	எதிர்ச்சொல் வரலாறு	பழமொழியும் சொல்வடையும்	கடிதம் எழுதும்முறை	தன்னுணர்ச்சிக் கவிதை
	SLO-2	உயிர் எழுத்துப் பிறப்பு	எதிர்ச்சொல்லின் உருவாக்கம்	பேச்சுநடையும் சொல்வடையும்	அலுவல் கடிதம்	இயற்கை/ சமூகம் - கவிதை
S-6	SLO-1	மெய்யெழுத்துப் பிறப்பு	இணைச்சொல்லும் எதிர்ச்சொல்லும்	மரபுத்தொடர்	வாழ்த்து/ பாராட்டுக் / நட்புக் கடிதம்	காலந்தோறும் கதைகள்
	SLO-2	மொழி முதல் எழுத்துகள்	தமிழில் எதிர்ச்சொற்கள்	பழமொழி மரபுத் தொடர் வேறுபாடு	கட்டுரை வகைகள்	கதைகளில் கற்பனையும் உண்மையும்
S-7	SLO-1	மொழி இறுதி எழுத்துகள்	ஒரெழுத்து ஒருமொழி - அறிமுகம்	தமிழில் மரபுத்தொடர்	கட்டுரை எழுதும் முறை	வாய்மொழிக் கதை
	SLO-2	எழுத்து வேறுபாடும் பொருளும்	ஒரெழுத்து ஒருமொழியும் பொருளும்	விடுகதை	கட்டுரைக் களங்கள்	ஒரு பக்கக் கதை
S-8	SLO-1	ணகர - னகர - நகர வேறுபாடு	சொற்களின் தன்மைகள்	நுண்ணறிவு வெளிப்படுத்தல்	போட்டிக் கட்டுரை	சிறுகதை
	SLO-2	லகர - ளகர - ழகர வேறுபாடு	ஒரு சொல் பல பொருள்	கதை மரபில் நாட்டுப்புறக் கதைகள்	அனுபவக் கட்டுரை	கதை எழுதும் முறை
S-9	SLO-1	சொல்லும் பொருளும்	ஒரு பொருள் பல சொல்	தமிழில் நாட்டுப்புறக் கதைகள்	பயணக் கட்டுரை	சமூக உணர்வின் வெளிப்பாடு
	SLO-2	காலந்தோறும் சொற்கள்	சொல் உருவாக்கத்தின் பயன்கள்	நாட்டுப்புறக் கதைகளும் சமூக வரலாறும்	இதழியல் கட்டுரைகள்	நிகழ்வைக் கதை வழியே வெளியிடல்

Learning Resources	1. நல்ல தமிழ் எழுத வேண்டுமா?, அ. கி. பரந்தாமனார், பாரி நிலையம், 2010. 2. நாட்டுப்புற இயல் ஆய்வு, சு. சக்திவேல், மணிவாசகர் பதிப்பகம், சென்னை, 2006. 3. படைப்புக்கலை, மு. சுதந்திரமுத்து, அறிவுப் பதிப்பகம், சென்னை, 2008. 4. கதையியல், க. பூரணச்சந்திரன், அடையாளம் பதிப்பகம், சென்னை, 2012. 5. இணைய வழித் தரவுகள் : https://tamilheritage.org/
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	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	30%	30%	30%	30%	20%	20%	20%	20%	30%	-
Level 2	Apply Analyze	40%	50%	50%	40%	50%	50%	50%	50%	50%	-
Level 3	Evaluate Create	30%	20%	20%	30%	30%	30%	30%	30%	20%	-
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
1. Dr. P.R.Subramanian, Director, Mozhi Trust, Thiruvanniyur, Chennai – 600 041.	1. Dr. V. Dhanalakshmi, Associate Professor, Subramania Bharathi School of Tamil Language & Literature, Pondicherry University, Pondicherry	1. Dr. B.Jaiganesh, Associate Professor & Head, Dept. of Tamil, FSH, SRMIST, KTR
		2. Dr. R. Ravi, Assistant Professor and Head, Dept. of Tamil, FSH, SRMIST, VDP.
		3. Mr. G. Ganesh, Assistant Professor, Dept. of Tamil, FSH, SRMIST, RMP.
		4. Dr. T.R.Hezbibah beulah Suganthi, Assistant Professor, Dept. of Tamil, FSH, SRMIST, KTR.
		5. Dr. S.Saraswathy, Assistant Professor, Dept. of Tamil, FSH, SRMIST, KTR.

Course Code	ULH23AE1J	Course Name	APPLIED HINDI-I	Course Category	AE	Ability Enhancement Course	L	T	P	O	C
							1	0	2	2	2
Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil						
Course Offering Department	HINDI	Data Book / Codes/Standards				Nil					
Course Learning Rationale (CLR):	The purpose of learning this course is to:										
CLR-1 :	Explain and appreciate the Constant moral values of India										
CLR-2 :	Focus on Evaluating the social changes through prose										
CLR-3 :	To Display moral and social values in the field of religion and communal Unity										
CLR-4 :	To make translation of good literature and any relevant document from the Hindi Language to English and vice –versa										
CLR-5 :	To help the learners to tackle Administrative terminology										
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:										
CLO-1 :	Understand the various forms of Prose and different aspects of social issues										
CLO-2 :	To create an awareness on Ramayanan										
CLO-3 :	To Examine the accuracy in Translation										
CLO-4 :	To Provide technical writing skills										
CLO-5 :	To evaluate the nuance in essays										
Duration (hour)	9	9	9	9	9						
S-1	SLO-1	KAHANI	NIBANDH	BAL RAMAYAN	ANUVAD	PARIBHASHIK SHABDAVALI					
	SLO-2	AVDHARNA	AVDHARNA	KHATHA VASHTU	AVDHARNA	ARTH					
S-2	SLO-1	ARTH	ARTH	AVADHPURI MEN RAM	ARTH	PARIBHASHA					
	SLO-2	SWARUP	SWARUP	RAM KE ADARSH KE PRATI PRERIT KARNA	SWARUP	SWARUP					
S-3	SLO-1	PARIBHASHA	PARIBHASHA	RAMAYAN KE PRATI RUCHI JAGANA	PARIBHASHA	PRAKAR					
	SLO-2	KAHANI KE TATVA	MAHABHARAT KE SAMAY KA BHARAT-BHALKRISHNA BHATT	RAMAYAN KA SAMAJ MEN MAHATVA	PRAKAR	AVADHARNA					
S-4	SLO-1	UDDESHYA	LEKHAK PARICHAYA	LOKJEEVAN KE PRATI JAGRUP KARNA	MAHATVA	PRAYOJAN					
	SLO-2		PATH KA VISLESHAN	JANGAL AUR JANKPUR	UDDESHYA	UDDESHYA					
S-5	SLO-1	ANTASH MAN KI JAGRITI	UDDESHYA	GURU KE PRATI ADAR BHAV	ANUBAD PRAKRIYA	MAHATVA					
	SLO-2	EIDGAH – KAHANI PREMCHAND	SAMAJIK SAMRASTA	VIRTA KE BHAV KO JAGANA	VIVIDH PRAYOG	PRAYOG					
S-6	SLO-1	KAHANI KA PARICHAYA	PAURANIK KAHANIYO SE AVAGAT KARANA	VIDHARM KA PRATIFAL	HINDI SE ANGREZI ANUVAD	UDDESHYA					
	SLO-2	KAHANI VISLESHAN	MAHABHARAT EVAM RAMAYAN KE SAMAJ KI TULNA	VAN JEVAN SE AVAGAT KARANA	ANGREZI SE HINDI ANUVAD	TAKANIKI SHABDAVALI KA MHATVA					
S-7	SLO-1	BAL MANOVIGYAN	BABUL AUR KAKTASH-RAMDARASH MISHRA	SITA KE ADARSH CHARITRA SE AVAGAT KARANA	ANUVAD KA PRAYOJAN	HINDI SE ANGREZI SHABD					
	SLO-2	ASMANTA KA CHITRAN	LEKHAK PARICHAY	RAM KE CHARITRA SE AVAGAT KARANA	ANUVAD KA PRAYOG	ANGREZI SE HINDI SHABD					

S-8	SLO-1	DIP SE DIP JALE- USHA YADAV	PATH KA VISLESHAN	VIRTA KE BHAV JAGANA	SHROT BHASHA KA GYAN	EK DIN EK SHABD
	SLO-2	SAPNE KE LIYE SANGHARSH	MANVATA KO JIVIT RAKHANE KI PRERNA	PATH KA VISLESHAN	LAKSHYA BHASHA KA GYAN	SHABDON KA VISLESHAN
S-9	SLO-1	SAMASYA KA SMADHAN JAD MEN HOTA HAI	AAJ KE SANDARBH ME MAHABHARAT KI UPYOGITA	PATH PRICHARCHA	ANUVAD KA DAYITVA	PATH PRICHARCHA
	SLO-2	PRASHNABHAYASH	PRASHNABHAYASH	PRASHNABHAYASH	ANUVAD KA ABHYASH	PRASHNABHAYASH

Learning Resources	Edited Book: "PRAYOJAN MULOK HINDI", SRIJONLOK PUBLICATION, 2023, New Delhi.		PUNRIKSHAN
	1. Srijanlok Literary Magazine, Ara (Bihar – 802301) 2. https://hindisamay.com/ 3. https://ncert.nic.in/textbook.php?fhbr1=0-12 4. Prayojan mulak Hindi, Dr. Sontakke 5. https://rajbhasha.gov.in/hi/ol_clause		

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	30%	30%	30%	30%	20%	20%	20%	20%	30%	-
Level 2	Apply Analyze	40%	50%	50%	40%	50%	50%	50%	50%	50%	-
Level 3	Evaluate Create	30%	20%	20%	30%	30%	30%	30%	30%	20%	-
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Shri. Santosh Kumar Editor : Srijanlok Magazine Place: Vashishth Nagar, Ara – 802301	1. Prof.(Dr.) S.Narayan Raju, Head, Department of Hindi, CUTN, Tamilnadu	1. Dr.S Preeti. Associate Professor & Head, SRMIST
		2. Dr. Md.S. Islam Assistant Professor, SRMIST
		3.Dr. S. Razia Begum, Assistant Professor, SRM IST
		4. Dr.Nisha Murlidharan Assistant Professor, VDP,SRM IST

Course Code	ULF23AE1J	Course Name	French for Specific purpose-I	Course Category	AE	Ability Enhancement Courses (AE)	L	T	P	O	C
							1	0	2	2	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	French	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)
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CLR-1 :	Strengthen the language of the students both in oral and written
CLR-2 :	Express their sentiments, emotions and opinions, reacting to information, situations
CLR-3 :	Make them learn the basic rules of French Grammar.
CLR-4 :	Develop strategies of comprehension of texts of different origin
CLR-5 :	Enable the students to overcome the fear of speaking a foreign language and take position as a foreigner speaking French

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:
CLO-1 :	To acquire knowledge about French language
CLO-2 :	To strengthen the knowledge on concept, culture, civilization and translation of French
CLO-3 :	To develop content using the features in French language
CLO-4 :	To interpret & Translate the French language into other language
CLO-5 :	To improve the communication, intercultural elements in French language

1	2	3
Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
2	75	80
2	80	90
2	75	80
2	75	90
2	80	75

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
H	M	H	H	M	H	H	L	M	M	H	L	-	-	-
M	H	L	H	H	M	H	M	L	L	H	M	-	-	-
H	H	L	M	H	M	L	H	M	M	H	H	-	-	-
H	L	M	H	M	H	H	M	L	H	M	L	-	-	-
M	H	H	L	M	M	H	H	M	L	H	M	-	-	-

Duration (hour)	9	9	9	9	9
S-1	SLO-1	TP de chimie	Le jour des examens	L'impératif négatif	Comprendre une lettre de motivation
	SLO-2	Les exemples	Les activités	-Le passé composé avec être	Comprendre la structure d'un rapport de stage
S-2	SLO-1	-Un TP au laboratoire-	Le sms à la française -	Les exemples	Trouver des mots clés-
	SLO-2	Les exemples	Les activités	Le passé composé des verbes pronominaux	Repérer le présent
S-3	SLO-1	Comprendre un TP	Les examens	Le passé composé des verbes pronominaux	Les activités
	SLO-2	Les exemples	Les activités	-La recherche de stage -	Comprendre un texte technique-
S-4	SLO-1	-Suivre un protocole expérimental -	Les exemples	Les activités	Le passé composé et
	SLO-2	Les activités	Les exemples	Le stage en France	Les activités

S-5	SLO-1	Lire des équations chimiques -	-Écrire et comprendre un sms -	Les activités	- Le rapport de stage et le domaine des carburants -	Les exemples
	SLO-2	Les activités	Comprendre une interdiction	Le CV français	Les activités	Les activités
S-6	SLO-1	Identifier des formules chimiques à l'oral	Les activités	Les exemples	Le stage	Les activités
	SLO-2	Les exemples	-Donnez des consignes -	La lettre de motivation-	Les exemples	Les pronoms COI
S-7	SLO-1	- L'infinifit pour exprimer un ordre ou	Les exemples	Comprendre une offre de stage	La méthode du plan détaillé-	Les exemples
	SLO-2	Les activités	Comprendre	Les exemples	Les activités	Les exemples
S-8	SLO-1	un conseil (dans les consignes) -	Les exemples	Les activités	Les exemples	Les activités
	SLO-2	Les exemples	et parler d'actions passées-	Comprendre et réaliser un CV	Le contenu du rapport de stage	Quelques verbes et leur préposition
S-9	SLO-1	La nominalisation	Les exemples	Les activités	Les exemples	Les activités
	SLO-2	Les exemples	L'impératif des verbes pronominaux	Les exemples	Les activités	Les exemples

Learning Resources	Theory:	
	1. "Tech French" French for Science and Technology, Ingrid Le Gargasson, Shariva Naik, Claire chaize, Les éditions Didier, India, 2011. 2. https://www.fluentu.com/blog/french/french-grammar 3. https://www.elearningfrench.com/learn-french-grammar-online-free.html 4. https://www.lawlessfrench.com/grammar 5. https://blog.gymglish.com/2022/12/15/basic-french-grammar	

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (5%)#		Theory	Practice
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice		
Level 1	Remember	30%	30%	30%	30%	20%	20%	20%	20%	30%	-
	Understand										
Level 2	Apply	40%	50%	50%	40%	50%	50%	50%	50%	50%	-
	Analyze										
Level 3	Evaluate	30%	20%	20%	30%	30%	30%	30%	30%	20%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
1. Mr. Kavaskar Danasegarane Process Expert Maersk Global Service Center Pvt. Ltd	1. Dr. C. Thirumurugan Professor, Department of French, Pondicherry University	1. Mr. Kumaravel K. Assistant Professor & Head, SRMIST, KTR
2.Mr. Sharath Raam Prasad		2. Mrs. Abigail, Assistant Professor, SRMIST, VDP

Character Designer, Animaker Company Pvt.		
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Course Code	UST23G01J	Course Name	R Programming	Course Category	G	Generic Elective Course	L	T	P	O	C
							3	0	2	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)
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CLR-1:	Learn R Environemntal setup and R packages	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2:	Learn how to start looking at data from the perspective of the data scientist	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-3:	Experimenting with different data pre-processing techniques for knowledge discovery				H	H	H	M	M	M	M	M	M	M	L	M	M	M	M
CLR-4:	Experimenting with userdefiend function in R programming				H	H	H	M	M	M	M	M	M	M	L	M	M	M	M
CLR-5:	Use R software for data import and export, data exploration and visualization, and for data analysis tasks				H	H	H	M	M	M	M	M	M	M	L	M	M	M	M
CLR-5:	Use R software for data import and export, data exploration and visualization, and for data analysis tasks				H	H	H	M	M	M	M	M	M	M	L	M	M	M	M
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1:	Understand the fundamental concepts and applications of R Language	2	85	80															
CLO-2:	Analyze the basic principles of Controls statements , functions and arrays	3	85	80															
CLO-3:	Learn various data structures and their functions	3	85	80															
CLO-4:	Learn about Exploratory Data Analysis Process	3	85	80															
CLO-5:	Apply data visualization techniques for various dataset	3	85	80															

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Introduction to R Programming	Control statements: IF, IF...ELSE	R-Function	Importing Files: CSV,xls,text files	Overview of Data Visualization in R
	SLO-2	Essentials of the R Language	SWITCH Statement	Creating Function, Calling function, passing Arguments	Loading and handling Dataset in R	Data Visualization Packages

S-2	SLO-1	Getting Started with R: Installation of R & R Studio	Looping statements: FOR, WHILE	Built in functions: mean(), paste(),	Getting and Setting the Working Directory – getwd(), setwd()	Interactive Graphics
	SLO-2	R Packages	REPEAT LOOP	sum(), min(), max(), seq()	Standard Deviation, Skewness, Kurtosis, Bivariate Quantitative Analysis – Crosstabs, Covariance, Correlation, Data Manipulation in R	Working with Graphs: Creating and saving graphs, Customizing symbols, lines, colors, and axes Annotating with text and titles Controlling a graph's dimensions, Combining multiple graphs into one
S-3	SLO-1	Installing Packages	Control Statement: break statement, next statement	user-defined function	List Management Data Transformation	Plotting, Scatter plot, Line Plot
	SLO-2	Loading Libraries	Working with String & Date functions	Data Manipulation	Merging Data Frames Outlier Detection Combining multiple vector	R – Bar Charts & Box Plot: Bar Chart Labels, Title and Colors.
S-4-5	SLO-1 SLO-2	Lab 1: Implementation to install R & R Studio and install & load packages	Lab 5: Implementation of Control Statements & Looping Statements in R	Lab 7: Implementation of R Function	Lab :9 Implementation of Data Manipulation in R	Lab 13: Implementation of data visualization in R
S-6	SLO-1	Working with R Environment Setup	R Data Structure	Manipulating Text in Data: substr(), strsplit(),	Introduction to Data Preprocessing in R	- R –Pie Charts: Pie Chart title and Colors – Slice Percentages and Chart Legend, 3D Pie Chart
	SLO-2	R Script	R Vectors – Sequence vector, rep function, vector access,	paste(), grep(), toupper(), tolower()	Steps for Data Pre-processing in R	R Histograms – Density Plot,
S-7	SLO-1	Basic Syntax	R List - Creating a List, List, Add/Delete Element List, Size of List, Merging Lists, Accessing element in the List	Data Aggregation	Handling Missing Values: is.na(), is.nan	Kernel density plots, Violin plots, Heat maps
	SLO-2	Variables in R	R Matrices: Creating Matrixes, Accessing Elements of a Matrix,	Data Summarization	na.omit, na.exclude, na.pass, na.fail	Regression Analysis - Simple Linear Regression
S-8	SLO-1	Variable Assignment	Matrix Computations: Addition, subtraction, Multiplication and Division	Apply Family: apply(), lapply(), sapply()	Exploratory Data Analysis, Types of EDA	Multiple Regression
	SLO-2	Data types and R Objects	R Arrays: Naming Columns and Rows, Accessing Array Elements, Manipulating Array Elements, Calculation Across Array Elements	tapply(), mapply()	Descriptive Statistics : min(), max(), range(), mean(),	Logistic Regression
S-9,10	SLO-1 SLO-2	Lab:2 Implementation of data types in R	Lab 6: Implementation of Vector & List	Lab 7: Implementation of R Function	Lab :10 Implementation of R Program to handle missing values for real-time dataset	Lab 14: Implementation of various charts for categorical data and box plot
S-11	SLO-1	Working with files: Read and writing into different types of files	Data Frames –Create Data Frame, Data Frame Access	split() Function, by()	median(), quartile ()	Poisson Regression
	SLO-2	Comments in R	Understanding Data in Data Frames: dim(), nrow(), ncol(), str(), Summary(), names(), head(), tail(), edit() functions - Extract Data from Data Frame	Working with Tables	Measures of Central Tendency: Mean, Median, Mode	Visualizing bivariate and multivariate relationships
S-12	SLO-1	Saving in R data, Loading R data objects, Writing to files	Expand Data Frame: Add Column, Add Row - Joining columns and rows	Matrix/Array-Like Operations on Tables	Measures of Dispersion	Understanding correlograms

	SLO-2	Data sorting , Data aggregation	Data frame rbind() and cbind()	Extracting a Sub table, Table-Related Function	Standard Deviation, Bivariate Quantitative Analysis	Using mosaic and association plots
S-13	SLO-1	R Operators: Arithmetic operators, Assignment operators	Merging Data frames merge() – Melting and Casting data melt(), cast().	Data Merging in R	Skewness ,Kurtosis	Identification of missing data
	SLO-2	Comparison operators, Logical operators,Miscellaneous operators	R Factors –creating factors, generating factor levels	Working with dplyr packages	Crosstabs, Covariance , Correlation,	Visualization of missing data patterns
S-14- S-15	SLO-1 SLO-2	Lab: 3 Implementation of operators in R	Lab 6: Working with Data frames & Factor using historical data	Lab 8: Implementation of Data merging operations for real-time data set.	Lab :12 Implementation of Descriptive Statistics	Lab:15: Implementation of Data Visualization for missing data patterns

Learning Resources	Text Books:			References:		
	1. Roger D. Peng, "R Programming for Data Science", 2012 2. Norman Matloff, "The Art of R Programming- A Tour of Statistical Software Design", 2011			1. Robert I. Kabacoff, "R in Action Data Analysis and Graphics with R", Manning Publications, 2011. 2. Tony Fischetti Data Analysis with R, Packt Publishing; 2nd edition,2018		

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasanth, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani,SRMIST

Course Code	UST23S01L	Course Name	MS Excel For Statistical Analysis	Course Category	S	Skill Enhancement course	L	T	P	O	C
							0	0	2	2	1

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning			Program Learning Outcomes (PLO)														
CLR-1 :	Categorize data in an easy-to-navigate manner	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Do basic and complex mathematical functions	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-3 :	Turn lots of data into helpful graphics and charts.																		
CLR-4 :	Analyze data and make forecasting predictions																		
CLR-5 :	Create, build, and edit pixilated images																		
CLR-6 :	easily create dashboards, reports, interfaces, charts and formatted data																		
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1 :	Construct formulas, including the use of built-in functions, and relative and absolute references.	2	85	80	M	H	M	M	H	M	M	H	M	M	L	M	M	M	M
CLO-2 :	Enter and edit data.	3	85	80	M	M	H	M	H	M	M	H	M	M	L	M	M	M	M
CLO-3 :	Indicate the names and functions of the Excel interface components.	3	85	80	M	H	M	M	H	M	M	H	M	M	L	M	M	M	M
CLO-4 :	Using Statistical tools to analyze data	3	85	80	M	H	M	M	H	M	M	H	M	M	L	M	M	M	M
CLO-5 :	Preview and print worksheets.	3	85	80	H	M	M	M	H	M	M	H	M	M	L	M	M	M	M

Duration (hour)	Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
	6	6	6	6	6
S-1	SLO-1 Introduction to MS Excel	Introduction to functions	Introduction to spreadsheet	Introduction to statistical measure	Introduction to dashboards in excel
	SLO-2 Working in MS Excel	Knowning functions such as number, text or date filter	Entering data in spreadsheet	Types of statistical measures	Dahboards appllication
S-2	SLO-1 Spreadsheet application	Logical functions	Editing data in spreadsheet	Mean and variance	Uses of dashboard in excel
	SLO-2 Formatting sheets	Date function	Impoting data from web filtering	Percentiles and quartiles	Excel data presentation library
S-3	SLO-1 Manipulating of texts	time functions	Sorting data in excel	Types of correlation	Application of presentation
	SLO-2 Using excel shortcuts	Information function	Different sorting techniques	Pearson correlation	Elements in excel dashboard
S-4	SLO-1 Formating cells using shortcuts	Mathematical functions	Creating Hyperlinks	Spearman's rank correlation	Uses of the elements in dashboard
	SLO-2 Formating cells using pasre special options	Trignometrical functions	Different ways to use hyperlinks	Parametric tests	Decision support system
S-5	SLO-1 Protecting celss with or without password	Other informative functions	Cell referencing	Non – parametric tests	Introduction to VBA code in Macro
	SLO-2 Unprotecting cells with or without password	Statistical function	Numeric formats	Introduction to ANOVA	Editing in VBA code in Macro
S-6	SLO-1 Page layout	Text functions	Array formula in excel	One way ANOVA	Writing a VBA code in Macro
	SLO-2 Printing properties in excel	Graph and diagrams	Set print area	Working of one way ANOVA	Saving in Macro

Learning Resources	Text Books: 1. Curtis Frye (2016): Microsoft Excel 2016 Step by Step by, Microsoft press	References: 1. Bernd Held (2006): Microsoft Excel Functions & Formulas, Wordware Publishing, Inc. 2. Jordan Gold Meier and PurnachandraDuggirala (2015): Dashboards for excel, Apress.

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	-	40%		30%	-	30%	-	30%	-	30%
	Understand	-	40%		30%	-	30%	-	30%	-	30%
Level 2	Apply	-	40%		40%	-	40%	-	40%	-	40%
	Analyze	-	40%		40%	-	40%	-	40%	-	40%
Level 3	Evaluate	-	20%		30%	-	30%	-	30%	-	30%
	Create	-	20%		30%	-	30%	-	30%	-	30%
Total		100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr. M.Vasantha, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani,SRMIST

Course Code	UST23P01L	Course Name	INTERNSHIP - I	Course Category	IAPC	Internship/Apprenticeship / Project/ Community Outreach	L	T	P	O	C
							-	-	-	-	1

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards			Nil

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)
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CLR-1:	Demonstrate skills learnt in the real time environment.	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2:	Explore the different industries that are using IT																		
CLR-3:	Enhance the skills in the system aspects																		
CLR-4:	Understanding the professional connections with the knowledge learnt																		
CLR-5:	Applying the skills in problem solving																		
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLO-1:	To get an insight of an industry and organization/company	3	80	70	L	H	L	H	M	L	M	L	L	M	L	M	M	L	H
CLO-2:	To gain valuable skills and knowledge	3	85	75	M	H	L	M	M	M	M	H	L	M	L	L	H	L	M
CLO-3:	To make professional connections and enhance networking	3	75	70	H	H	M	H	M	M	M	M	M	M	L	M	L	M	M
CLO-4:	To get experience in a field to allow the student to make a career transition	3	85	80	H	H	M	H	L	M	L	M	M	L	L	M	M	M	M
CLO-5:	To get an inside view of an industry and organization/company	3	85	75	H	H	M	H	L	L	L	M	M	L	L	M	M	M	M

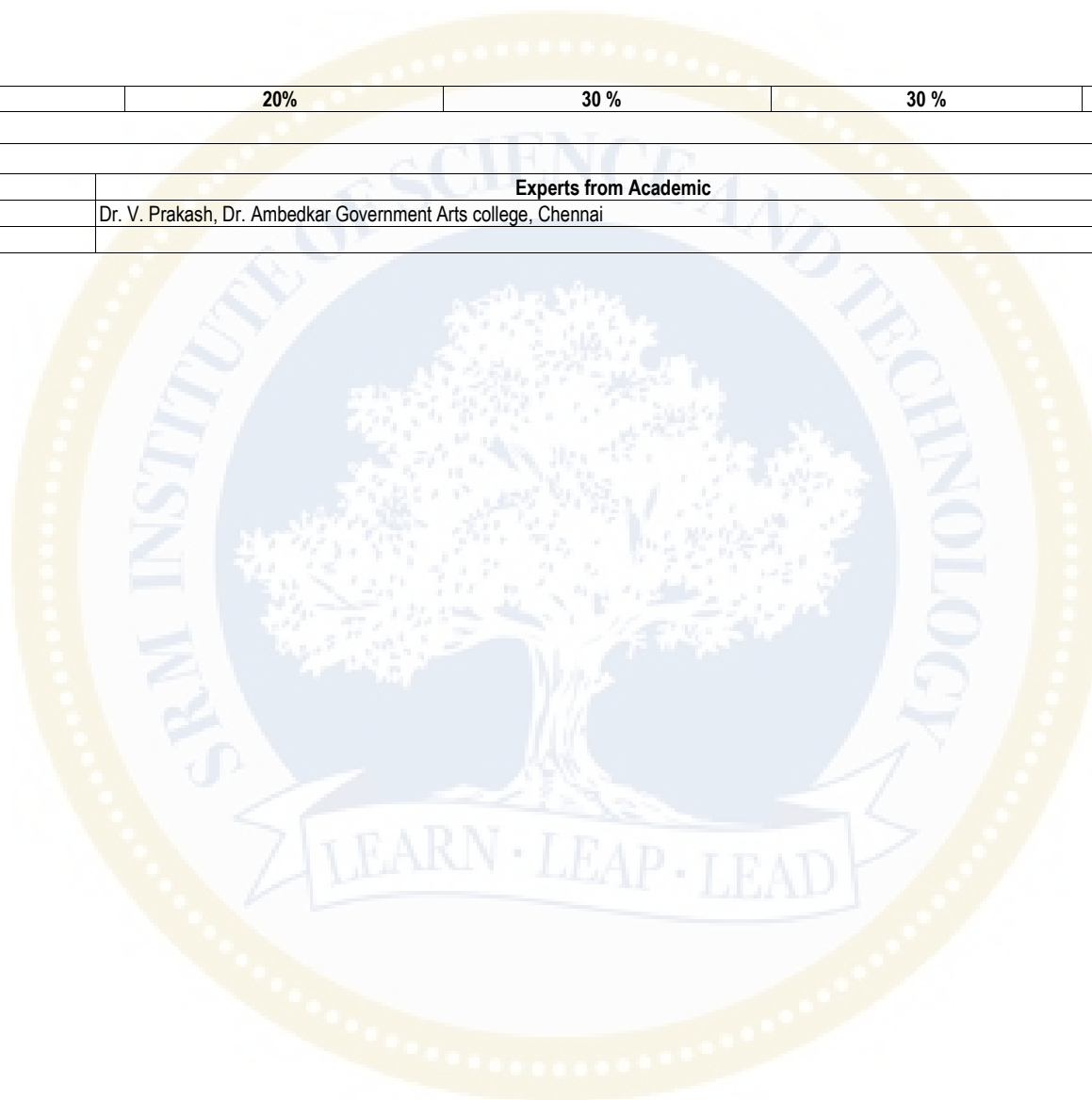
Students can choose a company of their own interest for internship for a period of minimum four weeks to learn about the application of IT in real time environment. In the first week of July, all the students have to give a presentation about their observations made by them in internship. At the end of the internship period, every student shall submit a structured internship report within 15 days from the date of the completion of the internship period.

Learning Assessment			
Project Work / Internship	Continuous Learning Assessment (50% weightage)		Final Evaluation (50% weightage)
	Review – 1	Review – 2	Internship Report Viva-Voce

	20%	30 %	30 %	20 %
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Course Designers

Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasantha, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani,SRMIST



Course Code	UCD23V02T	Course Name	Industry Oriented Employability Skills for Science	Course Category	V	Value Addition course	L	T	P	O	C
							2	0	0	2	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Career Guidance Cell	Data Book / Codes/Standards	-		

Course Learning Rationale (CLR):		The purpose of learning this course is to:			Learning				Program Learning Outcomes (PLO)														
CLR-1 :	Demonstrate various principles involved in solving mathematical concepts related to permutation and combination and probability and interpret data				1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Learn the basic mechanics of grammar and develop resume-building practice and presentation skills in students				Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)		Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-3 :	Understand the object oriented features																						
CLR-4 :	Prepare students for job interviews																						
CLR-5 :	Instill confidence in students and develop the necessary skills to face interview																						
Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:																					
CLO-1 :	Understand the concepts of permutation and combinations, probability and approach questions in a simpler and innovative method				3	80	70		M	M	-	M	-	H	-	M	H	M	-	H	-	-	-
CLO-2 :	Understand the different parts of speech and use them in sentences appropriately and also the importance of resume preparation				3	85	75		M	-	-	M	-	H	-	-	-	-	H	-	-	L	H
CLO-3 :	Understand the importance of object oriented features				3	85	80		H	M	M	M	M	H	L	-	-	-	-	-	M	-	H
CLO-4 :	Face interviews confidently				3	85	80		M	M	H	M	M	H	L	-	-	-	-	-	M	-	H
CLO-5 :	Develop their domain skills				3	85	80		M	M	H	M	M	H	L	-	-	-	-	-	M	-	H

Duration (hour)	6	6	6	6	6
S-1	SLO-1	Permutation and Combination – Introduction	Change of voice	Object Oriented Programming - Introduction	Overloading & Overriding – Introduction
	SLO-2	Permutation and Combination – Problems	Change of voice	Introduction to Monolithic, POP, Structures, OOP	Overloading & Overriding
S-2	SLO-1	Probability – Introduction	Change of speech	Translators – Introduction	Virtual Functions & Abstract Class – Introduction
	SLO-2	Probability – Problems	Change of speech	Translators	Virtual Functions & Abstract Class
S-3	SLO-1	Data Sufficiency – Introduction	Resume Writing - Introduction	Class – Introduction	Dangling Pointer – Introduction
	SLO-2	Data Sufficiency – Problems	Resume Writing - Introduction	Class	Dangling Pointer
S-4	SLO-1	Puzzles - Selections	Resume Writing - Session 1	Object Abstraction – Introduction	Garbage Collector – Introduction
	SLO-2	Puzzles - Selections	Resume Writing - Session 1	Object Encapsulation	Garbage Collector
S-5	SLO-1	Puzzles - Distribution	Types of Interviews - Group / Stress / HR	Polymorphism, Inheritance and Dynamics Binding – Introduction	Algorithm and Data Structures - Introduction
	SLO-2	Puzzles - Distribution	Types of Interviews - Group / Stress / HR	Polymorphism, Inheritance and Dynamics Binding	Logical Thinking & Arrays

S-6	SLO-1	Cubes & Cuboids	Presentations - Introduction	Function Execution Sequence - Introduction	Structures & Pointers – Introduction	Introduction to P, NP, NP-Hard & NP-Complete Problems
	SLO-2	Cubes & Cuboids	Presentations - Activity	Stack & In Line Functions - Introduction	Structures & Pointers	Introduction to P, NP, NP-Hard & NP-Complete Problems

Learning Resources	1. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Tata McGraw Hill, 5th Edition	3. Greg Perry, Dean Miller, C Programming Absolute Beginner, Que Publishing, 3rd Edition
	2. Scott Bennett, The Elements of Resume Style: Essential Rules for Writing Resumes and Cover Letters That Work, AMACOM, 2014	4. Cay S. Horstmann, Core Java Fundamentals, Volume 1, 11th Edition, Prentice Hall, 2018
	1. Raymond Murphy, Intermediate English Grammar, Cambridge University Press, 2007	1. Langsam, Augenstein, Tanenbaum, Data Structures Using C and C++, 2nd Edition, Pearson Education, 2015.

Learning Assessment					
Level	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)			
		CLA-1 (20%)	CLA-2 (20%)	CLA-3 (30%)	CLA-4 (30%) #
		Theory	Theory	Theory	Theory
Level 1	Remember	10%	10%	30%	30%
	Understand				
Level 2	Apply	50%	50%	40%	40%
	Analyze				
Level 3	Evaluate	40%	40%	30%	30%
	Create				
	Total	100 %	100 %	100 %	100 %

CLA-1, CLA-2 and CLA-3 can be from any combination of these: Online Aptitude Tests, Classroom Activities, Case Studies, Poster Presentations, Power-point Presentations, Mini Talks, Group Discussions, Mock interviews, etc.
 #CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Mr. M. Ponmurugan, Executive PMOSS, Cognizant Technology Solutions India Pvt.Limited, Chennai	Dr. G. Saravana Prabu, Asst. Professor, Department of English, Amrita Vishwa Vidyapeedam, Coimbatore	Dr. Sathish K, HOD, Department of Career Guidance, FSH, SRMIST
		Dr. Muthu Deepa M, Assistant Professor, Department of Career Guidance, FSH, SRMIST

SEMESTER - IV

Course Code	UST23401J	Course Name	Statistical Inference - I	Course Category	C	Discipline Specific Core Course	L	T	P	O	C
							3	0	3	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Statistical Table and Graph sheet		

Course Learning Rationale (CLR):	<i>The purpose of learning this course is to:</i>
CLR-1 :	<i>Identify the parameter of population and point estimate the parameter various methods</i>
CLR-2 :	<i>To understand the concepts of Interval estimation</i>
CLR-3 :	<i>To obtain the Best estimator for decision making.</i>
CLR-4 :	<i>To understand the logic and framework of the inference of hypothesis testing.</i>
CLR-5 :	<i>To gain the application of inference theory</i>

Course Learning Outcomes (CLO):	<i>At the end of this course, learners will be able to:</i>
CLO-1 :	<i>Introduce the basic theory behind the development and assessment of statistical estimation techniques in areas of point estimation.</i>
CLO-2 :	<i>Obtain estimator with minimum variance and bound estimator using Cramer – Rao Inequality, Rao Blackwell theorem.</i>
CLO-3 :	<i>Understand and apply the various methods of estimation techniques and solving problem based on these techniques</i>
CLO-4 :	<i>Understand the concept of interval estimation and fixing the confidence interval of parameter of various distributions.</i>
CLO-5 :	<i>Understand the concept of test of significance and carryout test procedure for real life situation problem.</i>

Learning		
1	2	3
Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
3	85	80
3	80	75
3	85	80
3	85	80
3	85	80

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
H	H	M	M	H	L	L	L	L	L	L	M	L	M	L
H	H	M	L	M	M	M	L	M	L	H	M	L	L	L
H	H	H	M	M	L	M	M	M	M	L	M	L	L	L
H	M	H	L	H	M	M	M	M	M	L	L	L	M	L
H	H	H	M	M	M	L	M	L	M	M	L	L	M	L

Duration (hour)		Learning Unit / Module 1 18	Learning Unit / Module 2 18	Learning Unit / Module 3 18	Learning Unit / Module 4 18	Learning Unit / Module 5 18
S-1	SLO-1	Parameter Space, Characteristics of Estimators	Efficiency	Methods of minimum variance	Method of maximum likelihood estimation (MLE)	Confidence intervals: Basic Notions , proportion, variance (for the case of one and two populations)
	SLO-2	Point estimation – introduction, Properties of estimators	Minimum Variance Unbiased Estimators (MVUE)	Methods of Estimation- introduction, discussion	maximum likelihood estimation (MLE) procedure	Testing of hypothesis
S-2	SLO-1	Unbiasedness and consistency	Minimum Variance Unbiased Estimators (MVUE)-Theorem	Moment estimation of mean and variance	Properties of maximum likelihood estimators	Sum on C-I and testing of hypothesis
	SLO-2	Conditions for consistency	Minimum Variance Unbiased Estimators (MVUE)- proof	Moment estimation of uniform distribution	Likelihood function	Confidence Intervals for the mean of normal population
S-3	SLO-1	Invariance Property of Consistent Estimators	Invariance property of consistent estimators	Moment estimation of normal population	Cramer rao theorem	95% confidence interval theta known

Duration (hour)	Learning Unit / Module 1		Learning Unit / Module 2		Learning Unit / Module 3		Learning Unit / Module 4		Learning Unit / Module 5	
	18		18		18		18		18	
	SLO-2	Sufficient Conditions for Consistency	BLUE- statement and proof		Moment estimation of normal population proof		Hazoor bazar's theorem		95% confidence interval theta unknown	
S-4-S6	SLO-1	Problems on Fisher-Neyman Factorization theorem	Properties of BLUE		Sums on moment estimator		Asymptotic normality of MLE		Confidence limit for rectangular distribution	
	SLO-2	Problems on Fisher-Neyman Factorization theorem	Cramer-Rao Inequality		Problems on moment estimator		Sufficient estimator of MLE		Example on rectangular distribution	
S-7	SLO	Sufficiency	Cramer rao inequality proof		Method of least squares		Invariance property of mle		Confidence interval for correlation coefficient	
S-8	SLO-1	Bernoulli distribution	Regularity conditions of cramer rao inequality		method of least squares		MLE for normal population		Confidence Intervals for the mean of normal population	
	SLO-2	Factorization theorem	Theorem 1 on cramer rao inequality		method of least squares discussion , procedure		MLE for poisson distribution		95% confidence interval theta known	
S-9	SLO-1	Factorization theorem proof	Theorem 2 on cramer rao inequality		method of least squares sums		MLE for uniform population		Prediction problems	
	SLO-2	Invariance property of the sufficient estimator	Conditions for the equality sign in cramer rao inequality		method of least squares problems		MLE for power series distribution		Example on prediction problems	
S-10-S-12	SLO-1	Fisher neyman criterion	MVB estimator for normal population		Exercises on method of least squares		MLE for rectangular population		Large samples confidence intervals- derivation	
	SLO-2	Fisher neyman criterion proof	MVB estimator for cauchy population		Method of minimum chi-square discussion		Other examples to calculate MLE		Example poisson distribution	
S-13	SLO-1	Sufficient estimator of normal population	MVB estimator		Method of minimum chi-square procedure		Completeness definiton		Example for large samples	
	SLO-2	Cramer rao lower bound attained lower bound of MVB	Rao - Blackwell Theorem- proof		Method of minimum chi-square sums		Completeness proof		Sums on large samples C-I	
S-14	SLO	Sufficient estimator of uniform population	Problems on Rao - Blackwell Theorem		Method of minimum chi- square excersies		Lehman-Scheffe Theorem definition, theorem		Problems on C-I and testing of hypothesis	
S-15	SLO-1	Sufficient estimator of normal population	MVUE for normal population		Method of minimum chi- square for normal population		Examples on Binomial, gamma		C-I for mean for one population	
	SLO-2	Cramer rao lower bound attained lower bound of MVB	MVUE for uniform population		Method of minimum chi-square for uniform distribution		Complete Sufficient Statistics For The Exponential Class		Sum on C-I for mean for one population	
S-16-S-18	SLO-1	Cramer rao lemma statement	T is a complete statistic for theta		Method of minimum chi-square- practical sum		Problems on Lehman-Scheffe Theorem		C-I for mean for two population	
	SLO-2	Cramer rao proof	T is a complete sufficient statistic for theta		Method of minimum chi- square- practical sum		Examples on negative Binomial, normal,beta distribution		Sum on C-I for mean for two population	

Learning Resources	Text Books:		References:
	1. Hogg, R.V., Mc Kean J W and Craig, A.T. (2005): Introduction to Mathematical Statistics, 6/e Pearson Edition 2. Gupta, S.C. and V.K. Kapoor (2000): Fundamental Mathematical Statistics, Sultan Chand and Co.		

- Larson (1982): Introduction to Probability Theory and Statistical Inference, 3/e, John Wiley.
- Rohatgi, V.K. and Saleh, A.K. (2002): An Introduction to Probability and Statistics, 2/e, John Wiley.

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA_1 (10%)		CLA_2 (10%)		CLA_3 (20%)		CLA_4 (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr. M.Vasanth, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani,SRMIST

Course Code	UST23402J	Course Name	STATISTICAL QUALITY CONTROL	Course Category	C	Discipline Specific Core Course	L 3	T 0	P 3	O 2	C 4
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Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards			

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning			Program Learning Outcomes (PLO)														
CLR-1 :	Use control charts to analyze for improving the process quality	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Demonstrate the approaches and techniques to assess and improve quality in process and product control.	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-3 :	Illustrate the basic concept and techniques of modern reliability engineering tools																		
CLR-4 :	Gaining knowledge on several charts																		
CLR-5 :	To know the purpose of charts																		
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1 :	Introduce the principles and techniques of Statistical Quality Control and their practical uses in product and process design and monitoring.	3	85	80	H	H	M	H	M	M	M	M	M	L	L	L	L	M	L
CLO-2 :	Draw different types of control charts for variables and attributes.	3	80	75	H	H	M	M	L	L	L	H	M	M	L	M	L	L	M
CLO-3 :	Understand the practical applicability of single and double sampling inspection plans.	3	85	80	H	H	M	M	L	M	M	H	M	M	L	M	L	M	M
CLO-4 :	Understand variable and sequential sampling inspection plans and to draw OC and ASN functions.	3	85	80	H	H	L	M	M	M	L	H	L	M	L	L	L	L	M
CLO-5 :	Can apply the sampling plans in quality control	3	85	80	H	H	L	H	M	M	M	M	L	L	L	M	L	M	L

Duration (hour)		Learning Unit / Module 1 18	Learning Unit / Module 2 18	Learning Unit / Module 3 18	Learning Unit / Module 4 18	Learning Unit / Module 5 18
S-1	SLO-1	Statistical Quality Control- Introduction, definition	Statistical Basis of the Charts for variables	Control chart for attributes	Acceptance sampling plans for attributes	Acceptance Sampling by Variables
	SLO-2	Application	X bar chart, purpose of the charts	purpose of the chart	Acceptance sampling plans for attributes - procedure	Advantages and Disadvantages of Variables Sampling
S-2	SLO-1	Need for Statistical Quality Control techniques in Industry	σ chart	Development and Operation of the Control Chart	Producer's risk	Designing a Variables Sampling Plan with a Specified OC Curve
	SLO-2	Control techniques in industry	purpose of the charts	Construction and Operation of a Fraction Nonconforming Control Chart	Type I error (producer's risk)	lot standard deviation is known.
S-3	SLO-1	Causes of Quality- definition	R chart ,purpose of the charts	Interpretation of Points on the Control Chart for Fraction Nonconforming	Type II error (consumer risk)	lot standard deviation is unknown.
	SLO-2	Causes of Quality- importance	Basis of sub grouping	Control chart for non- conformities- problem	single – sampling plans	Determination of n and k
S-4-S-6	SLO-1	variation control charts	X bar and R charts- procedure	np control chart	OC Curve	Problem on Variables Sampling
	SLO-2	Shewhart control charts and its applications	Problems on X bar and R charts	np control chart with Variable Sample Size	OC Curve- problem	Variables Sampling with a One-Sided Specification
S-7	SLO-1	Shewhart control charts and its Uses	The Effect of Non-normality on and R Charts	Control Limits Based on an Average Sample Size	Double – sampling plans	determination of n and k for one sided specification

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		18	18	18	18	18
S-8	SLO-1	Problems on Specification and tolerance limits	The Operating-Characteristic Function	Standardized Control Chart	Double – sampling plans- OC Curve	Sequential-Sampling Plans
	SLO-2	Specification and tolerance limits	The Average Run Length for the Chart	Standardized Control Chart-problems	Double – sampling plans- OC Curve problem	Sequential-Sampling Plans- procedure
S-9	SLO-1	application of theory of runs in quality control	determining the trial control limits	The Operating-Characteristic Function Calculations	Double – sampling plans- OC Curve problem	The OC Curve and ASN Curve for Sequential Sampling
	SLO-2	warning limits	Construction and operation of $\bar{X}$ bar and σ charts	Average Run Length Calculations	Double – sampling plans- OC Curve problem	The OC Curve and ASN Curve for Sequential Sampling- problem
S – 10-S-12	SLO-1	3 sigma limits	$\bar{X}$ bar and s Control Charts -problems	Analysis of Nonconformities	AOQL Plans	OC, AOQ,ASN, ATI Curve for double sampling plans
	SLO-2	6 sigma limits	$\bar{X}$ bar and s Control Charts with Variable Sample Size	Analysis of problem on Nonconformities.	AOQL Plans- problem	OC, AOQ,ASN, ATI Curve for double sampling plans
S-13	SLO-1	application of theory of runs in quality control	Interpretation of control charts- procedure	The c Chart	Average outgoing quality(AOQ)	Process capability ratios
	SLO-2	application of theory of runs in quality control	$\bar{X}$ bar chart	C Control Charts, Standards Given	Examples	Normality and the process
S- 14	SLO-1	Problems on Modeling process quality - theory	σ chart, R chart	Problems on purpose of the chart p chart - definition	associated performance measures	Problems on Process capability analysis using control chart Calculation
S - 15	SLO-1	Problems on Modeling process quality - formulas	s^2 Control Chart-procedure	Demerit Systems	The Dodge–Romig Sampling Plans	Process capability analysis using designed experiments
	SLO-2	Problems on Modeling process quality - procedure	s^2 Control Chart- problem	Examples	The Dodge–Romig Sampling tables	Calculation
S-16-S-18	SLO-1	Problems on Modeling process quality - uniform distribution, binomial and poisson distribution	applications of variables control charts-procedure	The Operating-Characteristic Function	LTPD plan procedure	OC, AOQ, ASN, ATI Curve for single sampling plans
	SLO-2	Problems on Modeling process quality- normal distribution, gamma distribution	applications of variables control charts-examples	The Operating-Characteristic Function-exponential distribution	LTPD plan problems	OC, AOQ, ASN, ATI Curve for single sampling plans

Learning Resources	Text Books: 1. D.C. Montgomery: Introduction to Statistical Quality Control. Wiley. 2. Wetherill, G.B. Brown, D.W.: Statistical Process Control Theory and Practice, Chapman & Hall.	References: 1. Grant, E.L. and Leavenworth, R.S.: Statistical Quality Control, McGraw Hill. 2. Edward G. Schilling and Dean V. Neubauer (2009) Acceptance sampling in Quality control, 2nd edition, (Statistics: A series of Textbooks and Monographs) hard cover -March 2, 2009. Chapman and hall/ CRC.

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasanth, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani,SRMIST

Course Code	UST23403T	Course Name	Measures and Probability Theory	Course Category	C	Discipline Specific Core Course	L	T	P	O	C
							4	0	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)
CLR-1 :	To learn about Sets, Measurable Functions	1 2 3	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
CLR-2 :	Obtain the knowledge of Integrable Functions	Level of Thinking (Bloom)	Fundamental Knowledge
CLR-3 :	To understand the advanced concepts in probability theory	Expected Proficiency (%)	Application of Concepts
CLR-4 :	To obtain the estimate of various lemmas in measure theory	Expected Attainment (%)	Link with Related Disciplines
CLR-5 :	To understand the various concepts in theorems		Procedural Knowledge
			Skills in Specialization
			Ability to Utilize Knowledge
			Skills in Modeling
			Analyze, Interpret Data
			Investigative Skills
			Problem Solving Skills
			Communication Skills
			Analytical Skills
			ICT Skills
			Professional Behavior
			Life Long Learning
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:		
CLO-1 :	Gain knowledge about Measurable functions, sets and fields	3 85 80	H M H H M M M L M M L L M M M
CLO-2 :	Understand the basic ideas of Integration and Integrable functions	3 80 75	H M H H M M M L M L M L L L M
CLO-3 :	To learn how to derive the theorems in probability.	3 85 80	H L M H H M L M M M L L L L L
CLO-4 :	To learn the concepts in probability theory.	3 85 80	M L H H H M M M L L L L M L L
CLO-5 :	Can be able to solve the important theorems in probability .	3 85 80	M L M H M M H M H M L L L M L

Duration (hour)	Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module4	Learning Unit / Module 5
	12	12	12	12	12
S-1	SLO-1 Introduction to Sets	Definition of Integrals	Events, sample space	convergence of random variables	Central limit theorem, Characteristic functions
	SLO-2 Types of Sets – Finite and infinite sets	Integrable Function	different approaches to probability	convergence in probability	Continuity theorem
S-2	SLO-1 Properties of Sets	Theorems on Integrable Function	random variables and random vector	almost surely, almost surely in the r-th mean	moments
	SLO-2 Sequences	Sequence of Integrable simple functions	Distribution functions of random variables and vectors	Relationships on convergence	Product measures basis
S-3	SLO-1 Limits	Properties of Integrals	Expectation and moments, basic	convergence of moments	Product measures proof
	SLO-2 Problems on Limits	Properties of Integrals	Example and exercise	Proof and Exercise of convergence of moments	Fubini's theorem of product of 2 measures basis
S-4	SLO-1 Functions	Mean Value Theorem for Integrals	Markov inequality	Helly-Bray theorem	Product σ -Algebra
	SLO-2 Field	Monotone Convergence Theorems	Chebyshev's inequality	Extended Random Variables	Fubini and Lebesgue theorem
S-5	SLO-1 Sigma Field	Fatou's Lemma	Example and exercise	Lemma proof on extended random variables	Convolution on Fubini and Lebesgue theorem
	SLO-2 Borel Field	Dominated Convergence Theorem	Holder's and Minkowski inequality	Theorem proof on extended random variables	Lindeberg, Levy and Liapounov forms with proof

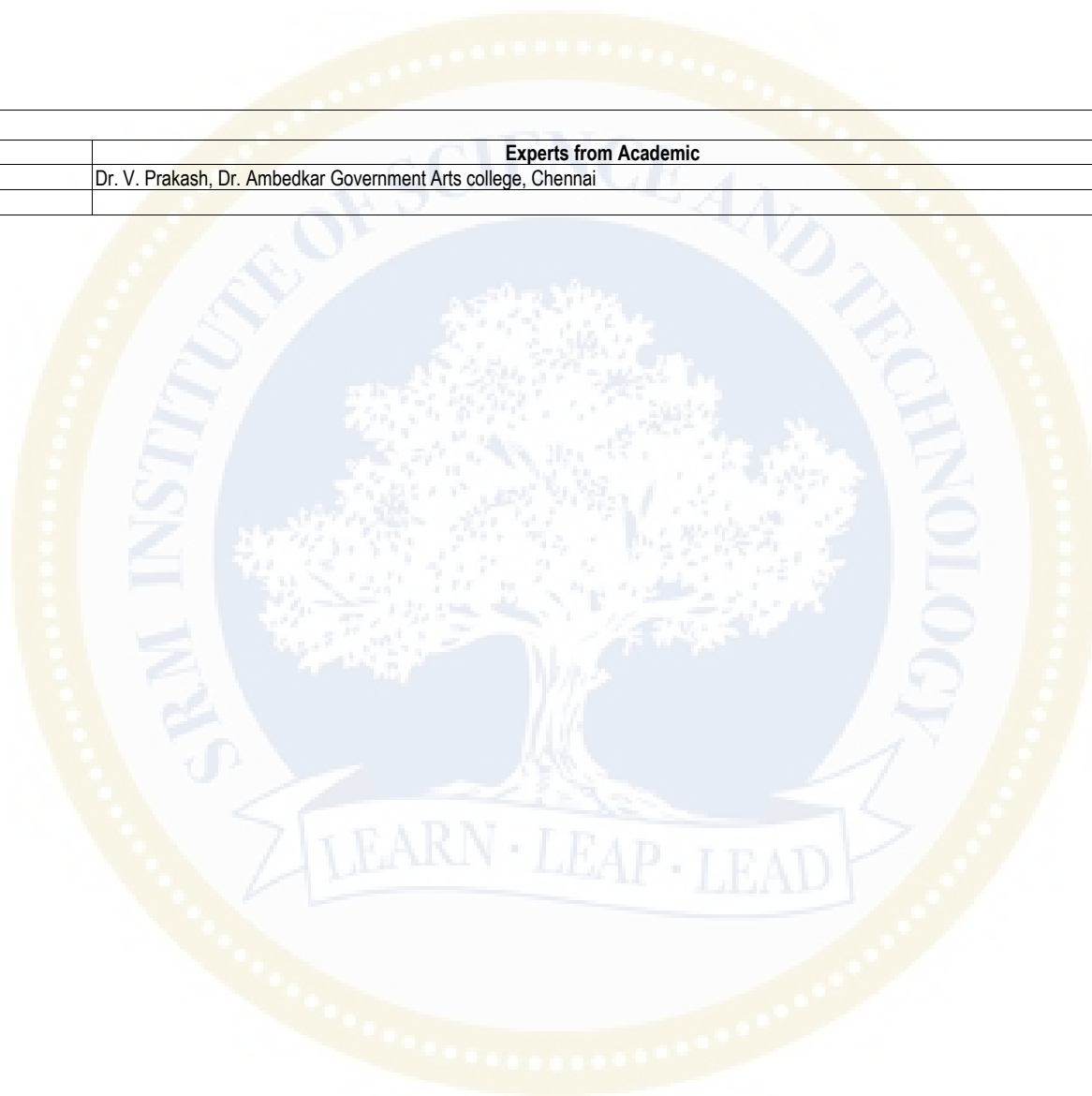
Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		12	12	12	12	12
S-6	SLO-1	Inverse Functions	Lebesgue's Dominated Convergence Theorem	Example and exercise	convolution of distributions	Theorem of Lindeberg, Levy and Liapounov with proof
	SLO-2	Introduction of Functions	Holder's Inequality	Jensen's inequalities	continuity theorem	Problem on Lindeberg, Levy and Liapounov
S-7	SLO-1	Inner Measure	Cauchy-Schwartz Inequality	Example and exercise	Definition and properties of integrals	Lindeberg Feller's form and proof
	SLO-2	Outer Measure	Cauchy-Schwartz Inequality	Independence of sequence of events and random variables	Proof of properties	Examples on Lindeberg Feller's form
S-8	SLO-1	<i>Theorems</i>	Minkowski's Inequality	Example and exercise	Absolute continuity, Proof of absolute continuity	Exercises on Lindeberg, Levy and Liapounov forms
	SLO-2	<i>Measure Space</i>	Minkowski's Inequality	conditional probability	additivity of indefinite integrals	Problems on Lindeberg Feller's form
S-9	SLO-1	<i>Measurable Functions</i>	Randon-Nikodym Theorem (Statement Only)	conditional expectation	Proof on additivity of indefinite integrals,	Khinchine weak law of large numbers
	SLO-2	Lebesgue Measurable Sets and Lebesgue Measure	Product Measure	Problems on conditional probability	Singularity, Proof of singularity	Theorem with proof of Khinchine weak law of large numbers
S-10	SLO-1	Basic Properties of Lebesgue Measure	Product σ -Field	Problems on conditional expectation	monotone converge theorem- proof	Kolmogorov inequality
	SLO-2	Theorems	Construction of Product Measure	Characteristic functions	Corollary – proof of convergence theorem	Exercises on Kolmogorov inequality
S-11	SLO-1	Borel Sets	Monotone Class Product	Properties of characteristic functions	Absolute continuity corollary	Exercises on Khinchine weak law of large numbers
	SLO-2	Equivalent Conditions	Monotone Class Product	Examples on characteristic functions	Fatou lebesgue theorem	Exercises on Khinchine weak law of large numbers
S-12	SLO-1	Convergence in Measure	Fubini's Theorem (Statement only)	inversion formula	Lemma with proof of fatou lebesgue theorem	strong law of large numbers
	SLO-2	Convergence in Measure	examples	Proof of inversion formula	Main theorem of fatou lebesgue theorem	Exercises on strong law of large numbers

Learning Resources	Text Books:			References:			
	1.	DeBarra, G. (1987), Measure Theory and Integration, Wiley Eastern, New Delhi.			1.	Munroe, M. E. (1965), Measure and Integration, Addison & Wesley, New York.	
	2.	Burill, C. W. (1972), Measure, Integration and Probability, McGraw Hill, New York.					

	Learning Assessment										
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	-	30%	-	30%	-	30%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	30%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasantha, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani,SRMIST



Course Code	ULT23AE2J	Course Name	Applied Tamil – II	Course Category	AE	Ability Enhancement Courses (AE)	L	T	P	O	C
							1	0	2	2	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Tamil	Data Book / Codes/Standards			Nil

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)
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CLR-1 :	அகராதி, கலைச்சொல் குறித்த நுட்பங்களை அறியச் செய்தல்	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	நேர்காணல் செய்யும் திறனும் செய்தி வாசிப்பு முறைகளையும் தெரியச் செய்தல்																		
CLR-3 :	விமர்சனத்தின் தன்மைகளும் செய்தியறிக்கை தயாரிக்கும் முறையையும் அறியச் செய்தல்																		
CLR-4 :	பேச்சுக்கலையின் தனித்துவங்களைப் புரியச் செய்தல்																		
CLR-5 :	கணினித்தமிழின் பல்வேறு நுட்பங்களைத் தெரியச் செய்தல்																		

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	அகராதித்துறை, கலைச்சொல்லாக்கத் துறையைத் தெரிந்துகொள்ளுதல்	2	75	60	H	L	H	M	H	H	L	M	H	M	L	H	-	-	-
CLO-2 :	ஊடகங்களில் மொழி ஆளுமையோடு செயல்படும் திறன் பெறுதல்	2	80	70	H	M	H	L	M	H	L	H	M	L	H	H	-	-	-
CLO-3 :	கலை, இலக்கிய விமர்சன முறைகளையும், செய்தியறிக்கை தயாரிக்கும் நுட்பங்களையும் தெரிந்துகொள்ளுதல்	2	70	65	H	L	H	M	H	H	M	H	L	H	M	H	-	-	-
CLO-4 :	பல்வேறு வடிவங்களைக் கொண்ட பேச்சுக்கலையை அறிவதன்வழி, சிறந்த மேடைப் பேச்சாளராக உருவாகும் தகுதியைப் பெறுதல்	2	70	70	H	M	H	L	H	M	M	H	H	L	H	H	-	-	-
CLO-5 :	தமிழைக் கணினி வழி, இணையம் வழி கொண்டுசேர்க்கும் உலகளாவிய செயல்பாடுகளை அறிந்துகொள்ளுதல்	2	80	70	H	M	H	H	M	H	L	M	H	L	H	H	-	-	-

Duration (hour)	9	9	9	9	9
S-1	SLO-1 தமிழில் அகராதிகள்	நேர்காணல் அறிமுகம்	விமர்சனம் – அறிமுகம்	பேச்சுக்கலை	கணினித்தமிழ்
	SLO-2 ஒரு மொழி/ இருமொழி அகராதி	ஆளுமைத்திறன்	விமர்சனத்தின் நோக்கம்	பேச்சின் அடிப்படைகள்	கணினி வழித் தட்டச்சு
S-2	SLO-1 பன்மொழி அகராதி	நோக்கம் – கண்டறிதல்	விமர்சன வகைகள்	தன்னம்பிக்கையும் பேச்சும்	தட்டச்சு செய்யும் மென்பொருட்கள்

	SLO-2	உயிர்/ மெய் எழுத்துகள்	நேர்காணல் முறைகள்	இலக்கிய விமர்சனம்	பேச்சின் வகைகள்	எழுத்துருக்கள்
S-3	SLO-1	உயிர்மெய் எழுத்துகள்	இனிய சொற்கள் பயன்பாடு	திரை விமர்சனம்	மேடைப் பேச்சு	யூனிகோடு எழுத்துருக்கள்/ பிற எழுத்துருக்கள்
	SLO-2	அகராதிக்கான அடிப்படைகள்	நேர்காணல் வகைகள்	கலை விமர்சனம்	பட்டிமன்றப் பேச்சு	குரல் வழி தட்டச்சு
S-4	SLO-1	அகராதி உருவாக்கப் பயிற்சி	நேரடியாக வினா விடை	விமர்சகர் தகுதிகள்	சொற்பொழிவு முறை	எழுத்து வழி தட்டச்சு
	SLO-2	அகராதி உருவாக்கப் பயிற்சி	அச்சு ஊடக நேர்காணல்	தேர்ந்த புலமை	பேச்சின் நுட்பங்கள்	தட்டச்சு செய்யும் பயிற்சி
S-5	SLO-1	கலைச்சொல் அறிமுகம்	காட்சி ஊடக நேர்காணல்	எழுத்துவடிவ விமர்சனம்	பேச்சாளர்களும் பேசும் முறைகளும்	தட்டச்சு செய்யும் பயிற்சி
	SLO-2	பிறமொழிச் சொற்களும் தமிழில் கலைச் சொற்களும்	கேட்பு ஊடக நேர்காணல்	காட்சி வடிவ விமர்சனம்	பேச்சு - எடுத்துரைப்பும் உடல்மொழியும்	பிழை திருத்திகள்
S-6	SLO-1	கலைச்சொல்லாக்க நெறிமுறைகள்	கள ஆய்வில் நேர்காணல்	விமர்சனம் செய்யும் பயிற்சி	நவீன தொழில்நுட்பங்களில் பேச்சு முறைகள்	தமிழில் பிழை திருத்தம் செய்யும் மென்பொருட்கள்
	SLO-2	கலைச்சொல் உருவாக்க உத்திகள்	நேர்காணல் செய்யும் பயிற்சி	விமர்சனம் செய்யும் பயிற்சி	பேச்சாளர்குரிய தகுதிகள்	வலைப்பூ உருவாக்கம்
S-7	SLO-1	துறைசார் சொற்கள்	நேர்காணல் செய்யும் பயிற்சி	செய்தியறிக்கை	பேச்சுப் பயிற்சி	வலைப்பூவில் எழுதும் முறைகள்
	SLO-2	புதிய கண்டுபிடிப்புகளும் கலைச்சொற்களும்	செய்தி வாசிப்பு முறைகள்	சமூக நிகழ்வை எழுதுதல்	பேச்சுப் பயிற்சி	வலைப்பூவின் பயன்கள்
S-8	SLO-1	பயன்பாட்டுச் சொற்கள்	செய்தி வாசிப்பு நுட்பங்கள்	செய்தியாளர்குரிய தகுதிகள்	கலந்துரையாடலின் நோக்கம்	தமிழ் இணைய நூலகங்கள்
	SLO-2	கலைச்சொல்லாக்கப் பயன்பாடுகள்	உச்சரித்தல்	உற்றுநோக்குதல்	கலந்துரையாடலின் தனித்தன்மைகள்	இணைய நூலகப் பயன்பாடுகள்
S-9	SLO-1	கலைச்சொல் உருவாக்கப் பயிற்சி	பிழையின்றி வாசித்தல்	சமநிலையில் எழுதுதல்	தம் கருத்தைத் தெளிவாக உரைத்தல்	தமிழ்த் தொடரடைவுகள்
	SLO-2	கலைச்சொல் உருவாக்கப் பயிற்சி	வாசித்தலும் உணர்வும்	செய்தியறிக்கை தயாரித்தல்	கலந்துரையாடல் பயிற்சி	தொடரடைவின் பயன்பாடுகள்

Learning Resources	1. அகராதியியல், பெ. மாதையன், தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர், 1997. 2. பேச்சுக்கலை, ம. திருமலை, மீனாட்சி புத்தக நிலையம், மயூராவளாகம், மதுரை, 2009. 3. பேச்சாளராக, அ.கி.பரந்தாமனார், பாரி நிலையம், சென்னை, 1961 4. இணையத் தமிழ், சந்திரிகா சுப்பிரமணியன், சந்திரோதயம் பதிப்பகம், மதுரை, 2020. 5. நேர்காணல், மின்னூலகம், தமிழ் இணையக் கல்விக் கழகம், https://www.tamilvu.org/
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Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	30%	30%	30%	30%	20%	20%	20%	20%	30%	-
Level 2	Apply Analyze	40%	50%	50%	40%	50%	50%	50%	50%	50%	-
Level 3	Evaluate Create	30%	20%	20%	30%	30%	30%	30%	30%	20%	-
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
1. Dr. P.R.Subramanian, Director, Mozhi Trust, Thiruvanniyur, Chennai – 600 041.	1. Dr. V. Dhanalakshmi, Associate Professor, Subramania Bharathi School of Tamil Language & Literature, Pondicherry University, Pondicherry	1. Dr. B.Jaiganesh, Associate Professor & Head, Dept. of Tamil, FSH, SRMIST, KTR
		2. Dr. R. Ravi, Assistant Professor and Head, Dept. of Tamil, FSH, SRMIST, VDP.
		3. Mr. G. Ganesh, Assistant Professor, Dept. of Tamil, FSH, SRMIST, RMP.
		4. Dr. T.R.Hebzibah beulah Suganthi, Assistant Professor, Dept. of Tamil, FSH, SRMIST, KTR.
		5. Dr. S.Saraswathy, Assistant Professor, Dept. of Tamil, FSH, SRMIST, KTR.

Course Code		ULH23AE2J	Course Name		APPLIED HINDI-II		Course Category		AE	Ability Enhancement Courses (AE)										L	T	P	O	C	
																				1	0	2	2	2	
Pre-requisite Courses		Nil			Co-requisite Courses		Nil			Progressive Courses		Nil													
Course Offering Department			HINDI				Data Book / Codes/Standards				Nil														
Course Learning Rationale (CLR):			The purpose of learning this course is to:				Learning			Program Learning Outcomes (PLO)															
CLR-1 :	To find and analyze different types of Cinema				1	2	3	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	To Discover the print Media in the present World										Fundamental Knowledge Application of Concepts Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning		
CLR-3 :	Writing report for Employability																								
CLR-4 :	Writing Reviews and Create Job Oriented learning																								
CLR-5 :	To Acquire technical words for various job Prospects																								
Course Learning Outcomes (CLO):			At the end of this course, learners will be able to:				2	75	60	H	H	H	M	L	H	L	M	L	L	H	M	-	-	-	
CLO-1 :	To Understand the History and Documentary in Hindi Cinema				2	80	70	H	H	H	M	L	H	H	M	L	L	H	M	-	-	-			
CLO-2 :	To Comprehend Media Studies				2	70	65	H	H	M	L	H	H	M	H	M	M	H	H	-	-	-			
CLO-3 :	To Evaluate report Writing				2	70	70	H	H	L	H	M	H	L	H	H	M	H	H	-	-	-			
CLO-4 :	Enhance their Writing Skills in Media Studies				2	80	70	M	H	M	H	L	H	H	L	H	M	H	H	-	-	-			
CLO-5 :	To Understand and usage of technical words in Hindi																								
Duration (hour)		9		9		9		9		9		9													
S-1	SLO-1	HINDI CINEMA		MEDIA AUR HINDI BHASHA		REPORTARJ LEKHAN		FILM REVIEW& VIGYAPAN		PARIBHASHIK SHABDAVALI															
	SLO-2	CINEMA KI AVDHARNA		AVDHARNA		AVDHARNA		ARTH		RTH															
S-2	SLO-1	UDBHAV		SWARUP		SWARUP		PARIBHASHA		ARIBHASHA															
	SLO-2	VIKASH		MAHATVA		DDESHYA		SWARUP		WARUP															
S-3	SLO-1	DOCUMENTRI MOVE KI AVDHARNA		MEDIA MEN BHASHA KA PRAYOG		AHATVA		AWADHARNA		RAKAR															
	SLO-2	COMERCIAL MOVE KI AVDHARNA		UTTARDAYITVA		REPORTARJ LEKHAN KE PRATI RUCHI JAGANA		FILM REVIEW KA MAHATTVA		VADHARNA															
S-4	SLO-1	PRAYOJAN		PRINT MEDIA		REPORTAJ KI BHUMIKA		VIGYAPAN AUR BAZAR		RAYOJAN															
	SLO-2	UDDESHYA		ELECTRONIC MEDIA		PRAYOJAN		VIGYAPAN AUR ROZGAR		DDESHYA															
S-5	SLO-1	MAHATVA		MEDIA KI JIMMEDARI		PRAYOG		PRINT VIGYAPAN		AHATVA															
	SLO-2	PRAKAR		SMACHAR LEKHAN		UTTARDAYITVA		VIGYAPAN KI BHASHA		RAYOG															
S-6	SLO-1	PRISHTHBHUMI		REPORTER KE GUN		RIPOTARJ LEKHAN		AWADHARNA		DDESHYA															
	SLO-2	KARYASHALA		SAHAJTA		PUNRIKSHAN		ARTH		AKANIKI SHABDAVALI KA MHATVA															
S-7	SLO-1	DOCUMENTRY KI VIDHI		NISPAKSHTA		LEKHAN VIDHI		PARIBHASHA		HINDI SE ANGREZI SHABD															
	SLO-2	DOCUMENTRY AUR COMERCIAL MOVE MEN ANTAR		PEET PATRAKARITA		SAMAJIK DAYRA		SWARUP		ANGREZI SE HINDI SHABD															
S-8	SLO-1	COMERCIAL KI VIDHI		UTTARDAYITVA		SAHITYA ME RIPOTARJ LEKHAN		VIGYAPAN KE PRAKAR		EK DIN EK SHABD															
	SLO-2	MOVE VISLESHAN		BHASHA GYAN		PARIYOJNA KARYA		VIGYAPAN KI VISHESHTAYEN		SHABDON KA VISLESHAN															
S-9	SLO-1	PARICHARCHA		PARICHARCHA		PARICHARCHA		VIGYAPAN MANG		PATH PRICHARCHA															
	SLO-2	PRASHNABHYASH		PRASHNABHYASH		PRASHNABHYASH		VIGYAPAN KA PRABHAV		PRASHNABHAYASH															

Learning Resources	Edited Book: "PRAYOJAN MULOK HINDI", SRIJONLOK PUBLICATION, 2023, New Delhi.
	1. Film Banti Hai aur Banati Bhi hai, Lekhika – Sonal, Neolit Publication
	2. https://navbharattimes.indiatimes.com/entertainment/movie-review/articlelist/2325387.cms?curpg=3
	3. https://epustakalay.com/book/4858-hindi-patrarakita-by-dr-krishnabihari-mishra/
	4. https://hindisamay.com/
	5. https://rajbhasha.gov.in/hi/hindi-vocabulary

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	30%	30%	30%	20%	20%	20%	20%	30%	-
	Understand										
Level 2	Apply	40%	50%	50%	40%	50%	50%	50%	50%	50%	-
	Analyze										
Level 3	Evaluate	30%	20%	20%	30%	30%	30%	30%	30%	20%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Shri. Santosh Kumar Editor : Srijanlok Magazine Place: Vashishth Nagar, Ara – 802301	1. Prof.(Dr.) S.Narayan Raju, Head, Department of Hindi,CUTN, Tamilnadu	1. Dr.S Preeti. Associate Professor & Head, SRMIST
		2. Dr. Md.S. Islam Assistant Professor, SRMIST
		3.Dr. S. Razia Begum, Assistant Professor, SRM IST
		4. Dr.Nisha Murlidharan Assistant Professor, VDP,SRM IST

Course Code	ULF23AE2J	Course Name	French for Specific purpose - II	Course Category	AE	Ability Enhancement Courses (AE)	L	T	P	O	C
							1	0	2	2	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	French	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)
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CLR-1 :	Strengthen the language of the students both in oral and written
CLR-2 :	Express their sentiments, emotions and opinions, reacting to information, situations
CLR-3 :	Make them learn the basic rules of French Grammar.
CLR-4 :	Develop strategies of comprehension of texts of different origin
CLR-5 :	Enable the students to overcome the fear of speaking a foreign language and take position as a foreigner speaking French

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:
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CLO-1 :	To enable the students to overcome the fear of speaking a foreign language and take position as a foreigner speaking French
CLO-2 :	To strengthen the knowledge on concept, culture, civilization and translation of French
CLO-3 :	To develop content using the features in French language
CLO-4 :	To interpret the French language into other language
CLO-5 :	To improve the communication, intercultural elements in French language

1	2	3
Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
2	75	80
2	80	90
2	75	80
2	75	90
2	80	75

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	PSO -1	PSO -2	PSO-3
H	M	H	H	M	H	H	L	M	M	H	L	-	-	-
M	H	L	H	H	M	H	M	L	L	H	M	-	-	-
H	H	L	M	H	M	L	H	M	M	H	H	-	-	-
H	L	M	H	M	H	H	M	L	H	M	L	-	-	-
M	H	H	L	M	M	H	H	M	L	H	M	-	-	-

Duration (hour)	9	9	9	9	9
S-1	SLO-1	TOEIC	Les quantificateurs	Les prépositions de lieu	Les verbes irréguliers
	SLO-2	Qu'est-ce que c'est/	le génitif	Les activités	le futur et
S-2	SLO-1	À qui est-il destiné ?	Les adjectifs	Les prépositions de temps -	le conditionnel
	SLO-2	Les compétences évaluées	et pronoms possessifs	Les activités	les modaux
S-3	SLO-1	Le nom	les pronoms	les temps et	La suggestion
	SLO-2	Le pluriel des noms	Les pronoms personnels	Les activités	le conseil
S-4	SLO-1	Les indéterminables	les pronoms compléments	les aspects-	Les exemples
	SLO-2	Les noms composés	Les activités	Les activités	le reproche
S-5	SLO-1	L'adjectif	pronoms réfléchis	Le présent simple	Les activités
	SLO-2	Les comparatifs	Les activités	Les activités	L'obligation
S-6	SLO-1	les superlatifs	les adverbes	Le présent be+ing	la permission
					la voix passive

	SLO-2	les articles définis (the)	Les activités	Les activités	l'interdiction	Les exemples
S-7	SLO-1	les articles indéfinis (a, an)	La place de l'adverbe dans la phrase	Les exemples	La capacité	les subordonnées relatives
	SLO-2	Les exemples	Les activités	Le prétérit simple - Le prétérit be+ V-ing	l'incapacité	Les activités
S-8	SLO-1	Les adjectifs	L'ordre des adverbes	Les exemples	les verbes à particule	Les subordonnées circonstancielles
	SLO-2	Les exemples	Les activités	- Le présent perfect be+ing	les verbes suivis de V-ing	Les activités
S-9	SLO-1	pronoms possessifs (this et that)	les prépositions-	Le past perfect simple -	d'un infinitif avec sans to	A ne pas confondre
	SLO-2	Les activités	Les exemples	Le past perfect be + ving -	Les exemples	Les activités

Learning Resources	Theory:					
	1. “Réussir le nouveau TOEIC” Détails des épreuves, méthodologie, grammaire, et vocabulaire, Studyrama.					
	2. https://www.fluentu.com/blog/french/french-grammar					
	3. https://www.elearningfrench.com/learn-french-grammar-online-free.html					
	4. https://www.lawlessfrench.com/grammar					
	5. https://blog.gymglish.com/2022/12/15/basic-french-grammar					

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	30%	30%	30%	20%	20%	20%	20%	30%	-
	Understand										
Level 2	Apply	40%	50%	50%	40%	50%	50%	50%	50%	50%	-
	Analyze										
Level 3	Evaluate	30%	20%	20%	30%	30%	30%	30%	30%	20%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
1. Mr. Kavaskar Danasegarane Process Expert Maersk Global Service Center Pvt. Ltd	1. Dr. C.Thirumurugan Professor, Department of French, Pondicherry University	1. Mr. Kumaravel K. Assistant Professor & Head, SRMIST, KTR
2.Mr. Sharath Raam Prasad Character Designer, Animaker Company Pvt.		2. Mrs. Abigail, Assistant Professor, SRMIST, VDP

Course Code	UST23G02J	Course Name	Database Management System and Statistical Tools	Course Category	G	Generic Elective Course	L	T	P	O	C
							3	0	2	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Nil		

				Learning						Program Learning Outcomes (PLO)																
Course Learning Rationale (CLR):		The purpose of learning this course is to:		1	2	3	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
CLR-1 :	Understand the fundamentals of Database Management Systems, Architecture and Languages																									
CLR-2 :	Conceive the database design process through ER Model and Relational Model																									
CLR-3 :	Design Logical Database Schema and mapping it to implementation level schema through Database Languages																									
CLR-4 :	Familiarize queries using Structure Query Language (SQL) and PL/SQL																									
CLR-5 :	Data base management system with special emphasis on significance of topic to the statisticians																									
Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:								Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning		
CLO-1 :	Acquire the knowledge on DBMS Architecture and Languages		3	80	70					H	M	L	L	H	M	L	M	H	L	L	M	M	M	L		
CLO-2 :	Apply the fundamentals of data models to model an application's data requirements using conceptual modeling tools like ER diagrams		3	85	75					H	H	H	M	M	L	M	M	M	M	L	M	L	M	M		
CLO-3 :	Apply the method to convert the ER model to a database schema based on the conceptual relational model		3	75	70					H	H	M	H	M	L	M	M	M	L	L	M	L	M	M		
CLO-4 :	Apply Hierarchial model and Network models		3	85	80					H	H	M	M	M	M	M	L	H	M	L	M	M	L	M		
CLO-5 :	Apply the knowledge to create, store and retrieve data using Structure Query Language (SQL) and PL/SQL		3	85	75					H	H	M	M	L	M	L	L	H	M	L	M	M	L	L		

Duration (hour)	15	15	15	15	15
S-1	SLO-1 Database Management System - Introduction	SQL basics - Introduction	SQL Queries and SQL: Set Operations	Design process - introduction	Relational Model - Codd Rules
S-2	SLO-1 Advantage of DBMS over File Processing System	SQL Commands	SQL: Nested Queries	Entity Relationship model - concepts	Normalization – 1NF, 2NF, 3NF,
S-3	SLO-1 Introduction and applications of DBMS, Views of data and Data Independence	DDL - concepts	SQL Views	ER – diagrams, components of ER diagram	BCNF, 4NF and 5NF. PL/SQL Introduction, PL/SQL: variable declaration and control structures
S 4-S-5	SLO-1 Lab 1: Data Definition Language Commands on sample exercise	Lab4 : exercise on DDL	Lab 7: exercise on Queries	Lab 10: exercise on ER Diagram	Lab 13: PL/SQL Conditional and Iterative Statements

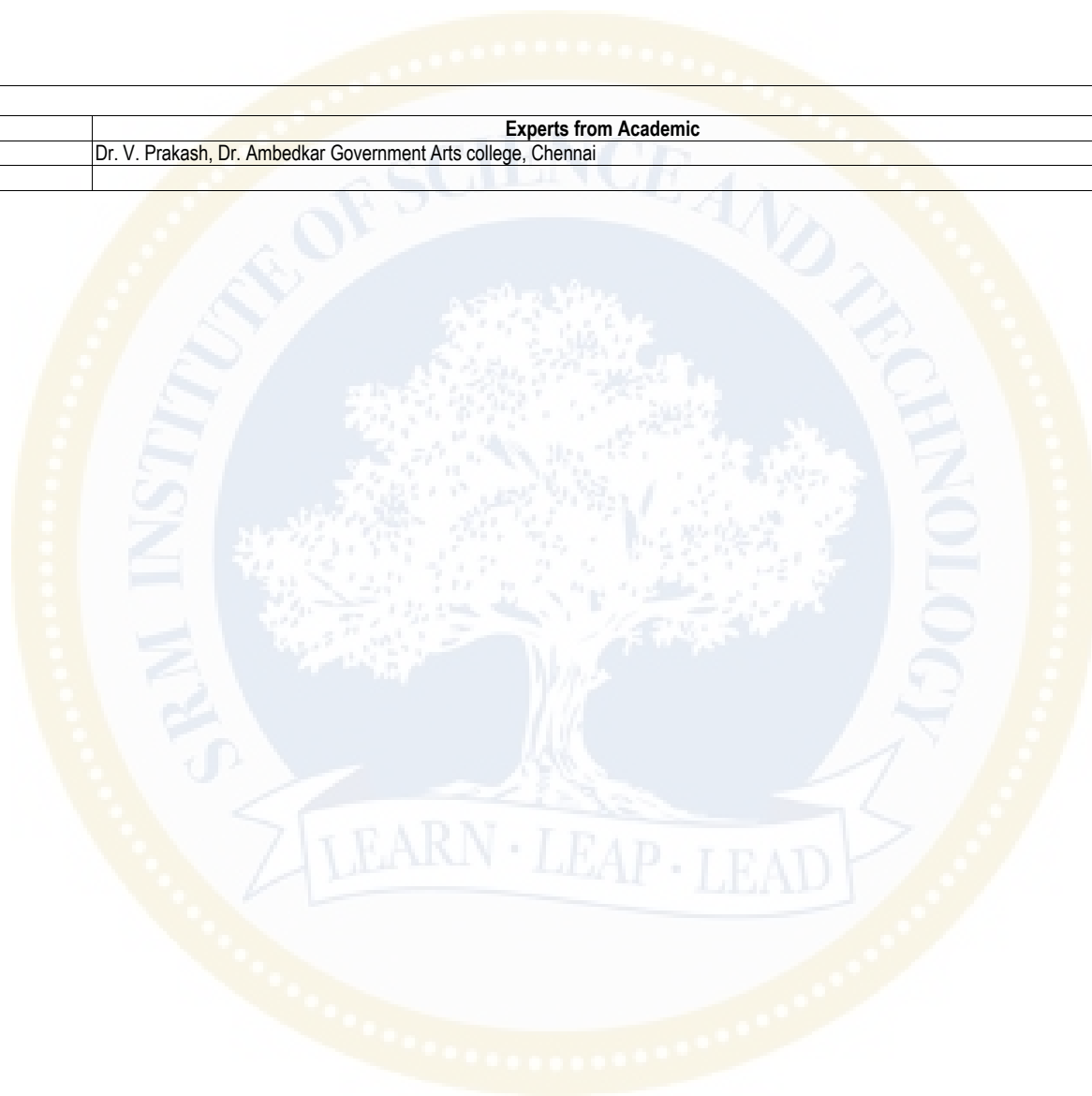
S-6	SLO-1	Database system Architecture	DQL statements – select command - examples	SQL: Joins Basics	Design issues in ER model	PL/SQL: Query Processing and Stored Procedure
	SLO-2	Database Users and Administrators				
S-7	SLO-1	<i>Roles of Database Administrator. Overview of SQL.</i>	DML – commands – Insert, Update, delete, lock – concepts, examples	Inner and Outer Joins with suitable examples	Enhanced ER model – sub classes and super class	PL/SQL Cursor
	SLO-2					
S-8	SLO-1	<i>Comparison of Data Models. DDL (Data Definition Language) Command</i>	Examples for DCL command - Grant	Left Inner and Right Outer Joins with suitable examples	Specialisation and generalisation in EER model	PL/SQL: Functions and statements to handle Cursor
	SLO-2					
S-9-S-10	SLO-1	<i>Lab 2: SQL Data Manipulation Language Commands</i>	<i>Lab:5 Exercise on DML, DCL</i>	<i>Lab:8 Exercise on join Queries</i>	<i>Lab:11 Exercise on EER model</i>	<i>Lab 14: PL/SQL Exceptional Handling</i>
S-11	SLO-1	<i>SQL : Data Manipulation Commands</i>	DBMS Keys – primary key, foreign key - examples	Correlated sub queries – concept and applications	Conversion of ER to Relational Table	PL/SQL: Trigger
	SLO-2					
S-12	SLO-1	SQL: Data Control Commands	Constraints in SQL Server : not null, unique, check , in operator	Exists and not exists operator in correlated query – example	Functional Dependency – definition,	PL/SQL: Application Programs
	SLO-2					
S-13	SLO-1	SQL: Transaction Control Commands	Functions - aggregate, built-in, numeric, date, string, set operators	Any, all view in correlated subqueries	trivial and non-trivial FD	PL/SQL: Application Programs
	SLO-2					
	SLO-2					
S 14-S-15	SLO-1	<i>Lab 3: SQL Data Control Language Commands and Transaction control commands to the sample exercises</i>	<i>Lab 6: Exercise on keys, constraints and functions</i>	Lab 9: exercise on correlated queries	Lab 12: exercise on functional dependency	<i>Lab 15: Exercise on EPL/SQL Trigger</i>
	SLO-2					

Learning Resources	Text Books: 1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, Database System Concepts, Sixth Edition, Tata McGraw Hill, 2011. 2. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, Sixth Edition, Pearson Education, 2011.			References: 1. Martin Gruber, Understanding SQL, Sybex, 1990 2. Sharad Maheshwari, Introduction to SQL and PL/SQL, 2nd ed., Laxmi Publications, 2016.		

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA_1 (10%)		CLA_2 (10%)		CLA_3 (20%)		CLA_4 (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasanth, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. M.Kalaivani,SRMIST
		2. M. Ramla,SRMIST



Course Code	UST23S02L	Course Name	Statistical Data Analysis Using SPSS	Course Category	S	Skill Enhancement course	L	T	P	O	C
							0	0	4	2	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):		The purpose of learning this course is to,		
CLR-1 :	Introduce students to the basic practice of statistics by using SPSS Statistics			
CLR-2 :	Create statistical software program used for data management and data analysis			
CLR-3 :	Introduce students to the use of advanced SPSS for analyzing project data for reporting purposes focusing on database management tasks			
CLR-4 :	Introduce students to the use of advanced SPSS for descriptive statistics and graphics			
CLR-5 :	Learn how to perform basic statistical analyses.			

Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:		
CLO-1 :	Students will able to perform a wide range of data management tasks in SPSS application			
CLO-2 :	Understand the basic workings of SPSS, and perform basic statistical analyses.			
CLO-3 :	To perform data checking and create simple tables and charts.			
CLO-4 :	To perform database management tasks, descriptive statistics and graphics,			
CLO-5 :	To perform basic inferential statistics for comparisons and correlations.			

Learning		
1	2	3
Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning

H	H	H	M	M	M	M	M	M	M	L	M	M	M	M
M	H	H	M	H	M	M	L	M	M	L	M	L	M	M
M	H	H	M	H	M	M	M	M	L	L	M	M	M	L
M	H	H	M	H	M	L	M	L	M	L	L	M	L	M
H	H	M	M	H	L	L	M	L	L	L	L	M	L	L

Duration (Hour)	Learning Unit / Module 1 12	Learning Unit / Module 2 12	Learning Unit / Module 3 12	Learning Unit / Module 4 12	Learning Unit / Module 5 12
S-1 to S-4	SLO-1 Data handling	Recode in to same variable	Data handling: Split	Pie Diagram, Frequency Table, Frequency Curve, Frequency Polygon by using SPSS	Simple Regression Analysis by using SPSS
	SLO-2 open SPSS data file	Recode in to different variable	compute total scores, table looks by using SPSS	Histogram, Scatter diagram, Box Plot by using SPSS	Multiple Regression Analysis [Enter and stepwise methods] by using SPSS
S-5 to S-8	SLO-1 save from other data source	Transpose of data by using SPSS	Explain about Changing column by using SPSS	Mean, Median, Mode, Standard Deviation by using SPSS	Testing of Hypothesis: Parametric , One sample t – test, Two sample Independent t – test, Paired t – test
	SLO-2 import SPSS data file from other data source	Insert variables and cases by using SPSS	Explain about Different font style, font size by using SPSS	Skewness, Kurtosis by using SPSS	Non – parametric: One sample KS test by using SPSS
S-9 to S-12	SLO-1 data entry by using SPSS	merge variables and cases by using SPSS	Diagrammatic representation: Simple Bar diagram, Multiple bar diagram by using SPSS	Karl Pearson's Correlation by using SPSS	Mann-Whitney U test, Wilcoxon Signed Rank test, Kruskal Wallis test, Friedman test by using SPSS
	SLO-2 Labeling for dummy numbers	Explanation for selecting cases by using SPSS	Sub-divided Bar diagram, Percentage diagram	Spearman's Rank Correlation by using SPSS	Chi- square test, Analysis of variance, One way ANOVA by using SPSS

Learning Resources	Text Books:
	1. Clifford E.Lunneborg (2000). Data analysis by resampling: concepts and applications. Dusbury Thomson learning. Australia. 2. Everitt, B.S and Dunn, G (2001). Applied multivariate data analysis. Arnold London.

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	-	40%		30%	-	30%	-	30%	-	30%
	Understand										
Level 2	Apply	-	40%		40%	-	40%	-	40%	-	40%
	Analyze										
Level 3	Evaluate	-	20%		30%	-	30%	-	30%	-	30%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasanth, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani, SRMIST

Course Code	UCD23V05T	Course Name	Career Readiness and Professional Skills	Course Category	V	Value Addition Course					L	T	P	O	C
											2	0	0	2	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Career Guidance Cell	Data Book / Codes/Standards	-		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning			Program Learning Outcomes (PLO)														
CLR-1 :	Enable students to understand reasoning skills and mathematical concepts	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Prepare students for job interviews	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-3 :	Learn structured query language (SQL) to an intermediate/advanced level																		
CLR-4 :	Learn the benefits of Python as a scripting language																		
CLR-5 :	Develop life-long skills students can use to seek jobs, internships and make career changes																		
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1 :	Solve the problems on reasoning	3	80	75	H	M	-	-	-	M	-	H	-	H	-	H	M	-	-
CLO-2 :	Face interviews confidently	3	80	75	-	-	M	-	M	-	-	-	L	-	H	-	-	H	H
CLO-3 :	Understand the importance and major issues of database security and the maintenance of data integrity.	3	75	70	H	M	-	M	H	-	M	-	-	-	-	M	-	H	M
CLO-4 :	Utilise essential programming components including variables, conditional logic, loops, and functions to create simple programmes.	3	75	70	H	-	M	M	-	H	-	-	-	M	-	H	-	H	M
CLO-5 :	Assist students in choosing a career path during their course	3	75	70	-	M	M	-	H	-	M	-	-	-	H	-	-	H	H

Duration (hour)	6	6	6	6	6
S-1	SLO-1 Partnership	Self-Image and Self-Presentation	SQL - Introduction to SQL	SQL – Joins	Class coding basics
	SLO-2 Partnership related solving problems	Etiquettes	SQL Statement Classes	SQL – inner joins –Join Syntax	Class coding basics – quiz session
S-2	SLO-1 Cryptarithmic	Interview Skills - Introduction	Introduction to Databases	Introducing Python	Understanding Data Structures
	SLO-2 Cryptarithmic – solving problems	Do's and Don'ts during Interview	SQL - Databases & RDBMS	Introducing Python Object Types	Python for Data
S-3	SLO-1 Ordering, Ranking	Mock Interview – Session 1	SQL data types - Introduction	Python - Data Types & Operators	Python Data Types
	SLO-2 Grouping	Mock Interview – Session 2	SQL data types	Python's Core Data Types	Overview of Python Data Types
S-4	SLO-1 Venn Diagrams concepts	Mock Interview – Session 3	SQL - Syntax	Introduction to Functions	Python Structures
	SLO-2 Venn Diagrams solved questions	Mock Interview – Session 4	SQL – Data Type Syntax	Why use Functions	Overview of Python Data Structures
S-5	SLO-1 Types of Paragraph	HR Round – Practice Session	SQL – Commands Introduction	Python – Functions basic	Python - Collections
	SLO-2 Paragraph Forming Questions	HR personal Interview –Mock-Session	SQL - DDL, DML Commands	Coding functions	Improving Code readability
S-6	SLO-1 Types of Sentences	Email Etiquettes	SQL - Subqueries	Introduction to Classes	Collection Module
	SLO-2 Ordering of Sentences	Email Drafting – Do's and Don'ts	Non-correlated Subqueries	Why Use Classes?	Collection Module in Python

Learning Resources	1. <i>Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Tata McGraw Hill, 5th Edition</i>	4. <i>Bhatnagar R P, English for Competitive Examinations, Trinity Press, 2016</i>
	2. <i>Dr. Agarwal.R.S, Quantitative Aptitude for Competitive Examinations, S. Chand and Company Limited, 2018 Edition</i>	5. <i>C. J. Date, A. Kannan, S. Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.</i>
	3. <i>Edgar Thrope, Test of Reasoning for Competitive Examinations, Tata McGraw Hill, 6th Edition</i>	6. <i>Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.</i>

Learning Assessment					
Level	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)			
		CLA-1 (20%)	CLA-2 (20%)	CLA-3 (30%)	CLA-4 (30%)#
		Theory	Theory	Theory	Theory
Level 1	Remember	20%	10%	25%	25%
	Understand				
Level 2	Apply	50%	50%	50%	50%
	Analyze				
Level 3	Evaluate	30%	40%	25%	25%
	Create				
	Total	100 %	100 %	100 %	100 %

CLA-1, CLA-2 and CLA-3 can be from any combination of these: Online Aptitude Tests, Classroom Activities, Case Studies, Poster Presentations, Power-point Presentations, Mini Talks, Group Discussions, Mock interviews, etc.

CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
<i>Mr. M. Ponmurugan, Executive PMOSS, Cognizant Technology Solutions India Pvt. Limited, Chennai</i>	<i>Dr. G. Saravana Prabu, Asst. Professor, Department of English, Amrita Vishwa Vidyapeedam, Coimbatore</i>	<i>Dr. Sathish K, HOD, Department of Career Guidance, FSH, SRMIST</i>
		<i>Ms. Deepalakshmi S, Assistant Professor, Department of Career Guidance, FSH, SRMIST</i>

Course Code	UMI23M01L	Course Name	My India Project	Course Category	M	Mandatory Course	L	T	P	O	C
							0	0	0	0	0

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
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Course Offering Department	Computer Science	Data Book / Codes/Standards	Nil
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My India project - Assessment Method – Fully Internal

Assessment Method – Fully Internal

Assessment Tools	Marks
Review – I (Activities)	50
Review – II (Project report and Presentation)	50
Total	100

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr. M.Vasanth, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani,SRMIST

SEMESTER - V

Course Code	UST23501J	Course Name	STATISTICAL INFERENCE - II	Course Category	C	Dicipline Specific Core Course				
						L	T	P	O	C
						3	0	3	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics		Data Book / Codes/Standards	Statistical Table and Graph sheet	

Course Learning Rationale (CLR):		The purpose of learning this course is to:			Learning			Program Learning Outcomes (PLO)														
CLR-1 :	To provide theoretical understanding of Statistical Inference procedures				1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	To carry out the test procedures and obtain the best test with minimum possible errors for any given null and alternative hypothesis				Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-3 :	To calculate Uniformly powerful test for distributions																					
CLR-4 :	To get knowledge of likelihood ratio test for various distribution																					
CLR-5 :	Introduce main ideas and principles behind the non-parametric inference procedures																					
Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:			Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	H	M	M	M	M	L	M	H	H	M	L	M	L	M	M
CLO-1 :	Introduce the basic theory behind the development and assessment of statistical estimation techniques in areas of point estimation.				3	85	80	H	M	M	M	M	L	M	H	H	M	L	M	L	M	M
CLO-2 :	Understand and apply the various methods of estimation techniques and solving problem based on these techniques				3	80	75	H	M	H	M	M	L	M	H	M	M	L	M	L	M	L
CLO-3 :	Introduce main ideas and principles behind the non-parametric inference procedures.				3	85	80	H	L	M	M	M	M	M	H	H	L	L	M	M	M	L
CLO-4 :	Understand Decision theory, Prior distributions – Baye’s risk. For fixed α and β fixing the sample size n fixing sample size n using Sequential Probability Ratio Test.				3	85	80	H	M	M	H	L	M	L	M	H	M	L	L	M	L	M
CLO-5 :	Finding OC and ASN function for various distribution.							H	M	H	H	L	M	L	M	M	L	L	L	M	L	M

Duration (hour)		Learning Unit / Module 1 18	Learning Unit / Module 2 18	Learning Unit / Module 3 18	Learning Unit / Module 4 18	Learning Unit / Module 5 18
S-1	SLO-1	Testing of Hypothesis – Concepts	Monotone likelihood ratio definiton	Likelihood Ratio tests-introduction	Difference between large and small sample test	Non-parametric test - introduction
	SLO-2	Testing of Hypothesis – procedure	Monotone likelihood ratio property	Likelihood Ratio tests- definition, properties	Introduction and application of small samples	Assumptions of Non-parametric test
S-2	SLO-1	Simple and composite hypothesis	UMP test – statement	LR Test for one- tail test	Small samples definition	Advantages and disadvantages of non-parametric test
	SLO-2	Null hypothesis and alternative hypothesis	UMP test – property	LR Test for two- tail test	Student's t - test - procedure	Run – test - procedure
S-3	SLO-1	Null hypothesis and alternative hypothesis – examples	UMP test – problems	Two tail normal distribution example	Problems on testing of single sample mean for two-tail	Run – test - problems
	SLO-2	Simple problems on simple and composite hypothesis	UMP test for the parameters of univariate normal uses, formula	T- Test for one mean- proof	Problems on testing of single sample mean for one-tail	Mann Whitney U test statistic - assumptions
S-4 – S-6	SLO-1	Construction of simple and composite hypothesis - problems	UMP test for the parameters of univariate normal - procedure	T- Test for one mean-problem	Problems on two sample with one tail	Mann Whitney U test statistic

Duration (hour)	Learning Unit / Module 1		Learning Unit / Module 2		Learning Unit / Module 3		Learning Unit / Module 4		Learning Unit / Module 5	
	18		18		18		18		18	
	SLO-2	Type-I and Type – II error	UMP test for the parameters of univariate normal distribution - problem		Exact and Asymptotic p values		Problems on testing difference of two sample means for two tail test		U test for small sample - Procedure	
S-7	SLO	Type-I and Type – II error - problems	UMP test for the parameters of univariate exponential distribution		Wald, score, likelihood ratio		Problems on testing difference of two sample means for one tail test		Run – test and U test for small sample - problems	
S-8	SLO-1	Type-I and Type – II error - problems	UMP test for the parameters of univariate exponential distribution - properties		Test for equality of proportions		Paired t-test procedure		Sign test for sample - Procedure	
	SLO-2	Critical region – level of significance	UMP test for the parameters of univariate exponential distribution - procedure		Independent samples		Paired t-test problem		Wilcoxon signed rank test - small sample procedure	
S-9	SLO-1	Critical region – level of significance – simple problems	UMP test for the parameters of univariate exponential distribution – problem		Independent hypothesis test		t-test for correlation coefficient		Wilcoxon signed rank test - small sample problems	
	SLO-2	Critical region – level of significance – simple problems	UMP test for the two parameters of univariate exponential distribution – procedure		Problems on test for equality of proportions		F-Test derivation, uses		Median test procedure	
S-10- S-12	SLO-1	Type – I and Type – II error and Critical region – level of significance – problems	UMP test for the two parameters of univariate exponential distribution - application		Asymptotic test based on Normal distribution.		F-Test with given values		Median test problems	
	SLO-2	Critical region – level of significance – simple problems	one parameter exponential family proof of the theorem		LRT for normal distribution		F-Test with $S_1 > S_2$		Test for normality - importance	
S-13	SLO-1	Power test - definition	Application on one parameter exponential family		MLE for normal distribution		F-Test with $S_2 > S_1$		Purpose of normality test	
	SLO-2	Most powerful test – statement	Problems on one parameter exponential family		Wald test for normal distribution		Chi-square test – goodness of fit		Assumptions of normality test	
S-14	SLO	Neyman-pearson lemma - statement	Example of binomial distribution		Score statistic for normal distribution		Problems on goodness of fit		Kolmogorov – Smirnov (KS) one sample test	
S-15	SLO-1	Neyman-pearson lemma proof	Example of normal distribution- proof		Methods for evaluating test		Problems on goodness of fit		Kolmogorov – Smirnov (KS) one sample test - procedure	
	SLO-2	Problem on Neyman-pearson lemma	Example of normal distribution- sum		Example on Methods for evaluating test		Chi-square test – independent of attributes		Kolmogorov – Smirnov (KS) two sample test - explanation	
S-16 – S-18	SLO-1	P-value – applications	Example of exponential distribution- proof		Example of gamma distribution		Problems – independence of attributes		Kolmogorov – Smirnov (KS) two sample test - problem	
	SLO-2	P-value – interpretations- simple problems	Example of exponential distribution- sum		Sum on asymptotic test		Independence of attributes and goodness of fit - problems		Kolmogorov – Smirnov (KS) one sample test - problem	

Learning Resources	Text Books:		References:	
	- Manoj Kumar Srivastava, Namita Srivastava (2009): Statistical Inference: Testing of Hypotheses), PHI, New Delhi - Hogg R.V., Craig A.T. and Joseph W McKean(2005): Introduction to Mathematical Statistics, 6th edition, Pearson.		- Goon A.M, Gupta M.K., Das Gupta B. (1980): An Outline of Statistical Theory, Vol. 2, 6th revised edition, World Press, Calcutta. - Hogg R.V. and Tanis E.A. (2001): Probability and Statistical Inference, Pearson Education Asia.	

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA_1 (10%)		CLA_2 (10%)		CLA_3 (20%)		CLA_4 (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr. M.Vasanth, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani, SRMIST

Course Code	UST23502J	Course Name	Operations Research	Course Category	C	Dicipline Specific Core Course	L 3	T 0	P 3	O 2	C 4
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Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):		The purpose of learning this course is to:			Learning			Program Learning Outcomes (PLO)														
CLR-1 :	To understand the concepts of linear programming problem				1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	To provide the knowledge of optimization techniques and approaches.				Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-3 :	To learn the concepts of transportation and assignment problem																					
CLR-4:	To learn the basic concepts of game theory																					
CLR-5:	To understand the sequencing problems																					
Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:																				
CLO-1 :	Explain the linear programming problem and its properties				3	85	80	M	L	L	H	M	L	H	M	H	M	L	M	M	L	M
CLO-2 :	Explain the fundamental concepts in linear programming problem and its applications.				3	80	75	M	H	M	H	M	L	H	M	M	M	L	M	M	L	M
CLO-3 :	Explain the concepts of transportation and Assignment problem				3	85	80	M	H	M	H	M	M	H	M	M	L	L	M	L	M	M
CLO-4 :	Relate the different types of game theory				3	85	80	H	M	M	M	L	M	M	L	H	L	M	L	M	M	L
CLO-5 :	Describe the different types of sequencing problems				3	85	80	M	H	L	M	L	M	M	L	M	M	H	H	L	M	L

Duration (hour)		Learning Unit / Module 1 18	Learning Unit / Module 2 18	Learning Unit / Module 3 18	Learning Unit / Module 4 18	Learning Unit / Module 5 18
S-1	SLO-1	Introduction – Basics	Linear programming problem (LPP)– Introduction	Introduction to Transportation problem	Game theory- Introduction	Sequencing Problems: Introduction -
	SLO-2	<i>Basics of Operations Research (OR)</i>	Assumptions of LPP	Transportation Problems(TP) - Examples, Definitions – decision variables, supply and demand constraints	Two person zero sum games	Assumptions made while solving Sequencing problem
S-2	SLO-1	<i>Characteristics of O.R</i>	Mathematical model of LPP	Mathematical formulation of TP	Main characteristics	Basic rules
	SLO-2	<i>Importance and limitations of O.R</i>	Components of LPP	Balanced and Unbalanced TP	Saddle point	Total elapsed time, Idle time, No passing Rule
S-3	SLO-1	Various phases of O.R	Step by step procedure of LPP model formulation	Methods for finding Initial basic feasible solution – North west corner rule, Least cost method	Maximin-Minimax Principle	Procedure for sequencing n jobs on 2 machines
	SLO-2	<i>Formualtion Phase</i>	Formulation of LPP - problems	Vogel's Approximation Method(VAM)	Saddle point and value of the game	Problems for sequencing n jobs on 2 machines
S-4 - S-6	SLO-1	<i>Practical:: Main phases of O.R</i>	Practical: Formulation of LPP for a real life problem	<i>Practical: Problems of finding Initial Basic feasible solution for TP</i>	<i>Practical: Practice problem on Pure strategy</i>	Practical: sequencing n jobs on 2 machines
	SLO-2					

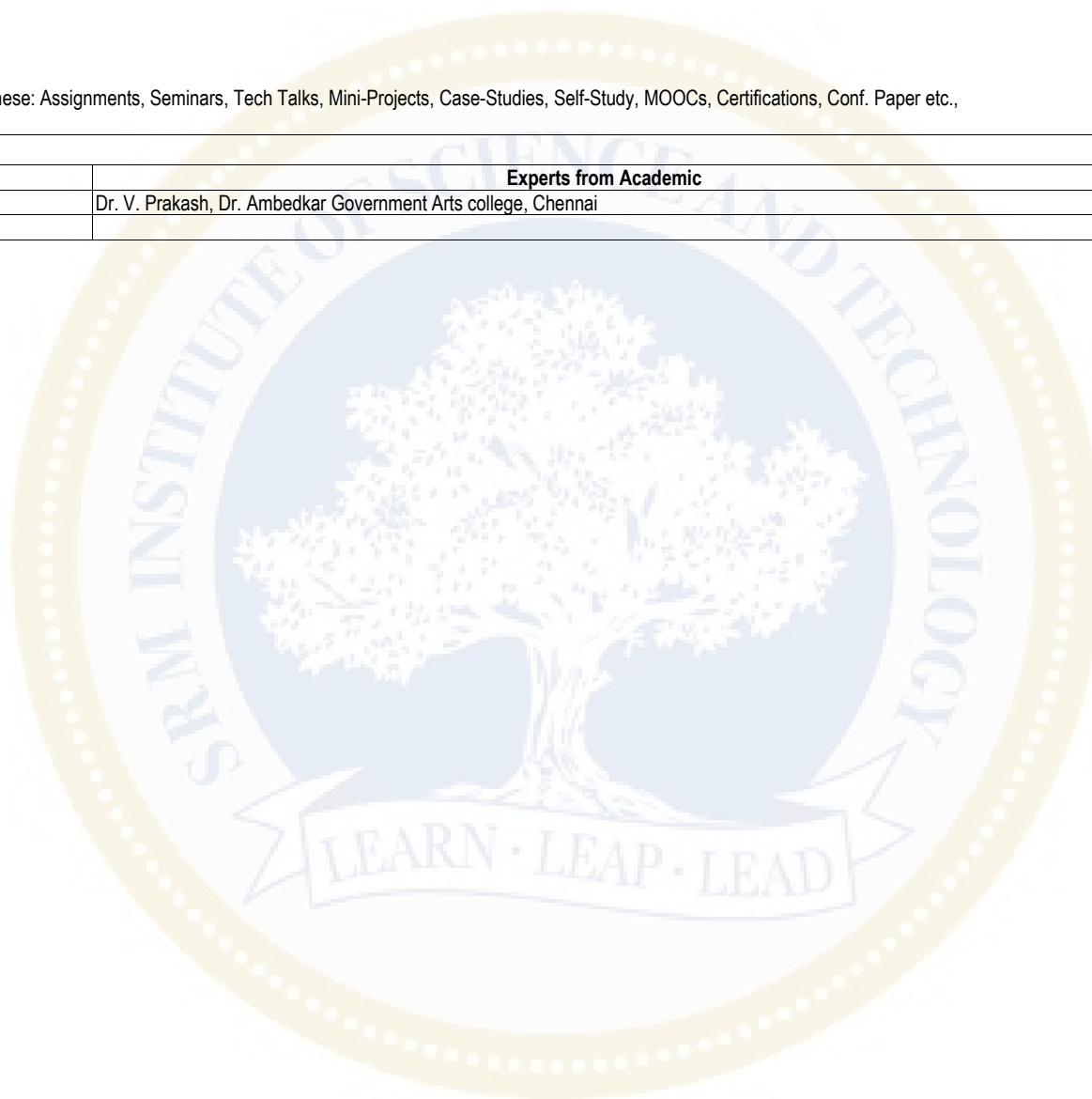
Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		18	18	18	18	18
S-7	SLO-1	Analysis Phase	Formulation of LPP - problems Introduction of Slack variables	Degeneracy and Non-degeneracy condition	Problems based on two-person zero sum game	Procedure for sequencing n jobs on 3 machines
	SLO-2	Interpretation phase		Unbalanced Transportation Problem	Problems based on Games with saddle point	Sequencing n jobs on 3 machines
S-8	SLO-1	Operation Research and decision making	Introduction of Surplus variables	Optimality test	Mixed Strategies, without saddle point	Procedure for sequencing n jobs on 4 machines
	SLO-2	Methods of solving OR	Canonical form of LPP	Introduction to MODI method	2 x 2 rectangular Games—introduction	Sequencing n jobs on 4 machines
S-9	SLO-1	<i>Analytic method, Monte-Carlo method</i>	Problems on Canonical form of LPP	Problems on MODI Method	2 x 2 rectangular Games— procedure	Procedure for sequencing n jobs on m machines
	SLO-2	<i>Iterative method</i>	Standard form of LPP	Maximization case in Transportation Problem	2 x 2 rectangular Games— problems	Problems for Sequencing n jobs on m machines
S-10 - S-12	SLO-1	<i>Practical: Role of computers in OR</i>	Practical: Problems on Graphical method of solving LPP	<i>Practical: Transportation problem – max and min - problems</i>	<i>Practical: Practice Problems on Mixed Strategies</i>	Practical: sequencing n jobs on m machines
	SLO-2					
S – 13	SLO-1	Advantages of OR models	Procedure of simplex Method	Assignment Problem (AP): Examples, Definitions – decision variables, supply and demand constraints	Matrix oddment method for 3x3 games	Processing of 2 jobs on n machines - Introduction
	SLO-2	Disadvantages of OR models	Simplex algorithm (maximization case – procedure)	Mathematical formulation of AP, Balanced and Unbalanced AP	Matrix oddment method for n x n games	Method of Processing of 2 jobs on n machines
S-14	SLO-1	Some characteristics of a good model	setup initial solution	Assignment Algorithm: Hungarian Method	Procedure: graphical method of solving 2 x n games	Advantages and disadvantages of Method of Processing of 2 jobs on n machines
	SLO-2	Basic models in OR	Simplex method: non-degenerate basic solution, degenerate basic solution	Hungarian Method: Computation details	Procedure: graphical method of solving n x 2 games	Graphical method
S-15	SLO-1	Classification of Models	Simplex method: basic feasible solution	Solving Unbalanced AP	<i>Problems on graphical method of solving games</i>	Problems on Processing of 2 jobs on n machines
	SLO-2	principles of Models	Simplex algorithm (minimization case) – procedure	Maximization case in AP	Domination Property—General Rule	Problems on Processing of 2 jobs on n machines
S-16 - S-18	SLO-1	<i>Practical: Applications of various models in OR</i>	<i>Practical: Simplex method – max and min - problems</i>	<i>Practical: Assignment problem – max and min - problems</i>	<i>Practical: Problems based on Dominance property</i>	<i>Practical: Processing of 2 jobs on n machines</i>
	SLO-2					

Learning Resources	Text Books: Sundaresan, V, Ganapathy Subramanian, K.S. and Ganesan, K (2011), Resource Management Techniques, A.R. Publications-Nagapattinam.	References 1. Taha, Hamdy A. Operations research: an introduction. Pearson Education India, 2013. 2. C.R. Kothari – Quantitative Techniques, Vikas Publishing House, 1986

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

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Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasantha, ICMR, Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani, SRMIST



Course Code	UST23503J	Course Name	Regression Analysis	Course Category	C	Dicipline Specific Core Course	L	T	P	O	C
							3	0	3	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):		The purpose of learning this course is to:			Learning			Program Learning Outcomes (PLO)														
CLR-1 :	Describe simple and multiple linear regression models and its properties				1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Apply principle of least square method to estimate the parameters in simple and multiple linear regression models				Thinking (Bloom)	Proficiency (%)	Assessment (%)	Knowledge	Concepts	Related	Knowledge	Specialization	Core	Modeling	Interpret Data	Skills	Learning Skills	Communication Skills	Analytical Skills	Professional Behavior	Life Long Learning	
CLR-3 :	Discuss the problem of estimation of parameters when multicollinearity occurs.																					
CLR-4:	Understand the model adequacy checking based on residuals																					
CLR-5:	Understand the concept of variable and model building																					

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	Understand simple and multiple linear regression models with their applications.	3	85	80	H	H	M	H	M	M	L	M	M	M	L	M	L	M	M
CLO-2 :	Learn the fitting of these models to simulated and real data sets.	3	80	75	M	H	M	M	H	L	M	H	M	M	L	M	M	L	M
CLO-3 :	Learn model adequacy using classical diagnostics, awareness of potential problems	3	85	80	M	M	M	H	H	M	M	H	M	M	L	M	M	M	M
CLO-4 :	Understand the effects of autocorrelation in regression models	3	85	80	M	M	M	M	H	M	M	H	M	M	H	L	M	M	L
CLO-5 :	Identify multicollinearity problem, its consequences.	3	85	80	H	M	M	M	H	M	L	M	H	M	M	L	L	L	L

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		18	18	18	18	18
S-1	SLO-1	Simple regression model introduction	Analysis of residual	Multiple regression model Introduction	Testing of hypothesis on linear model – introduction	Multicollinearity – Introduction
	SLO-2	Simple linear regression model	Model adequacy	Description of data model	Basic ideas	
S-2	SLO-1	Assumptions about the explanatory variable	Checking of linearity between study and explanatory variable	Properties of least square estimators	The unrestricted model	Multicollinearity and its effects on inference and forecasting
	SLO-2	Least square estimation of parameters	Detection of outliers	Predicted values and standard errors	Restricted model	Sources of Multicollinearity
S-3	SLO-1	Hypothesis testing on the slope and intercept	Treatment of outliers	Confidence intervals on the regression coefficients	The unrestricted residual sum of squares	Effects of Multicollinearity
	SLO-2	Interval estimation in simple linear regression	The press statistic - definition	Problems on residual plots	Restricted residual sum of squares	Multicollinearity diagnostics
S-4 to S-6	SLO-1	Procedure for simple linear regression	R ² for prediction based on PRESS. Using PRESS to compare models	Partial regression and partial residual plots	The F statistic	Structural Multicollinearity
	SLO-2	Problems on simple linear regression using least square methods	Methods for scaling residuals	Other residual plots and analysis methods – statistical tests on residuals	Inference with non-normal errors	Data Multicollinearity

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		18	18	18	18	18
S-7	SLO-1	estimation of model parameters β_0	Residual plots – normal probability plot	Multiple correlation coefficient	A large sample example	Detection of Multicollinearity
	SLO-2	estimation of model parameters β_1	Normal probability plot based on delivery time data	Selection of variables	Alternative form of the F-statistic using the R squared	Examination of Correlation Matrix
S-8	SLO-1	Properties of least square estimators	Plot the residual against the fitted y values	Forward selection procedure	Common distributions	Variance Inflation factor (VIF)
	SLO-2	Prediction of new observations	Plot the residual against the regressor and time sequence	Backward elimination procedure	The normal distribution - Linear Combinations of Normal Variables	Eigen system Analysis of Correlation Matrix
S-9	SLO-1	Coefficient of determination	Problems on residual plots	Stepwise method	The Multivariate Normal Distribution	High Correlation Coefficients
	SLO-2	Estimation by maximum likelihood	Partial regression and partial residual plots	Efficient generation of all possible regressions	The Student's t Distribution , The F Distribution	High R^2 with low t-Statistic Values
S-10 to S-12	SLO-1	Problems on simple linear regression using least square methods	Comments on partial regression plots	Example using cement data	Exact Tests in the Classical Normal Linear Model	Remedial measures
	SLO-2	Problems on maximum likelihood estimation	Other residual plots and analysis methods – statistical tests on residuals	Computational techniques for variable selection – all possible regressions	Tests of Several Restrictions	Ridge regression
S – 13	SLO-1	Multiple linear regression models	Transformation of variable	Forward selection procedure with example	Testing a subset of regression coefficients equal to zero	Principal Component analysis
	SLO-2	estimation of model parameters β_0	Transformation of dependent variable	Backward elimination procedure with example	Bootstrap DGPs for Regression Models	Ridge regression - procedure
S-14	SLO-1	estimation of model parameters β_1	Transformation of independent variable	Stepwise regression algorithm with example	A Nonparametric Bootstrap DGP	Ridge regression - Problem
	SLO-2	Properties of MLE	Transformation to stabilize variance	General comments on stepwise-type procedures	The Power of Hypothesis Tests	Principal Component analysis - procedure
S-15	SLO-1	Hypothesis testing in multiple linear regression	Removal of heteroscedasticity	Stopping rule for stepwise procedure	Testing of equality of regression coefficients	Principal Component analysis - Problem
	SLO-2	Confidence interval in multiple regression	Importance of heteroscedasticity	Problems on model selection using forward selection	Testing the Equality of Two Parameter Vectors	Drop a Redundant Variable
S-16 to S-18	SLO-1	Coefficient of determination	Procedure to find heteroscedasticity	Problems on model selection using backward elimination	Large -Sample Tests in Linear Regression Models	Transforming the Multicollinear Variables
	SLO-2	Adjusted R^2	Problem on removal of heteroscedasticity	Problems on model selection using stepwise algorithm	Simulation-Based Tests	Data having Multicollinearity solution

Learning Resources	Text Books:		References:
	1. S.Chatterjee and B.Price (1977): Regression Analysis by Example, John Wiley & Sons, New York. 2. Douglas C.Montgomery, Elizabeth A. Peck and G.Geoffrey Vining(2007) :		

1. Johnston J.(1984): Econometric Methods.
2. Thomas P.Ryan(2006): Modern Regression Methods, John Wiley and Sons,Inc.

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasantha, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani, SRMIST

Course Code	UST23D01J	Course Name	APPLIED STATISTICS	Course Category	D	Discipline Specific Elective course	L	T	P	O	C
							3	0	2	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Scientific calculator, Statistical Table and Graph sheet		

Course Learning Rationale (CLR):		The purpose of learning this course is to:			Learning			Program Learning Outcomes (PLO)														
CLR-1 :	To equip students with various forecasting techniques and knowledge on various statistical methods for analyzing time series data.				1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Understanding and constructing various indices.				Thinking (Bloom)	Efficiency (%)	Attainment (%)	Fundamental Knowledge	Application of Concepts related to the discipline	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-3 :	To know the statistical system of India.																					
CLR-4 :	To gain knowledge about rates and ratios in vital statistics.																					
CLR-5 :	To understand the concepts of various average methods.																					

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	Understanding of various components of time series and forecasting univariate variate time series data	3	85	80	M	H	M	H	M	H	M	L	L	L	L	M	M	L	M
CLO-2 :	Apply different methods of computing time series fitting models	3	80	75	M	H	H	M	H	M	M	L	M	M	L	M	L	L	M
CLO-3 :	Understanding various important concepts in forecasting and different approaches for modeling trend, seasonality and persistence	3	85	80	M	H	H	M	M	H	M	M	M	M	L	L	M	M	M
CLO-4 :	Interpret and use a range of index numbers commonly used in the business sector and understand the basic structure of the consumer price index (CPI) and its construction.	3	85	80	H	M	H	M	M	H	L	M	M	M	L	L	L	M	L
CLO-5 :	Familiarize on the function of various statistical system.	3	85	80	H	H	H	M	M	M	L	M	L	L	M	M	M	M	L

Duration (hour)	Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
	15	15	15	15	15
S-1	SLO-1 Introduction of Times series-background	Introduction of Index Number, Definition –uses	Statistical Quality Control - and chance and assignable.	Vital statistics – definition	official statistics – history
	SLO-2 Definition and uses of time series	classification of index numbers	Importance of statistical methods in industrial research and practice	Uses of vital statistics	Statistical system in India
S-2	SLO-1 Component of time series – secular trend, seasonal variation - concepts	Problems in the construction of index numbers	Determination of tolerance limits-calculation	Methods of obtaining vital statistics	Statistical system in India

Duration (hour)	Learning Unit / Module 1		Learning Unit / Module 2		Learning Unit / Module 3		Learning Unit / Module 4		Learning Unit / Module 5	
	15		15		15		15		15	
	SLO-2	Cyclic variation, irregular variation	Methods of constructing index numbers	Examples on Determination of tolerance limits			Registration method 2. Census Enumeration Registration method 2. Census Enumeration Registration method 2. Census Enumeration Registration method and census enumeration method		CSO functions- objectives	
S-3	SLO-1	Additive model, multiplicative model	Unweighted index numbers – procedure, examples	Causes of variations in quality			Analytical method estimation of vital rates using census data		CSO role and functions	
	SLO-2	Measurement of Secular trend – definition, various methods	weighted index numbers- procedure, examples	Causes of variations in quality- examples			Rates and ratios in vital statistics		NSSO – objectives	
S 4-S5	SLO-1	Graphical method-free hand curve - procedure	Unweighted index numbers - problems	General theory of control charts			Measurement of mortality		NSSO – role and functions	
	SLO-2	Semi average method-procedure	weighted index numbers - problems	Types of control charts			Crude rates – procedure and formula		NSSO – four divisions - Survey Design and Research (SDR), field operation division	
S-6	SLO-1	Semi average method-problems	Quantity index numbers – formulas, uses	process product control charts			Crude rates - problems		NSSO – data processing, economic analysis	
	SLO-2	Moving average method-procedure – formula – uses	Quantity index numbers- examples	product control charts			Crude rates - problems		Present structure of the statistical system	
S-7	SLO-1	Moving average method-problems	Quantity index numbers- problems	Control charts for variables			Crude rates - problems		Working process of statistical system	
	SLO-2	Moving average method-procedure – odd yearly	Fixed base index numbers – formula, procedure	X- bar procedure			Crude rates - problems		Functions of statistical system	
S-8	SLO-1	Problems on odd yearly moving average	Fixed base index numbers - sums	X- bar chart examples			Specific and standardized death rates – concepts, examples		Agricultural statistics - crop and land uses	
	SLO-2	Moving average method-procedure-even yearly	Fixed base index numbers - examples	X- bar chart sums			Problems on specific and standardised death rates.		Agricultural statistics – crop forecasting	
S-9-S10	SLO-1	Problems on odd yearly moving average	chain base index numbers – formula, uses	R-charts procedure			Construction of life table procedure		Agricultural statistics – Horticultural crops	
	SLO-2	Problems on even yearly moving average	chain base index numbers – procedure , problem	Sums on R-charts			Construction of life table uses		Agricultural statistics – irrigation statistics	
S-11	SLO-1	Methods of least square – procedure - advantage	Optimum test for index numbers – procedure, uses	Examples on R- charts			Types of tables		Industrial statistics – uses, applications	
	SLO-2	Construction of trend line using method of least square	Optimum test for index numbers- problems	Control charts for attributes			Stationary table – problems		Industrial statistics - examples	
S-12	SLO-1	Methods of least square-problems – even and odd number of years	Time reversal test- formula, uses	Types of Control charts for attributes			Stable population table		Trade statistics – import and export	
	SLO-2	Measurement of seasonal variations - Simple average method	Time reversal test-procedure, examples	p charts- procedure			Stable population table-problems		Trade statistics – foreign trade performance	

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		15	15	15	15	15
S-13	SLO-1	Ratio to trend method	factor reversal test- formula, uses	P charts-sums	Fertility rates	Trade statistics - foreign trade performance
	SLO-2	Ratio to moving average method	factor reversal test-procedure, examples	C charts-procedure	Crude, General rates	Labour statistics – objectives and functions
S-14-S-15	SLO-1	Link relative method	Cost of living index numbers - problem	C charts- sums	Specific fertility rates	Transport Communication statistics
	SLO-2	Variate Difference Method.	Time reversal test and factor reversal test-problem	C charts- examples	total fertility rates	Health statistics

Learning Resources	Text Books:		References:	
	1. Saluja,M.R (1972): Indian official statistical systems: Statistical publishing society, Calcutta and The Indian Econometric Society, Hyderabad		1. Croxton, F.E and Cowdon, D.J. (1973): Applied general statistics, Prentice Hall	
	2. Goon, A.M. Gupta, M.K., and Das Gupta, B. (1980): Fundamentals of statistics, Vol.II, 6th revised ed. World Press limited, Calcutta.		2. Parimal Mukhopadhyay, (1999), Applied Statistics, Books and allied, Pvt Ltd, Kolkata.	

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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Experts from Industry	Experts from Academic	Internal Experts
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		2. M.Kalaivani,SRMIST

Course Code	UST23D02J	Course Name	Demography	Course Category	D	Discipline Specific Elective course	L 3	T 0	P 2	O 2	C 4
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Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):		The purpose of learning this course is to:		
CLR-1 :	To collect valid Demographic data using different methods.			
CLR-2 :	To learn basic measures of Mortality, Fertility and Population Growth			
CLR-3 :	To construct life tables			
CLR-4:	To understand the concept of Life Tables, their construction and uses			
CLR-5:	To differentiate between Vital Statistics and Demography			

Learning			
1	2	3	
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge

Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:		
CLO-1 :	Understand the basic concepts of demography and vital statistics			
CLO-2 :	Identify the components of population change, including the effects of changing birth, death and migration rates, and demonstrate their influences on age structure			
CLO-3 :	To check the completeness of registration data using Chandrasekaran-Deming formula			
CLO-4 :	Understand the trends of mortality and compare and contrast among different age and sex group			
CLO-5 :	To understand the Measures of Population Growth			

Duration (hour)		Learning Unit / Module 1 15	Learning Unit / Module 2 15	Learning Unit / Module 3 15	Learning Unit / Module 4 15	Learning Unit / Module 5 15
	SLO-2	Chandrasekharan -Deming formula to check completeness of registration data – procedure	Sources of demographic data: census – de-jure and de-facto method	Force of Mortality - Definition	Problem using Greville's method	Crude rates of natural increase - Formula
S-6	SLO-1	Problem to check the completeness of registration data using Chandrasekaran Deming formula.	Measurement of population	Formula for Force of Mortality	King's Method – Concept and construction steps	Crude rates of natural increase - Problem
	SLO-2	Errors in Age data	Masculinity Proportion	Applications of central mortality rate and Force of Mortality	Merits and demerits of King's Method	Purpose of Crude rates of natural increase
S-7	SLO-1	Evaluation of Age data	Rate and ratio of vital events	Stable population- definition	Problem using King's Method	Pearl's Vital Index
	SLO-2	Adjustment of age data	Measurements of mortality	Properties of Stable population	Measurements of fertility	Pearl's Vital Index - definition
S-8	SLO-1	Example problem	Crude death rate - definition	The use of Stable population theory	Crude Birth Rate (CBR) - definition	Pearl's Vital Index - Formula
	SLO-2	Use of Whipple Indices	Formula for Crude death rate	Using the strong ergodicity principle	Formula for Crude Birth Rate (CBR)	Pearl's Vital Index – example problem
S-9 to S-10	SLO-1	Example problem	Example problem - Crude death rate	Stationary population as special case of stable population	Example problem - Crude Birth Rate (CBR)	Applications of Pearl's Vital Index
	SLO-2	Use of Myer's Indices	Specific death rate - definition	Life mortality tables - Introduction	General Fertility Rate (GFR) - definition	Gross Reproduction Rate
S – 11	SLO-1	Example problem	Formula for Specific death rate	Assumptions of Life Mortality tables	Formula for General Fertility Rate (GFR)	Gross Reproduction Rate - Definition
	SLO-2	Use of UN Indices	Example problem - Specific death rate	Life Mortality tables - Description	Example problem - General Fertility Rate (GFR)	Formula for Gross Reproduction Rate
S-12	SLO-1	Example problem	Infant Mortality rate - definition	Construction of life tables – steps	Specific Fertility Rate (SFR) - definition	Problems on Gross Reproduction Rate
	SLO-2	Problem on Myer's and UN indices	Formula for Infant Mortality rate	Applications of life tables	Formula for Specific Fertility Rate (SFR)	Applications of Gross Reproduction Rate
S-13	SLO-1	Population composition	Example problem - Infant Mortality rate	Example problem to construct life table	Example problem - Specific Fertility Rate (SFR)	Net Reproduction Rate - Definition
	SLO-2	dependency ratio	Standardized death rate - definition	Merits of life tables	Total Fertility Rate (TFR) - definition	Formula
S-14 to S-15	SLO-1	Sources of demographic data	Formula for Standardized death rate	Drawbacks in constructing life tables	Formula for Total Fertility Rate (TFR)	Problem
	SLO-2	Application of demographic studies	Example problem - Standardized death rate	Uses of life tables	Example problem - Total Fertility Rate (TFR)	Application

Learning Resources	Text Books:			References:		
	1. Mukhopadhyay P. (1999): Applied Statistics, Books and Allied (P) Ltd. 2. Gun, A.M., Gupta, M.K. and Dasgupta, B. (2008): Fundamentals of Statistics, Vol. II, 9 th Edition, World Press.			1. Biswas, S. (1988): Stochastic Processes in Demography & Application, Wiley Eastern Ltd. 2. Croxton, Fredrick E., Cowden, Dudley J. and Klein, S. (1973): Applied General.		

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasantha, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani, SRMIST

Course Code	UST23G03J	Course Name	Python Programming	Course Category	G	Generic Elective Course	L	T	P	O	C
							3	0	2	2	4

Pre-requisite Courses	NIL	Co-requisite Courses	NIL	Progressive Courses	NIL
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	NIL		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)
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CLR-1:	Describe the core syntax and semantics of Python programming language.	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2:	Discover the need for working with the strings and functions.	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-3:	Illustrate the process of structuring the data using lists, dictionaries, tuples and sets.																		
CLR-4:	Indicate the use of regular expressions and built-in functions to navigate the file system.																		
CLR-5:	Application of Python Library in Statistics																		

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1:	Develop, document, and debug modular python programs to solve computational problems	3	80	70	L	H	L	L	L	M	L	M	L	H	L	L	M	L	L
CLO-2:	Select a suitable programming construct and data structure for a situation.	3	85	75	M	H	L	M	M	L	L	M	M	M	L	M	M	M	M
CLO-3:	Use built-in strings, lists, sets, tuples and dictionary in applications.	3	75	70	H	H	M	M	M	M	M	M	M	H	L	L	M	M	M
CLO-4:	Use python library for data manipulation	3	85	80	H	H	M	L	M	M	M	L	M	H	L	M	M	M	L
CLO-5:	Select a suitable visualization tools in Python.	3	85	75	H	H	M	M	L	L	M	L	M	H	L	M	M	L	M

Duration (hour)	15	15	15	15	15
S-1	SLO-1 An introduction to python programming	Statement and syntax for Assignment	Introduction to function, Functions as Abstraction Mechanisms	Introduction to Python libraries	Introduction to Data wrangling
	SLO-2 Structure of a Python program	Expression - syntax	Functions Eliminate Redundancy, Functions Hide Complexity	Standard libraries of Python	Understand Merging , grouping data
S-2	SLO-1 understanding Python interpreter	Print - syntax	Functions Support General Methods with Systematic Variations	NumPy – introduction	Concatenating data
	SLO-2 understanding Python Shell	Examples for assignment, expression and print	Functions Support the Division of Labor	Import NumPy as np	Examples for data wrangling
S-3	SLO-1 Datatypes, Example program using all data types	Program using assignment and statistical expression	Defining a Recursive Function	Create NumPy arrays, Array indexing, negative indexing	Implementation of missing data
	SLO-2 String literals, Escape Sequences	Program using assignment and statistical expression	Tracing a Recursive Function	Array slicing	Data transformation
S-4-S-5	SLO-1 Lab 1: Write a Python code to display system information using pywhois	Lab 4: Make a simple calculator	Lab 7: Program using recursive function	Lab 10: Handling arrays using Numpy library	Lab 13: write a Python code - data wrangling functionalities for a database
S-6	SLO-1 String Concatenation	Introduction to Lists, List literals	Using Recursive Definitions to Construct Recursive Functions		

	SLO-2	Variables and the assignment statement	Basic list operators, Replacing an Element in a List	Recursion in Sentence Structure	Pandas – introduction and uses	Visualising data using various libraries
S-7	SLO-1	Example program using variables	Replacing an Element in a List	Infinite Recursion, The Costs and Benefits of Recursion	Pandas series, dataframes	Understanding matplotlib package
	SLO-2	Program Comments and Doc Strings	Example program to Replace an Element in a List	Managing a Program's Namespace	Load files into dataframes, Pandas read CSV files	Scatter plot
S-8	SLO-1	Numerical Datatypes, Character sets	List Methods for Inserting Elements	Module Variables, Parameters, and Temporary Variables	Analysing dataframes using Pandas	Bar chart
	SLO-2	Arithmetic expressions, Understanding error messages	Program to List Methods for Inserting Elements	Scope, Lifetime	Data cleaning sing Pandas	histogram
S-9-S-10	SLO-1	Lab 2: Python program to find Mean, Median and mode	Lab 5: simple programs using list s	Lab 8: Program to find the probabilities using Recurrence formula for various discrete distributions.	Lab 11: Program to present the data using pandas Library	Lab 14: Program to present the data using various function
	SLO-2					
S-11	SLO-1	Logical operators	Writing Text to a File, Writing Numbers to a File	Default (Keyword) Arguments	SciPy library – introduction	Pivot table - introduction
	SLO-2	Definite iteration : For loop, Example program using for loop	Reading Text from a File, Reading Numbers from a File	Functions as First-Class Data Objects	SciPy - interpolation	pivot table function in Pandas
S-12	SLO-1	Formatting text for output,	Example program to read and write text and numbers	Mapping, Filtering, Reducing	Scipy – statistical significance test	Importance of pivot table
	SLO-2	Selection : if and if else statement, Example program using if and if else	Accessing Files and Directories on Disk	Using lambda to Create Anonymous Functions	Statistical models in Python library – Lib/statistics.py	Crosstab function in Pandas
S-13	SLO-1	Conditional iteration :while loop	Manipulating Files and Directories on Disk	Example program using functions	Measures of central location, measures of spread	Uses of crosstab function in a dataframe
	SLO-2	Example program using while loop	Example program to access and manipulate files	Creating Jump Tables	Covariance, correlation, linear regression	Pivot table vs crosstabulation
S-14-S-15	SLO-1	Lab 3: Python Program to Generate a Random Number	Lab 6: Program to create and manipulate a csv file using historical dataset	Lab 9: Program to find the probabilities using Recurrence formula for various continuous distributions.	Lab 12: Python Program to calculate various statistical measures	Lab 15: handling a dataframe using pivot and crosstab fuctions
	SLO-2					

Learning Resources	Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning, ISBN: 978-1111822705
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Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasanth, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Mrs. M.Kalaivani, SRMIST
		2. Mrs. M.Ramla ,SRMIST

Course Code	UST23S03L	Course Name	Statistical Analysis using Analytical tools	Course Category	S	Skill Enhancement course	L	T	P	O	C
							0	0	2	2	1

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards			

Course Learning Rationale (CLR):		The purpose of learning this course is to:			Learning			Program Learning Outcomes (PLO)																	
CLR-1 :	Understand the keys and features of MATLAB code				Level of Thinking (Bloom)	2	Expected Proficiency (%)	3	Fundamental Knowledge	2	Application of Concepts	3	4	5	6	7	8	9	10	11	12	13	14	15	
CLR-2 :	Estimating the various statistical methods using MATLAB																								
CLR-3 :	Utilizing the various numerical methods in MATLAB																								
CLR-4 :	Gain the knowledge on how to use MATLAB for scientific computations																								
CLR-5 :	Identify the methodology for applying computational methods in MATLAB																								
Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:																							
CLO-1 :	Apply the MATLAB code to construct graph and diagrams				2	75	60	H	L	M	H	M	H	M	H	M	M	M	M	L	L	M	M	M	L
CLO-2 :	Understand to compute different measures of central tendencies and dispersion using MATLAB code				2	80	70	H	H	H	M	L	M	M	M	M	M	M	M	L	M	L	M	M	
CLO-3 :	Understand the concept of various numerical techniques				2	70	65	M	H	H	M	L	M	H	L	M	M	M	M	L	M	L	M	M	
CLO-4 :	Basic computations using the functions and variables of MATLAB				2	70	70	L	H	H	H	M	M	M	M	M	M	M	M	L	L	M	M	M	
CLO-5 :	Understand the importance and application of computations				2	80	70	H	M	H	M	M	L	H	L	L	L	M	L	L	M	M	M	M	

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
6		6	6	6	6	6
S-1	SLO-1	Introduction, Enter Commands, Name Variables, save and Load Variables	Generating switch statement	Program on Independence probability problem using MATLAB Code	Compute the interquartile range, mean absolute deviation, range, and standard deviation of the sample data.	simple linear regression using the \ operator.
	SLO-2	Use Built-in Functions and constants	Introduction to Basic Data, Manually Enter Arrays	Program on conditional probability problem using MATLAB Code	Absolute deviation (mad) and the standard deviation (std) terminologies	Use correlation analysis to determine whether two quantities are related to justify fitting the data.
S-2	SLO-1	simple arithmetic operations of addition, subtraction, multiplication, division	Create Evenly Spaced Vectors Create Arrays with Functions	Functions for Calculating Descriptive Statistics	Compute the Measures of Dispersion-mean deviation and standard deviation using MATLAB code	perform simple linear regression using the accidents dataset
	SLO-2	The operation of exponentiation	Array Indexing and Modification	computes these statistics independently for each column in the matrix.	Skewness, Syntax, Description	Linear regression models the relation between a dependent, or response, variable y and one or more independent, or predictor, variables $x_1, \dots, x_n$
S-3	SLO-1	how to control the number of decimal digits that appear in	Array Calculations, Perform Array Operations on Vectors	Calculating Maximum, Mean, and Standard Deviation	Find Skewness of Matrix	Compute regression coefficients and equations using MATLAB code

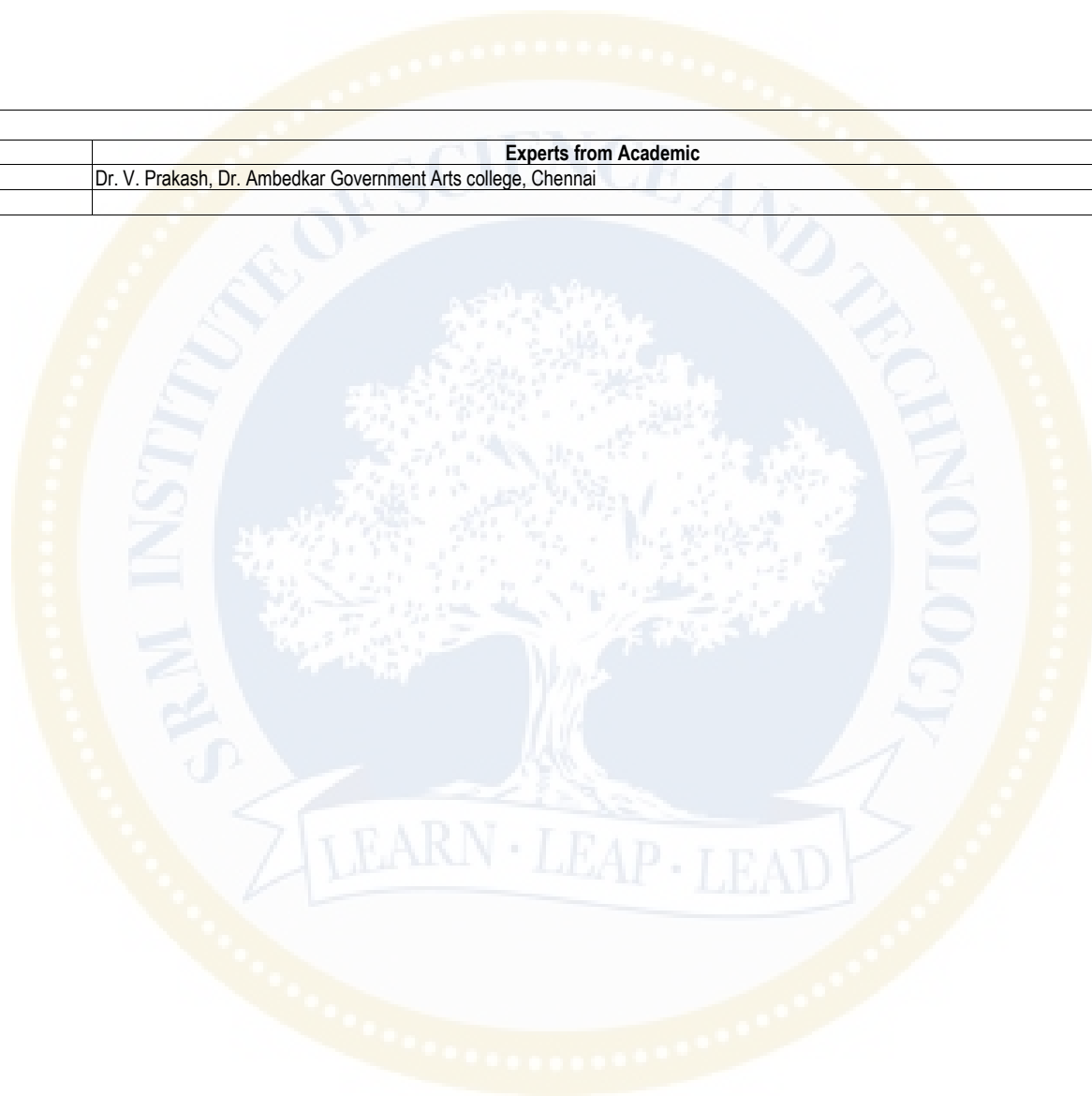
Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		6	6	6	6	6
		the answer				
	SLO-2	The logical operators and operations inside the parentheses	Perform Array Operations on Matrixes	Compute Arithmetic mean using MATLAB Code	Correct for Bias in Sample Skewness	slope or regression coefficient
S-4	SLO-1	How to perform multiple arithmetic operations in each line or command	Plot Vectors, Annotate Plots	Subtracting the Mean, Subtract the mean from each column of the matrix	Find Skewness Along Vector of Dimensions	Visualize the regression by plotting the actual values y and the calculated values yCalc.
	SLO-2	Order of computation	Construction of graph representation –Histogram using Matlab	Compute median and Mode using MATLAB Code	Input and Output Arguments	Functions, Hypothesis Testing ,
S-5	SLO-1	Generating Fibonacci Sequence using if-condition	Construction of graph representation –frequency polygons using MATLAB	Function names and descriptions.	Compute measures of skewness	Hypothesis Test Terminology
	SLO-2	Generating Fibonacci Sequence using for loop	Construction of graph representation – frequency curve using MATLAB	Compute the Measures of Dispersion-Range using MATLAB code	Input and Output Arguments	Hypothesis Test Assumptions,
S-6	SLO-1	Generating Fibonacci Sequence using while loop	Programming Constructs	Compare Measures of Dispersion	Compute measure of kurtosis	Available Hypothesis Tests and Examples
	SLO-2	Generating while loop	Decision Branching	Compute the interquartile range sample data.	Random Columns of Matrix Two Random Variables P-Values of Matrix Correlation Bounds NaN Values	Compute Testing hypothesis using MATLAB code
	SLO-2	Generating if-else statement	Program on basic probability problems using MATLAB code	Compute the Measures of Dispersion-quartile deviation using MATLAB code	Compute measures of Correlation coefficient	Compute Testing hypothesis using MATLAB code

Learning Resources	Text Books:		References:
	1. Tobin A. Driscoll, (1969): Learning MATLAB, Society for Industrial and Applied Mathematics (SIAM).		1. Brian R. Hunt Ronald L. Lipsman Jonathan M. Rosenberg with Kevin R. Coombes, John E. Osborn, and Garrett J. Stuck, A, (2001): Guide to MATLAB for Beginners and Experienced Users, Cambridge University Press.
	2. Andrew Knight. (2000): Basics of MATLAB and Beyond. CHAPMAN & HALL/CRC.		

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#		Theory	Practice
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice		
Level 1	Remember	-	40%		30%	-	30%	-	30%	-	30%
	Understand	-	40%		30%	-	30%	-	30%	-	30%
Level 2	Apply	-	40%		40%	-	40%	-	40%	-	40%
	Analyze	-	40%		40%	-	40%	-	40%	-	40%
Level 3	Evaluate	-	20%		30%	-	30%	-	30%	-	30%
	Create	-	20%		30%	-	30%	-	30%	-	30%
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasantha, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani,SRMIST



Course Code	UST23P02L	Course Name	INTERNSHIP - II	Course Category	IAPC	Internship/Apprenticeship / Project/ Community Outreach	L	T	P	C
							-	-	-	1

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards			Nil

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)
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CLR-1:	Demonstrate skills learnt in the real time environment.	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2:	Explore the different industries that are using IT																		
CLR-3:	Enhance the skills in the system aspects																		
CLR-4:	Understanding the professional connections with the knowledge learnt																		
CLR-5:	Applying the skills in problem solving																		
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLO-1:	To get an insight of an industry and organization/company	3	80	70	L	H	L	H	M	H	L	M	M	L	M	L	M	L	M
CLO-2:	To gain valuable skills and knowledge	3	85	75	M	H	L	M	L	H	M	H	M	M	M	L	M	M	M
CLO-3:	To make professional connections and enhance networking	3	75	70	M	H	M	M	M	H	M	H	M	M	M	M	M	M	M
CLO-4:	To get experience in a field to allow the student to make a career transition	3	85	80	M	H	M	M	M	H	M	H	L	M	L	M	L	M	L
CLO-5:	To get an inside view of an industry and organization/company	3	85	75	H	M	M	H	L	H	M	M	L	L	L	M	L	L	L

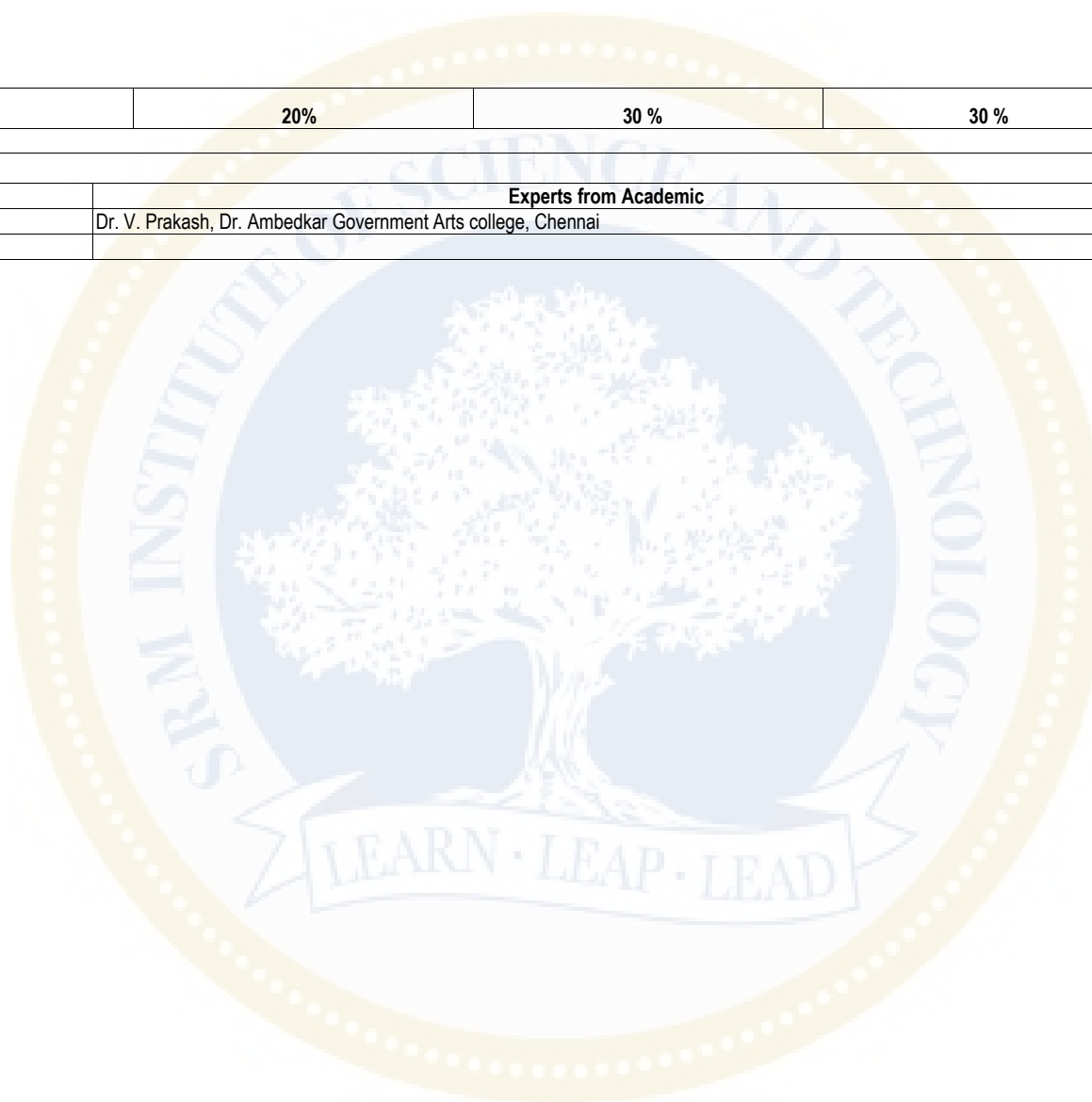
Students can choose a company of their own interest for internship for a period of minimum four weeks to learn about the application of IT in real time environment. In the first week of July, all the students have to give a presentation about their observations made by them in internship. At the end of the internship period, every student shall submit a structured internship report within 15 days from the date of the completion of the internship period.

Learning Assessment			
Project Work / Internship	Continuous Learning Assessment (50% weightage)		Final Evaluation (50% weightage)
	Review – 1	Review – 2	Internship Report Viva-Voce

	20%	30 %	30 %	20 %
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Course Designers

Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasantha, ICMR, Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani, SRMIST



SEMESTER – VI

Course Code	UST23601J	Course Name	Stochastic Processes	Course Category	C	Discipline Specific Core Course	L	T	P	O	C
							3	0	3	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards			

Course Learning Rationale (CLR):		The purpose of learning this course is to:		
CLR-1 :	To apply the Markov chains concepts			
CLR-2 :	To classify the states			
CLR-3 :	To generate probability function			
CLR-4 :	To understand the birth and death process			
CLR-5 :	To apply the Markov chains concepts			
Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:		
CLO-1 :	To Understand the basic concepts and classifications of stochastic processes			
CLO-2 :	To Study the theorems of stationary probability distributions.			
CLO-3 :	To Understand Markovian property			
CLO-4 :	To Analyse the birth and death processes and their applications.			
CLO-5 :	To Recognize applications of Queueing system			

Learning		
1	2	3
Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
3	85	80
3	80	75
3	85	80
3	85	80
3	85	80

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
H	H	M	H	M	M	L	M	L	M	L	M	L	M	L
H	L	H	M	M	M	M	L	H	M	L	M	M	M	L
H	H	M	M	M	M	M	M	H	M	L	M	M	M	M
H	H	M	M	M	M	M	L	H	L	L	L	L	L	M
H	H	M	H	M	L	L	M	L	L	L	L	M	L	M

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		18	18	18	18	18
S-1	SLO-1	stochastic processes (SP)- definition	Markov Processes- introduction	Continuous time Markov chain(CTMC) - definition	Renewal process - introduction	Queueing system - introduction
	SLO-2	State and parameter sapace in stochastic processes	Defintion of Markov chain		Definition and application of renewal process	Characteristics of queueing system – i/o pattern, Queue discipline
S-2	SLO-1	Classification of SP – discrete random sequence and Continuous random sequenece - exaples	Discrete Time Markov Chain (DTMC) - Transition Probability Matrix – definition, examples	Transition probabilities of Continuous time Markov chain – stationary and non-stationary	Representation of N(t)	Symbolic representation of a queueing model
	SLO-2	Discrete random process and Continuous random process with example	Condition for Transition Probability Matrix	Definition of stationary transition probabilities	Distribution of renewal process N(t) – statement	Difference equations related to Poisson Queue systems - postulates
S-3	SLO-1	Charaterissation of a random process distribution function and density function	Probability distribution of the process - definition	Chapman-Kolmogorov equation	Proof of Distribution of renewal process N(t)	Derivation of steady state proability function of queueing system
	SLO-2	Charaterissation of a random process distribution function and density function	Examples for probability distribution of the process	DTMC Vs CTMC. Jump times and holding times	Density function of renewal process N(t)	Probability of no customer and n customers in the queueing system

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		18	18	18	18	18
S-4-S-6	SLO-1	Simple Problems on classification of random processes	Problems on Markov chain	Problems on CTMC	Problems on Renewal process	Simple problems on queueing system
	SLO-2					
S-7	SLO-1	Mean, correlation of RP	Random walk definition	Pure birth process - definition, Poisson Process (PP) – definition and postulates	Limit theorem of renewal process - statement	Single server Poisson queue model with infinite capacity - concepts
	SLO-2	covariance and variance of RP	Construction of transition probabilities for random walk	Transition probabilities of PP	Limit theorem of renewal process	Characteristics of M/M/1: infinite/FIFO model
S-8	SLO-1	Stationary processes - definition	Construction of transition probabilities for random walk	Probability distribution of PP- statement and proof	Renewal equation	Derivation of average number of customers in the system and queue
	SLO-2	Types of stationary processes	Examples on random walk	Derivation of probability distribution of PP	Poisson process as renewal process	Average number of customers in non-empty queues
S-9	SLO-1	Strict sense stationary process (SSS) definition	Chapman-Kolmogorov (CK) equations - statement	Mean and autocorrelation of PP	Renewal density of the poisson process	Probability that number of customers in the system more than k
	SLO-2	Properties of SSS	Proof of CK equation	Properties of PP statement and proof	Properties of inter-arrival of N(t)	Probability density function of waiting time in the system, average waiting time of a customer in the system
S-10-S-12	SLO-1	Problems on averages of RP	Problems on constructing transition probability matrix	Problems on Poisson Process	Problems on renewal process	Problems on M/M/1: infinite/FIFO model
	SLO-2					
S-13	SLO-1	Condition for SSS	Classification of states – transient state	Properties of PP statement and proof	Branching Process - Introduction	Probability that the waiting time of a customer in the system exceeds t
	SLO-2	Condition for SSS	Communicating, recurrent and absorbing state	Birth and death process - definition	Definition of Branching process	p.d.f of the waiting time in the queue
S-14	SLO-1	Wide sense stationary process (WSS) - definition	Limiting theorem of Markov chain - statement	Relationship between birth and death process	Application of branching process	Characteristics of M/M/1: finite/FIFO model
	SLO-2	Properties of WSS	Stationary probabilities and their applications	Postulates of birth and death process	mean and variance of branching process	Derivation of P_n and P_n
S-15	SLO-1	Condition for WSS	Remarks on stationary probabilities	Difference equation for Birth and death process	Conditional mean of branching process	$E(N)$, $E(N)$ of queue
	SLO-2	Condition for WSS	Remarks on stationary probabilities	Difference equation for Birth and death process	conditional variance of branching process	Little's formula – relation ship between infinite and finite capacity of queueing model
S-16-S-18	SLO-1	Problems on SSS and WSS	Problems on classification of states and limiting theorem of Markov chain	Problems on Birth and Death Process	Problems on Branching process	Problems on M/M/1:finite/FIFO model
	SLO-2					

Learning Resources	Text Books:		References:	
	1. Medhi, J. (2009): Stochastic Process, Newage International, 3 rd edition.		1. Karlin, S. and Taylor, H. M. (1975): A First course in Stochastic Processes, Academic Press, New York.	
	2. Veerarajan, T. (2003): Probability, Statistics and Random Processes, Second edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi.		2. Feller, W (1972), Introduction to Probability Theory and its Applications, Volume I, Wiley Eastern Ltd, New York.	

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasanth, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani, SRMIST

Course Code	UST23602J	Course Name	Design of Experiments	Course Category	C	Discipline Specific Core Course	L 3	T 0	P 3	O 2	C 4
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Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):		The purpose of learning this course is to:		
CLR-1 :	To introduce basic concepts & Principles of designing of experiments.			
CLR-2 :	To impart sound knowledge of Analysis for Variance Technique.			
CLR-3 :	To have knowledge about experimental units and factors			
CLR-4 :	To differentiate between different methods.			
CLR-5:	To impart sound knowledge on appropriate use of various experimental designs (CRD, RBD & LSD), draw statistical inferences and interpretation of results obtained.			

Learning		
1	2	3
(Bloom)	Proficiency (%)	Attainment (%)

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Knowledge	Concepts	and Disciplines	Knowledge	Specialization	Knowledge	Design	Interpret Data	Skills	Design Skills	Skills			Behavior	Learning

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	Understand the Principles of Experimentation and Explain the methods of determination of experimental unit.	3	85	80	H	H	M	M	H	M	M	M	M	M	L	M	L	L	M
CLO-2 :	Identify type of classification of data and apply suitable Analysis of variance and perform post-hock multiple comparison tests.	3	80	75	M	H	H	M	M	M	M	M	H	M	L	M	L	M	M
CLO-3 :	Can give Complete explanation about randomization and replication process.	3	85	80	M	H	M	H	M	M	L	M	H	M	L	M	M	M	M
CLO-4 :	Use appropriate experimental designs (CRD, RBD&LSD) and carry out its analysis. Apply Missing plot technique and its estimation using Least square method.	3	85	80	M	H	H	M	M	L	L	M	H	L	M	L	M	M	M
CLO-5 :	Apply analysis of covariance technique in CRD and RBD with least square estimate. Analyze Split-Plot design in RBD layout.	3	85	80	H	H	H	M	M	L	M	M	M	L	M	L	M	M	L

Duration (hour)		Learning Unit / Module 1 18	Learning Unit / Module 2 18	Learning Unit / Module 3 18	Learning Unit / Module 4 18	Learning Unit / Module 5 18
S-1	SLO-1	Design of Experiments – Introduction	Completely Randomized Design	Randomized Block Design	Latin Square Design	Factorial Experiments - Explanation
	SLO-2	Three fundamental principles of experiments	CRD - Model	RBD - Model	LSD - Model	Factorial Experiments with factors at two levels
S-2	SLO-1	Randomization	Estimation of parameters	Estimation of parameters	Estimation of parameters	Estimation of main effects for 2X2 Factorial designs
	SLO-2	Replication	Estimation of standard error	Estimation of standard error	Estimation of standard error	Estimation of Interaction effects for 2 X 2 Factorial designs
S-3	SLO-1	Determination of number of replications	CRD - Randomization	RBD - Randomization	LSD - Randomization	Advantages of 2 X 2 Factorial designs
	SLO-2	Local Control	Alternative methods of random allocation	Local Control	Efficiency of LSD relative to CRD and RBD	Disadvantages of 2 X 2 Factorial designs
S-4 to S-6	SLO-1	Experimental error Notations and interpretation of data	Local Control	Efficiency of Randomized Block Design	Layout for constructing LSD	Procedure for 2X 2 experiments

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		18	18	18	18	18
	SLO-2	Basic Linear models assumptions	Layout for constructing CRD	Layout for constructing RBD	Assumptions of LSD	Analysis of 2X 2 experiments
S-7	SLO-1	Treatments	Assumptions of CRD	Assumptions of RBD	Estimation of Row Sum of Squares	Factorial Experiments with factors at three levels
	SLO-2	Experimental Units	Estimation of Total Sum of squares (TSS)	Estimation of Total Sum of Squares (Tss)	Estimation of Column Sum of Squares	Estimation of main effects for 2 X 3 Factorial designs
S-8	SLO-1	Methods of determination of experimental units	Estimation of Treatment Sum of Squares (Trss)	Estimation of Treatment Sum of Squares (Trss)	Estimation of TSS, TrSS and ESS	Estimation of Interaction effects for 2 X 3 Factorial designs
	SLO-2	Assumptions of ANOVA	Estimation of Error sum of squares (ESS)	Estimation of Replication sum of Squares (RSS)	Calculation of F ratio in LSD	Applications of 2 X 3 Factorial designs
S-9	SLO-1	Analysis of variance with one way classification	Calculation of F- ratio in CRD	Estimation of Error sum of squares (ESS)	Calculation of F table value in LSD	Advantages of 2 X 3 Factorial designs
	SLO-2	Models – one way	Calculation of F table Value in CRD	Calculation of F ratio in RBD	Procedure and analysis of LSD	Disadvantages of 2 X 3 Factorial designs
S-10 to S-12	SLO-1	Estimation of parameters	Procedure of CRD	Calculation of F table value in RBD	Repeated Latin Square Designs	Procedure for 2 X 3 experiments
	SLO-2	Advantages of One-way classification	Analysis of data arising from CRD	Procedure of RBD	Greco Latin Square Designs	Analysis of 2 X 3 experiments
S – 13	SLO-1	Disadvantages of One-way classification	Missing Plot technique in CRD	Analysis of data arising from RBD	Orthogonal Latin Square designs	Confounding
	SLO-2	Analysis of variance for two-way classification	Procedure for missing plot technique	Missing Observations in RBD	Different methods for the missing observations in LSD	Confounding in more than two blocks
S-14	SLO-1	Models – Two way	Example	Example - Missing Observations in RBD	Example - Missing Observations in LSD	General method of Construction of confounded factorials
	SLO-2	Estimation of parameters for two-way classification	Problems on Missing data in CRD	Problems on Missing data in RBD	Problems on Missing data in LSD	Fractional factorials
S-15	SLO-1	Advantages of Two-way classification	Multiple Comparison Test	Multiple Comparison Test	Multiple Comparison Test	Examples on Fractional factorials
	SLO-2	disadvantages of Two-way classification	Least Significant Difference test	Least Significant Difference test	Least Significant Difference test	Applications and analysis of Fractional factorials
S-16 to S-18	SLO-1	Procedure and problem for one way	Problem on Multiple Comparison Test	Problem on Multiple Comparison Test	Problem on Multiple Comparison Test	Procedure of confounding
	SLO-2	Procedure and problem for two-way	Problem on Least Significant Difference Test	Problem on Least Significant Difference Test	Problem on Least Significant Difference Test	Problems on confounding
Learning Resources		Text Books: 1. Das.M.N and Giri.N.C(1986): Design and Analysis of Experiments, Wiley Eastern Limited. 2. Gupta S.C.and KapoorV.K. (2001): Fundamentals of Applied Statistics, Sultan Chand & Sons. 3. Goon A.M, Gupta M.K., Das Gupta B. (1991): Fundamentals of Statistics, Vol. II, World Press, Calcutta.			References: 1. W.T.Federer(1967): Experimental Design, Oxford & IBH Publishing Co. 2. Montgomery D.C. (1991): Design and Analysis of Experiments, John Wiley	

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

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Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasantha, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani, SRMIST

Course Code	UST23603T	Course Name	Research Methodology	Course Category	C	Discipline Specific Course Core	L 4	T 0	P 0	O 2	C 4
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Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics		Data Book / Codes/Standards	Statistical Table	

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)
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CLR-1 :	To understand the concepts of research methodology	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	To learn the importance of modern statistical tools for research																		
CLR-3 :	To learn optimization tools, modeling tools and case studies in the domain of study																		
CLR-4 :	To learn simulation techniques																		
CLR-5 :	To analyse the case studies																		

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	Ability to identify research topic	3	85	80	L	L	H	M	M	M	L	L	L	M	H	H	M	M	M
CLO-2 :	Carry out literature survey	3	80	75	M	M	H	M	L	M	L	M	L	L	H	H	M	L	M
CLO-3 :	Write project proposals, research reports and publish the work	3	85	80	H	M	M	H	M	M	L	M	L	L	M	H	M	L	M
CLO-4 :	Apply statistical principles in data collection , analysis, inference and prediction	3	85	80	H	M	H	H	M	L	L	L	M	L	M	M	M	M	L
CLO-5 :	Apply basic principles and modern tools to model and simulate engineering systems	3	85	80	H	H	H	M	M	L	L	L	M	M	L	M	L	M	L

Duration (hour)	Learning Unit / Module 1 12	Learning Unit / Module 2 12	Learning Unit / Module 3 12	Learning Unit / Module 4 12	Learning Unit / Module 5 12
S-1	SLO-1 Introduction to research methodology	Sources of information – types, ICT enabled tools	Preparation of project proposal for funding – identification of funding agencies – format – elements of style	Basic probability distributions- types – statistics	Optimization studies and modern
	SLO-2 Research- objectives, definitions – knowledge economy	Databases, repositories, public and private sources, indexes	Organization of proposals – current status in national & global scenario	Normal distribution – exercises – problem solving using software tools	Tools usage in the field of study
S-2	SLO-1 Perspectives of stakeholders	Literature search – keyword, backward and forward search	Research report writing: Identification of line of argument – article type	Binomial and poisson distributions – exercises using software	Case studies
	SLO-2 Types of research – examples	Areas of research – background knowledge – new approach	Communication model – audience analysis – tailoring for audience	Weibull and exponential distributions	Uses of case studies
S-3	SLO-1 Understanding research goals - examples	Quality measurement tools: citation index, impact factor	Identification of suitable journal – format – instructions to authors – structure – major headings	Sampling: types – size of sample	Exercises on case studies

	SLO-2	Critical thinking Vs creative Thinking	h-index, g- index, i10 index, JCR	Writing discussion & conclusions	sample designs	Exercises on case studies
S 4	SLO-1	Templates for design problems – definition	Reading research articles – meta analysis	Conference presentation types: oral, poster – difference in audience interaction	Sampling tests: students t test – applications in engineering	Modeling and simulation
	SLO-2	Research proposal – rational techniques to research ideas	Literature review: Grouping, analyzing&comparison of articles	Synopsis- thesis-extended abstract – graphical and video abstract- short communications	research – exercises using software tools	Modeling in the field of study
S-5	SLO	Techniques for generating research topic – attributes, justification	Reporting literature review	Contributions of the work – novelty – innovation - examples	F test and its application in research studies – exercises using software	Simulation in the field of study
S-6	SLO-1	Identifying broad research question and objectives	Literature gap, refining research question and objectives – case studies	Referencing – style – tools for referencing , appendix – manual for preparation of synopsis	χ^2 test and its application in research studies – exercises using software	Case study of simulation
	SLO-2	Methods of scientific enquiry – theoretical,	Identification of research methods – experiments	Thesis writing: structure – preliminary pages, main body, references – contents - manual	Correlation, regression analysis	Uses of cases
S-7	SLO-1	Experimental and empirical - examples	results – examples on identification	Evaluation of thesis	time series analysis	Exercises on modeling and simulation
	SLO-2	Innovation, tools for scientific enquiry – questionnaire	Intellectual property rights – motivation- WIPO and WTO – IPR laws - TRIPS	examiner reports	Forecasting methods	Recent inventions and innovations in the field of study – case studies
S-8	SLO-1	Techniques in designing questionnaire – case studies	Copyright – patent, invention – trademark	Manuscript - introduction	Factor analysis and cluster analysis	Intelligence in learning tools
	SLO-2	Hypothesis -formulation	Trade secret – geographical indication	Tutorial on writing an abstract from manuscript	discriminant analysis	Machine learning tools
S-9	SLO-1	Hypothesis testing – examples	Industrial designs, technology transfer	Tutorial on writing materials	Design of experiments- Basic experimental designs	Case studies on machine learning tools
	SLO-2	Case studies	Patenting procedures:	Tutorial on methodology	Completely randomized design, Randomized block design	Analysis of thesis from library / UGC / other u
S-10	SLO	Procedure of guidelines in research process	Patent search	Tutorial on experiments	Problems on CRD, RBD	
S-11	SLO-1	examples / use case	Case studies	Tutorial on presenting experimental results	Latin square design	
	SLO-2	Framing an questionnaire	literature review	Using charts and graphs	Problems on LSD	
S-12	SLO-1	Exercise on Framing an questionnaire	Exercise on literature review	Tutorial on writing discussion section from experimental results	Factorial design – Basic factorial experimental designs	
	SLO-2	Tutorial on hypothesis formulation and testing	Review report from literature search	Tutorial on writing discussion section and literature review	2^2 , 2^3 - exercises	

Learning Resources	Text Books:	References:
	1. Mukerjee , S.P., (2020), A Guide to Research Methodology: An overview of Research problems , Tasks and Methods, CRC Press, Taylor & Francis Group, New York. 2. Bairagi, V., and Munot M.V.,(2019), Research Methodology: A practical and scientific approach , CRC press, Taylor & Francis Group, New York.	

- IEEE Reference Guide(2018), IEEEperiodicals, Transactions/ Journal Department, Piscataway, New jersey, USA.

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA_1 (10%)		CLA_2 (10%)		CLA_3 (20%)		CLA_4 (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40%	-	40%	-	40%	-	40%	-	40%	-
	Understand										
Level 2	Apply	30%	-	30%	-	30%	-	30%	-	30%	-
	Analyze										
Level 3	Evaluate	30%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasantha, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani,SRMIST

Course Code	UST23D03J	Course Name	Industrial Statistics	Course Category	D	Discipline Specific Elective Course	L	T	P	O	C
							3	0	2	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Scientific calculator		

Course Learning Rationale (CLR):		The purpose of learning this course is to:		
CLR-1 :	To impart basic concepts in industrial studies			
CLR-2 :	Preparing to understand of common aspects of statistical methods in terms of inventory control			
CLR-3 :	Understand and learn the concepts of stochastic models			
CLR-4 :	To prepare students to analyze and evaluate the exponential smoothing			
CLR-5 :	To impart the knowledge about forecasting			

Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:		
CLO-1 :	Gain knowledge about stochastic models			
CLO-2 :	Understand the concepts of production planning			
CLO-3 :	Understand the basic ideas in inventory models			
CLO-4 :	Acquire the knowledge on forecasting			
CLO-5 :	Acquire the knowledge of time series			

Learning		
1	2	3
Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
H	H	H	M	M	M	M	L	L	L	M	M	M	M	L
M	H	H	M	M	M	M	M	M	M	M	L	H	M	M
M	H	M	H	M	M	M	M	M	M	M	L	H	M	M
M	H	M	M	M	H	M	M	L	L	L	M	H	L	M
H	H	H	M	M	M	L	L	M	L	L	M	M	L	L

Duration (hour)	Learning Unit / Module 1 15	Learning Unit / Module 2 15	Learning Unit / Module 3 15	Learning Unit / Module 4 15	Learning Unit / Module 5 15
S-1	SLO-1 Inventory planning	Production planning	Forecasting definition	Method of least squares	Wage statistics
	SLO-2 Inventory policies	Production planning definition, formula	Forecasting methods	Linear trend	Concepts and definition
S-2	SLO-1 Inventory policies - types	Policy for production planning	Forecasting examples	Secular trend - linear	Minimum wage
	SLO-2 Concept of planned inventory policies	Policy for production planning types	Forecasting applications	Properties of method of least squares	Earnings, low wage pay
S-3	SLO-1 Deterministic models Policy	Policy for production planning applications	Forecasting in operations research	Least squares procedure	Gender wage gap
	SLO-2 inventory levels	Policy for production planning for inventory levels	Concept of forecasting	Method of least squares problems	Data sources
S-4-S-5	SLO-1 Inventory levels are reviewed continuously	Stochastic models	Benefits of forecasting	Method of least squares examples	Interpretation and uses
	SLO-2 Inventory levels are reviewed continuously- procedures	Single period model	Manufacturers forecast demand	Least square method to forecast the sales for the company	trade statistics
S-6	SLO-1 Demand	Single period model with no set up cost	Forecasting methods in manufacturing industry	Sums on least square method	Uses, types of trade statistics

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		15	15	15	15	15
	SLO-2	Types of demands	Single period model with no set up cost having zero	Forecasting revenue in manufacturing	Seasonal index using moving averages	Applications of trade statistics
S - 7	SLO-1	demands occur uniformly	Single period model with no set up cost having zero or non-zero initial stock	applications in manufacturing industrial situations	Problems on Seasonal index using moving averages	Calculation of trade statistics
	SLO-2	Economic order quantity	initial stock (s,S) policy}	applications in non-manufacturing industrial situations	Time series forecasting based on trend	Financial statistics
S - 8	SLO-1	Economic order quantity formula	(s,S) policy} examples	Different methods of forecasting including average	Time series forecasting based on trend procedure	Uses, applications of financial statistics
	SLO-2	Economic order quantity uses	(s, S) policy for uncertain single period inventory problem	Calculation and sum on forecasting including average	Time series forecasting based on trend	National income statistics
S - 9-S-10	SLO-1	Economic order quantity types	Uncertainty theory	Different methods of forecasting including last average	Time series forecasting based on seasonal components - introduction	Uses, applications of income statistics
	SLO-2	Economic order quantity with shortage costs	Uncertainty theory definition	Calculation on forecasting including last average	Time series forecasting based on seasonal components - procedure	Agricultural Statistics
S - 11	SLO-1	demands occur uniformly with shortage costs	Uncertainty theory procedure	Sum on forecasting including last average	Time series forecasting based on seasonal components - problems	Uses, applications of agricultural statistics
	SLO-2	demands occur uniformly without shortage costs	Uncertainty theory problem	Different methods of forecasting including weighted average	Time series forecasting based on seasonal components- problems	Examples of agricultural statistics
S - 12	SLO-1	demands occur uniformly with shortage costs Economic order quantity	Uncertainty theory example	Calculation of weighted average	seasonal components- problems	Indices of Agricultural production
	SLO-2	demands occur uniformly without shortage costs Economic order quantity	assumptions	Sums on forecasting weighted average	seasonal components- examples	Agriculture census
S-13	SLO-1	demands occur uniformly with and without shortage costs Economic order quantity procedure	Mathematical formulation	Exponential smoothing	Forecasting using deseasonalized data	Miscellaneous Agricultural Statistics
	SLO-2	sums	Applications of uncertainty theory	Basic Exponential smoothing model	Examples	Uses of agriculture statistics
S-14-S-15	SLO-1	Applications of EOQ	Applications of production planning	Time constant, Average age, Optimization	Applications on forecasting	Applications of agriculture statistics
	SLO-2	Examples on EOQ	Applications of stochastic models	Applications on exponential smoothing	Examples on deseasonalized data	Examples on agriculture statistics

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Learning Resources	Text Books: 1. Taha H A (1999): operations Research, Macmilan publishing co.	References: 1. Hiller F S and Libermann G J(1995): Introduction to Operations Research, 6tr, Edition.McGraw Hill. 2. Bain L J and Enghardt(1991): Statistical Analysis of Reliability and LifeTestingModels, Marckel Dekker.
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Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasanth, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani,SRMIST

Course Code	UST23D04J	Course Name	Actuarial Statistics	Course Category	D	Discipline Specific Elective Courses	L	T	P	O	C
							3	0	2	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Scientific calculator		

Course Learning Rationale (CLR):		The purpose of learning this course is to:			Learning			Program Learning Outcomes (PLO)														
CLR-1 :	To impart basic concepts in actuarial studies				1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Preparing to understand of common aspects of statistical methods in terms of different Rate of interest in Actuarial Science				Thinking (Bloom)	Proficiency (%)	Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	Professional Behavior	Life Long Learning	
CLR-3 :	Understand and learn the concepts of Annuities and interest rates																					
CLR-4 :	To prepare students to analyze and evaluate the annuity payments and purchase price of annuities																					
CLR-5 :	To impart the knowledge about stochastic interest and independent annual interest rates																					

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	Gain knowledge about effective , Nominal rate of interest and discounts	3	85	80	H	H	H	M	M	M	M	M	M	M	L	M	L	M	L
CLO-2 :	Understand the concepts of annuities, perpetuity, increasing and decreasing annuities	3	80	75	M	H	M	H	M	M	M	L	H	M	L	M	L	M	M
CLO-3 :	Understand the basic ideas Loan outstanding , purchase price of annuity net of tax	3	85	80	H	H	M	M	M	M	M	L	H	M	L	M	M	M	M
CLO-4 :	Acquire the knowledge on Annuity payments, capital and interest element in the annuity payment	3	85	80	H	H	M	M	M	H	M	M	M	L	L	M	M	M	M
CLO-5 :	Acquire the knowledge of stochastic interest rates, mean and variance of Sn and An	3	85	80	M	H	H	M	M	M	L	M	H	L	L	M	M	L	L

Duration (hour)	Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module4	Learning Unit / Module 5
	15	15	15	15	15
S-1	SLO-1 Introduction	Redemption of loans	Premiums	Life office valuations	Surplus definition
	SLO-2 Elements of compound interest	Redemption of loans procedure	Premiums examples	Life office valuations policy values	Surplus reasons
S-2	SLO-1 Effective Rate of Interest i	Redemption of loans calculation	Premiums uses , applications	Life office valuations definitions	Surplus consequences
	SLO-2 Nominal Rate of Interest $i(m)$	Understanding loans	Types of Premiums	Accrued terminal bonus, Accounts TechnicalAccount, Accounts BalanceSheet	Economic surplus
S-3	SLO-1 different rates of interest	Types of loans	general principles definition	Bonus earning power, Credibility, Critical illness policy	Consumer surplus
	SLO-2 annuities certain -Force of Interest δ	callable bond	general principles advantages	Demutualisation, EnhancedCapital Requirement(ECR), Profit test etc.,	Producer surplus
S-4-S-5	SLO-1 Expression for δ by use of calculus	Mutual fund	general principles examples	Basic principle Perception Principle	Surplus vs deficit
	SLO-2 Present values		natural premiums definition , uses	Prudence principle	Example of surplus
S-6	SLO-1 Effective rate of discount d	Capital gain and losses on redemptions	natural premiums application	Public principle	Sources of surplus
	SLO-2 Accumulation and Present values of Annuities- definition	Types of redemptions	natural premiums examples	Timing Principle	Surplus auction

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		15	15	15	15	15
S - 7	SLO-1	Accumulation and Present values of Annuities- sum	sinking funds- introduction	office premiums definition	Publicity Principle	Calculation of surplus
	SLO-2	Nominal rate of discount $d(m)$	Benefits of a Sinking Fund	office premiums uses	Stability principle	Principle methods of surplus
S - 8	SLO-1	deferred annuities	Understanding sinking fund	office premiums applications	methods of valuation of liabilities	Consumer surplus calculation
	SLO-2	deferred annuities- calculation	Types of sinking funds	office premiums examples	retrospective methods	Producer surplus calculation
S - 9-S-10	SLO-1	the functions included in compound interest	sinking funds calculation	Level premium insurance works	prospective methods	Demand curve
	SLO-2	compound interest calculation	the average yield on the life fund of an assurance office	Cost of premiums	valuation of liabilities	A fall in market price
S - 11	SLO-1	Sums on compound interest	Yield-to-average life introduction	Loading for expenses	Retrospective Implementation	Supply curve
	SLO-2	compound interest applications - tables and their uses	Yield-to-average life	Loading for expenses applications	Prospective Implementation	Rise in price
S - 12	SLO-1	Sums on rates	Understanding Yield-to-average life	Loading for expenses - with profit	Errors	Changing the quantity
	SLO-2	Nominal rate of discount $d(m)$ - Applications	Yield-to- maturity	Calculation on loading for expenses - with profit	Changes in Accounting Policies	Total surplus
S-13	SLO-1	Nominal rate of discount $d(m)$ - examples	Mortgage backed securities	loading for expenses without profit	Changes in Accounting Policies and estimates	Efficiency cost of tax
	SLO-2	Effective rate of discount d -sum	Methodology on life fund	Calculation on loading for expenses without profit	Change in method of depreciation	Reduction of tax
S-14-S-15	SLO-1	Nominal rate of discount $d(m)$ - sum	Problems on redemptions	adequacy of premiums relative	Straight line method	Deadweight loss of a tax
	SLO-2	Applications and examples	Problems on sinking fund	consistency	Principle of consistency	Deadweight elasticities

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Learning Resources	Text Books:	References:
	1. Federation of Insurance Institutes Study Courses - Mathematical Basis of Life Assurances 2. Donald. D. W. (1970) - Compound Interest and Annuities, Heinemann, London. 3. Bowers, N. L., Gerber, H. U., Hickman, J. C., Jones, D. A. And Nesbitt, C. J.	1. Elandt - Johnson. R.C, Johnson. N.L (1980), Survival Models and Data Analysis, John Wiley. 2. Dickson, C. M. D. (2005): Insurance Risk and Ruin (International Series on Actuarial Science), Cambridge University Press.

	(1997):.Actuarial Mathematics, Society of Actuaries, Itasca, Illinois, U.S. A	
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Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasantha, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani,SRMIST

Course Code	UST23G04J	Course Name	Numerical Methods	Course Category	G	Generic Elective Course	L	T	P	O	C
							3	0	2	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):		The purpose of learning this course is to:			Learning			Program Learning Outcomes (PLO)																
CLR-1 :	Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15					
CLR-2 :	Apply numerical methods to obtain approximate solutions to mathematical problems	Thinking (Bloom)	Proficiency (%)	Attainment (%)	Fundamental Knowledge of Concepts of Related Disciplines	Procedural Knowledge	Specialization Knowledge	Skill Utilize Knowledge	Modeling	Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	Professional Behavior	Life Long Learning								
CLR-3 :	Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations																							
CLR-4:	Analyze and evaluate the accuracy of common numerical methods.																							
CLR-5:	Understand and solve problems on numerical differentiation, numerical integration & Milne's predictor-corrector method																							

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	Gain knowledge about Bisection, Regula falsi Newton's method	3	85	80	H	M	M	M	H	M	L	M	L	H	L	M	L	M	L
CLO-2 :	Appreciate the concepts of simultaneous equations	3	80	75	H	M	M	H	M	M	L	M	L	H	L	M	L	M	L
CLO-3 :	Understand the basic ideas about Interpolation and extrapolation	3	85	80	H	M	M	H	M	M	M	L	M	H	L	M	M	L	M
CLO-4 :	Acquire the knowledge on Numerical solutions of Ordinary differential equations of first and second order	3	85	80	H	M	H	H	M	L	M	L	M	M	L	L	M	L	M
CLO-5 :	Understand and solve the problems on Euler's and Improved Euler's Method - Modified Euler's Method, Runge-Kutta method of second and fourth order – Milne's predictor corrector method	3	85	80	H	M	H	M	M	M	M	M	M	H	L	L	M	M	M

Duration (hour)	Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
	15	15	15	15	15
S-1	SLO-1 Basic concept of the algebraic equation	Numerical solution of simultaneous equations	Finite difference operator - introduction I	Introduction	Simultaneous equations
	SLO-2 Basic concept of transcendental equations	Numerical solution of simultaneous linear algebraic equations	Interpolation	Newton's forward Difference formula	Problems solved based on Simultaneous equations
S-2	SLO-1 Problems solved based on the above concept	Numerical solution of simultaneous linear algebraic equations	Interpolation basic definition, Interpolation and its concepts	Newton's Backward Difference formula	Taylor series method
	SLO-2 Bisection method explained	Problems solved based on the above concept	Problems solved based on the above concept	Concept based - Simple Problems	Problems solved based on the above concept
S-3	SLO-1 Solving transcendental equations	Problems solved based on the above concept	Newton-Gregory forward interpolation definition	Problems solved based on the above concept	Problems solved based on the above concept
	SLO-2 Problems solved based on the above concept	Gauss elimination method	Problems solved based on the above concept	Problems solved based on the above concept	Picard's method.
S 4	SLO-1 Bisection method	Gauss elimination method	Newton-Gregory forward interpolation concept	Introduction - Stirling's formula	Problems solved based on the above concept

Duration (hour)	Learning Unit / Module 1		Learning Unit / Module 2		Learning Unit / Module 3		Learning Unit / Module 4		Learning Unit / Module 5	
		15		15		15		15		15
	SLO-2	Bisection method	Computation of the inverse of a matrix using Gauss elimination method	Problems solved based on the above concept	Derivative using Stirling's formula	Euler's method				
S-5	SLO-1	Problems solved based on the above concept	Computation of the inverse of a matrix using Gauss elimination method	Problems solved based on the above concept	Problems solved based on the above concept	Improved Euler's Method				
	SLO-2	Successive approximation method	Method of Triangularisation (Method of Factorization)	Newton - Gregory Backward interpolation - definition	Problems solved based on the above concept	Problems solved based on the above concept				
S-6	SLO-1	Problems solved based on the above concept	Method of Triangularisation (Method of Factorization)	Problems solved based on the above concept	Bessel's formula	Modified Euler's Method				
	SLO-2	Problems solved based on the above concept	Problems solved based on the above concept	Newton-Gregory backward interpolation concept	Problems solved based on the above concept	Problems solved based on the above concept				
S-7	SLO-1	Regular falsi method	Jacobi method of iteration (Gauss-Jacobi Method)	Problems solved based on the above concept	Problems solved based on the above concept	Problems solved based on the above concept				
	SLO-2	Problems solved based on the above concept	Jacobi method of iteration (Gauss-Jacobi Method)	Problems solved based on the above concept	Introduction - Numerical integration	Runge-Kutta method of second order				
S-8	SLO-1	Successive approximation method	Problems solved based on the above concept	Newton's divided difference formula	Numerical integration using Trapezoidal rule	Problems solved based on second - order R-K				
	SLO-2	Successive approximation method by MATLAB	Problems solved based on the above concept	Problems solved based on the above concept	Problems solved based on the above concept	Concept - based Simple Problems				
S - 9	SLO-1	Regular falsi method	Croust's method	Problems solved based on the above concept	Problems solved based on the above concept	Two iterations related Runge-Kutta method of fourth order				
	SLO-2	Regula falsi method	Problems solved based on the above concept	Lagrange's interpolation formula for uneven intervals	Numerical integration using Simpson's 1/3 rule	Runge-Kutta method of fourth order				
S-10	SLO-1	Problems solved based on the above concept	Iterative methods	Lagrange's interpolation formula for uneven intervals - explanation	Problems solved based on the above concept	Problems solved based on the above concept				
	SLO-2	Problems solved based on the above concept	Problems solved based on the above concept	Problems solved based on the above concept	Problems solved based on the above concept	Four iterations related R-K method				
S-11	SLO-1	Problems solved based on the above concept	Gauss Seidel iteration method.	Problems solved based on the above concept	Numerical integration using Simpson's 3/8 rule	Runge-Kutta method of fourth order				
	SLO-2	Newton-Raphson method.	Finding the solution byGauss Seidel iteration method.	Lagrange's inverse interpolation formula for uneven intervals	Problems solved based on the above concept	Problems solved based on the above concept				
S-12	SLO-1	Newton-Raphson method.	Gauss Seidel iteration method.	Lagrange's inverse interpolation formula for uneven intervals - explanation	Problems solved based on the above concept	Problems solved based on the above concept				
	SLO-2	Three iteration Newton-Raphson method.	Problems solved based on the above concept	Problems solved based on the above concept	Weddle's rule	Milne's predictor method.				
S-13	SLO-1	Problems solved based on the above concept	3x3 matrix basedGauss Seidel iteration method for	Problems solved based on the above concept	Problems solved based on the above concept	Milne's predictor method.				
	SLO-2	Four iteration related Newton-Raphson method.	Problems solved based on the above concept	Problems solved based on the above concept	Problems solved based on the above concept	Problems solved based on the above concept				
S-14	SLO-1	Problems solved based on the above concept	2x2 matrix-based Gauss Seidel iteration method	Introduction - Stirling's formula - defintion	Romberg's Integration - formula	Problems solved based on the above concept				
	SLO-2	Newton-Raphson method	Gauss Seidel iteration method	Introduction - Stirling's formula - concept	Romberg's Integration - concept	Milne's predictor corrector method.				
S-15	SLO-1	Problems solved based on the above concept	Problems solved based on the above concept	Problems solved based on the above concept	Problems solved based on the above concept	Problems solved based on the above concept				

Duration (hour)	Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
	15	15	15	15	15
SLO-2	<i>Problems solved based on the above concept</i>	<i>Problems solved based on the above concept</i>	<i>Problems solved based on the above concept</i>	<i>Problems solved based on the above concept</i>	<i>Problems solved based on the above concept</i>

Learning Resources	Text Books: 1. Numerical methods, Dr.P. Kandasamy, Dr. K.Thilagavathy, Dr. K.Gunavathy, S Chand and Company Reprint 2020	References: 1. Kandasamy P, Thilagavathy. K and G. Gunawathy, Numerical Methods, S.Chand & Sons, 3rd Revised Edition, 2013 2. Isaacson E. and Keller, H.B., "Analysis of Numerical Methods" Dover Publication, 1994
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Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasantha, ICMR, Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1.Dr. S.Lakshmi Priya, SRMIST
		2.Dr. L.Sivakami, SRMIST

Course Code	UST23P04L	Course Name	Mini Project	Course Category	IAPC	Internship/Apprenticeship / Project/ Community Outreach (IAPC)	L	T	P	O	C
							0	0	4	2	2

Pre-requisiteCourses	Nil	Co-requisiteCourses	Nil	ProgressiveCourses	Nil
Course Offering	DepartmentMathematics and Statistics	Data Book / Codes/Standards	As required for the project work		

Course Learning Rationale (CLR):		The purpose of learning this course is to:			Learning			Program Learning Outcomes (PLO)																
CLR-1 :	CLR-1 : To prepare the student to gain major design and or research experience as applicable to the profession				1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
CLR-2 :	Apply knowledge and skills acquired through earlier course work in the chosen project				Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning		
CLR-3 :	Make conversant with the codes, standards , application software and equipment							L	H	M	M	M	H	M	H	L	L	M	L	L	L	L	M	
CLR-4 :	Carry out the projects within multiple design constraints							M	H	L	M	M	M	M	H	M	H	M	M	M	M	M	M	M
CLR-5 :	Incorporate multidisciplinary components							M	H	M	M	L	H	M	H	M	M	M	M	M	L	M	L	M
Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:																						
CLO-1 :	Design aresearch project				3	80	70	L	H	M	M	M	H	M	H	L	L	M	L	L	L	M		
CLO-2 :	Process or gain research insight into a defined problem				3	85	75	M	H	L	M	M	M	M	H	M	M	M	M	M	M	M		
CLO-3 :	Solution to the problem as would be encountered in professional manner				3	75	70	M	H	M	M	M	H	M	H	M	M	M	M	M	M	M		
CLO-4 :	Problem solving - its impacton global, Mathematical, Statistitcal, economic, environmental and social context.				3	85	80	M	H	M	M	L	H	M	H	M	M	M	M	L	M	L		
CLO-5 :	Practice statistical- software project phases				3	85	75	H	H	M	L	L	H	L	H	M	L	L	L	M	L	L		

The assessment method for the project work consists of in-semester and end semester evaluations as detailed below:

Course	Continuous Learning Assessment (50% weightage)		Final Evaluation(50% weightage)	
	Review – 1	Review – 2	Project Report	Viva-Voce*
Project Work / Internship	20%	30%	30 %	20 %

*Student has to be present for the viva voce for assessment. Otherwise it will be treated as non-appearance for the Final Evaluation and shall be with final grade as 'Ab'

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasanth, ICMR, Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani, SRMIST

SEMESTER - VII

Course Code	UST23701J	Course Name	Multivariate Analysis	Course Category	C	Discipline Specific Core Course	L 3	T 0	P 3	O 2	C 4
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Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards			

Course Learning Rationale (CLR):		The purpose of learning this course is to:	
CLR-1 :	To introduce the basic concepts of Multivariate Analysis		
CLR-2 :	To develop the total, partial and multiple correlation concept in Multivariate Analysis		
CLR-3 :	To gain knowledge of variance and covariance of Multivariate distribution		
CLR-4 :	To understand the classification and discriminant function		
CLR-5 :	To gain knowledge about factor and cluster analysis		

Learning		
1	2	3
Bloom)	ncy (%)	ant (%)

Program Learning Outcomes (PLO)															15
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Knowledge	Concepts		ledge	ation			Data	s	Skills	Skills				avior	

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 : :	Understand and Apply fundamental concepts the basic concepts of Multivariate Analysis	3	85	80	M	H	H	M	H	M	L	M	M	M	L	M	M	M	M
CLO-2 : :	Understand the concepts of the total, partial and multiple correlation concepts in Multivariate Analysis. Apply the concepts on solving the related problems	3	80	75	M	H	M	M	H	M	L	M	M	M	L	H	M	L	M
CLO-3 : :	Understand the concepts of variance, covariance and wishart distribution in MVD and able to prove and solve its related theorems and problems	3	85	80	M	H	H	M	H	M	M	M	M	M	L	M	M	L	M
CLO-4 : :	Understand the concept of classification problems and fisher's discriminant function .	3	85	80	M	H	H	M	H	M	M	L	L	L	L	M	M	M	L
CLO-5 : :	Attain the understanding of Principal components and concepts of factor analysis and estimation of Factor Loadings	3	85	80	H	H	M	L	H	L	M	L	M	L	L	L	M	M	L

Duration (hour)		Learning Unit / Module 1 18	Learning Unit / Module 2 18	Learning Unit / Module 3 18	Learning Unit / Module 4 18	Learning Unit / Module 5 18
S-1	SLO-1	Introduction of Multivariate Statistical Analysis	Introduction of The Multiple Correlation Coefficient	Introduction of the Generalized T ² –Statistic	Introduction and definition of problem of classification	Introduction and definition of Principal components (PC)
	SLO-2	Introduction of The Multivariate Normal Distribution (MND)	Definitions on The Multiple Correlation Coefficient	The assumption of the Generalized T ² – Statistic	Standards of good classification and minimize the probability of misclassification	Important definitions and properties of Principal components (PC)
S-2	SLO-1	Important definitions and notions of MND	Basic theorems on The Multiple Correlation Coefficient	Derivation of the generalized T ² -statistic and its distribution	Preliminary considerations and two cases of two populations	Statements and proof of orthogonal linear transformation of a random vector
	SLO-2	Important definitions and notions of MND	Basic theorems on The Multiple Correlation Coefficient	Derivation of the T ² -Statistic As a Function of the Likelihood Ratio Criterion	Procedures of classification into one of two populations with known probability distributions	Statements and proof of orthogonal linear transformation of a random vector

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		18	18	18	18	18
S-3	SLO-1	Statement and derivation of Joint distributions of MND	Definitions and basic theorems on Partial Correlation Coefficient	Theorems and Lemma on T^2 –Statistic	Classification with known probability distributions-the case when a priori probabilities are known	Computation of the maximum likelihood estimates of the principal components
	SLO-2	Statement and derivation of Joint distribution of MND	Definitions and basic theorems on Partial Correlation Coefficient	Theorems and Lemma on T^2 –Statistic	Classification with known probability distributions-the case when no set of a priori probabilities are known	Computation of the maximum likelihood estimates of the principal components
S 4-S6	SLO-1	Problems on Joint distribution in MND	Problems on multiple and partial Correlation Coefficient	Problems on generalized T^2 -statistic and its distribution	Problems on admissible classification procedures	Problems on orthogonal linear transformation of a random vector
	SLO-2	Problems on Joint distribution in MND	Problems on multiple and partial Correlation Coefficient	Problems on generalized T^2 -statistic and its distribution	Problems on every complete class of procedures include the class of admissible procedures	Problems on the maximum likelihood estimates of the principal components
S-7	SLO-1	Statement and derivation of Marginal distribution of MND	Introduction of The Characteristic Function of MND	Definitions and theorem of The Distribution of T^2 . Uses of the T^2 –statistic.	Statement and proof of the theorems on Bayes procedure	Asymptotic distribution of the 'roots and vectors of the population
	SLO-2	Statement and derivation of Marginal distribution of MND	Important definitions on The Characteristic Function of MND	Theorem and Corollary of The Distribution of T^2	Statement and proof of the theorems on Bayes procedure	Confidence Region for a Characteristic Vector
S-8	SLO-1	Statement and derivation of Statistical independence of MND	Lemmas on Characteristic Function of MND	Mahalanobis D^2 statistics. Relation ship between T^2 and D^2 statistics	Classification into one of two known multivariate normal populations	Exact Confidence Limits on the Characteristic Roots
	SLO-2	Statement and derivation of Statistical independence of MND	Lemmas on Characteristic Function of MND	Theorems and lemma on Testing the Hypothesis That the Mean Vector Is a Given Vector	Statement and proof of the theorem on classification and misclassification	Theorems and proof on A confidence interval for the characteristic roots and vectors
S-9	SLO-1	Statement and derivation of Conditional Distributions of MND	Theorems on Characteristic Function of MND	Theorems and lemma on A Confidence Region for the Mean Vector	Theorems and proof on probability of misclassification	Theorems and proof on A confidence interval for the characteristic roots and vectors
	SLO-2	Statement and derivation of Conditional Distributions of MND	Theorems on Characteristic Function of MND	Simultaneous Confidence Intervals for All Linear Combinations of the Mean Vector	Theorems and proof on probability of misclassification	Testing hypotheses about the characteristic roots of a covariance matrix
S-10-S12	SLO-1	Problems on Marginal, independence, Conditional and distribution of MND	Problems on Characteristic Function of MND	Problems on Two- sample	Problems based on class of classification procedures	Problems on the characteristics vectors and finding corresponding roots
	SLO-2	Problems on Marginal, independence, Conditional and distribution of MND	Problems on Characteristic Function of MND	Problems on several sample	Problems based on class of probabilities of mis-classification	Problems on the characteristics vectors and finding corresponding roots
S 13	SLO-1	Definitions and derivations on Transformation of Variable	Definitions and derivations on moments and cumulants	Distribution of the sample covariance Matrix and the Generalized Variance	Discriminant function in misclassification	Canonical Correlations and Canonical Variables
	SLO-2	Definitions and derivations on Transformation of Variable	Definitions and derivations on moments and cumulants	Statement and derivation of the Wishart Distribution	Classification into one of two MV normal populations when the parameters are estimated .The Criterion of Classification	Canonical correlations and variates in the population
S14	SLO-1	Definitions on expected values, variance and covariance matrix of X	Estimation of the mean vector and the covariance matrix	Lemma and corollary of Wishart Distribution	Classification into one of two MV normal populations –on the distribution of the criterion	Theorem and proof on canonical correlations and variation
	SLO-2	Definitions on expected values, variance and covariance matrix of X	The maximum likelihood estimators (MLE) of the mean vector and the covariance matrix	Theorem on density function linear transformation of wishart distribution	Classification into one of two MV normal populations –on the distribution of the criterion	Estimation Of Canonical Correlations And Variates

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		18	18	18	18	18
S15	SLO-1	Lemmas on expected value of a random matrix	Important lemma and theorems on (MLE) of the mean vector and the covariance matrix	Theorem and corollary on the density function of reciprocal linear transformation in Wishart distribution	Probabilities of misclassification-Asymptotic Expansion using W	Introduction on factor analysis, Simple structure of factor analysis
	SLO-2	Lemmas on expected value of a random matrix	Important lemma and theorems on (MLE) of the mean vector and the covariance matrix	Corollary and proof of reciprocal linear transformation in Wishart distribution	Probabilities of misclassification-Asymptotic Expansion using Z	Maximum Likelihood Estimators For Random Orthogonal Factors.
S16-S18	SLO-1	Problems on transformation of variable, expected, variance and covariance of random vectors	Problems on mean vector and the covariance matrix	Problems based on linear transformation	Problems based on misclassification and discriminant function	Problems on Canonical Correlations And Variates
	SLO-2	Problems on transformation of variable, expected, variance and covariance of random vectors	Problems on mean vector and the covariance matrix	Problems based on reciprocal linear transformation	Problems based on misclassification and discriminant function	Exercises on Maximum Likelihood Estimators For Random Orthogonal Factors.

Learning Resources	Text Books:	References:
	- Anderson, T. W. (2003): An Introduction to Multivariate Statistical Analysis – 3rd edn. John Wiley & Sons. - Johnson, R. A., & Wichern, D. W. (2007): Applied Multivariate Statistical Analysis – 2nd edn. Prentice Hall International	- Morrison, F(1985): Multivariate Statistical Methods, Mc Graw Hill Book Company. - Rao, C.R(1998): Linear Statistical Inference and its Applications, Wiley Eastern Ltd.,

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasantha, ICMR, Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani, SRMIST

Course Code	UST23D05J	Course Name	Time Series Analysis	Course Category	D	Dicipline Specific Elective Course	L 3	T 0	P 3	O 2	C 4
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Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):		The purpose of learning this course is to:			Learning			Program Learning Outcomes (PLO)																
CLR-1 :	To understand the concept of time series analysis				1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
CLR-2 :	To recognize different components of time series				Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning		
CLR-3 :	To know different time series models																							
CLR-4 :	To apply the time series models for stochastic time series																							
CLR-5 :	To establish the concept of forecasting and future planning																							
Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:			Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning		
CLO-1 :	Basic concepts of time series analysis.				3	85	80	H	H	M	M	H	M	M	M	M	M	L	M	M	L	M		
CLO-2 :	Recognize different components of time series				3	80	75	H	H	M	M	M	M	M	M	L	M	L	H	M	L	M		
CLO-3 :	Select appropriate time series model to analyze the data.				3	85	80	H	H	M	M	H	L	M	M	M	M	L	M	M	M	M		
CLO-4 :	Validate the time series models using different diagnostic tools				3	85	80	H	H	L	M	H	L	L	M	M	L	L	M	L	M	L		
CLO-5 :	Estimate the forecast values.				3	85	80	M	H	L	L	H	M	L	L	M	L	H	M	L	M	L		

Duration (hour)		Learning Unit / Module 1 18	Learning Unit / Module 2 18	Learning Unit / Module 3 18	Learning Unit / Module 4 18	Learning Unit / Module 5 18
S-1	SLO-1	Introduction of Times series-background	Seasonal variation - Introduction	Time series fore casting model – introduction	Autoregressive (AR) process – definition	Random component – introduction
	SLO-2	Definition and uses of time series	Methods of measuring seasonal variation	Graphical presentation of for casting models	Propositions for AR process	<i>Variate component method – concepts</i>
S-2	SLO-1	Component of time series – secular trend, seasonal variation - concepts	Simple average method - formula	Classification of fore casting models	AR(1) process – definition	<i>Exponential smoothing method - definition</i>
	SLO-2	Cyclic variation, irregular variation	Simple average method – advantages and disadvantages	Causal model, smoothing techniques model, time series model	Properties of AR(1)	Different smoothing techniques
S-3	SLO-1	<i>Additive model and multiplicative model</i>	Simple average method – problem based on quarters	<i>Time series statistical models – introduction</i>	Example for AR(1)	<i>Single exponential smoothing - definition</i>
	SLO-2	<i>Additive model and multiplicative model</i>	Simple average method – problem based on quarters	Definition and of time series models	Example for AR(1)	<i>Formula for single exponential</i>

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		18	18	18	18	18
S-4-S-5	SLO-1	<i>Secular tend</i> Secular trend –definition, various methods	Simple average method – problem based on months	Graphical presentation of time series model	Problems on AR(1)	<i>Problems on single exponential smoothing</i>
	SLO-2	Free hand curve, semi moving average method-problems	Simple average method – problem based on months	Graphical presentation of time series model	Problems on AR(1)	<i>Problems on single exponential smoothing</i>
S-6	SLO-1	Moving average method-procedure – formula – uses	Ratio to trend method - formula	Stationary process : Measure of dependence	AR(2) process - definition	Choosing the best value for parameter
	SLO-2	Moving average method-procedure – odd yearly	Ratio to trend method – advantages and disadvantages	Mean and autocorrelation	Properties of AR(2)	analysis of error and time series plots
S-7	SLO-1	Moving average method-procedure-odd yearly	Ratio to trend methods advantages	Weak stationary model - definition	Parameter estimation of AR(1)	Holt's and Holt Winter;s trend - definition
	SLO-2	Moving average method-procedure-even yearly	Ratio to trend methods disadvantages	Condition for Weak stationary	Parameter estimation of AR(1)	Formula for Holt's and Holt Winter;s trend
S-8	SLO-1	Moving average method-procedure-even yearly	Ratio to moving average method – formula	Strict stationary -definition	Parameter estimation of AR(2)	Autoregressive moving average (ARMA) process - definition
	SLO-2	Moving average method-procedure-even yearly	Ratio to moving average method – merits and demerits	Condition for strict stationary	Parameter estimation of AR(2)	Casuality and invertability
S-9-S-11	SLO-1	Problems on even yearly moving average	Ratio to trend method – problems	<i>Problems on stationary process</i>	Problems of AR (1)	Problems on Holt's and Holt Winter;s trend
	SLO-2	Problems on even yearly moving average	Ratio to trend method – problem s	<i>Problems on stationary process</i>	Problems of AR (2)	Problems on Holt's and Holt Winter;s trend
S-12	SLO-1	<i>Methods of least square – procedure - advantage</i>	Ratio to moving average method – formula	Example for stationary process	Yule walker equation - introduction	ARIMA models – concept
	SLO-2	<i>Construction of trend line using method of least square</i>	Ratio to moving average method – merits and demerits	Example for stationary process	Yule walker equation for AR(p)	Box-Jenkins ARIMA models – concept
S - 13	SLO-1	<i>Methods of least square-problems –even number of years</i>	Link relative method - formula	Linear process es definition	Lag 1 - expression	Autocorrelation function – definition
	SLO-2	<i>Methods of least square-problems –odd number of years</i>	Link relative method - merits and demerits	Smoothing techniques model – definition	Lag 1 - expression	ACF formula - Box-Jenkins Partial autocorrelation function - Box-Jenkins
S-14	SLO-1	<i>Short-term fluctuation using trend</i>	Cyclic component: Harmonic analysis	Moving average (MA) process – first order and second order	Lag 2 expression	<i>Bayesian forecasting in random component</i>
	SLO-2	<i>Short-term fluctuation using trend</i>	Formula – Harmonic analysis	Formula for first order MA(1) and MA(2)	Lag 2 expression	<i>procedure</i>
S-15-S-18	SLO-1	<i>Construction of trend line using method of least square</i>	Link relative method - problem	Problems on MA(1)	<i>Problems on Yule walker equation</i>	<i>Problems on autocorrelation function - Box-Jenkins</i>
	SLO-2	<i>Construction of trend line using method of least square</i>	Harmonic Analysis - problem	Problems on MA(2)	<i>Problems on Yule walker equation</i>	<i>Problems on Partial autocorrelation function - Box-Jenkins</i>

Learning Resources	Text Books:	References:
	1. Box, G. E. P. and Jenkins, G. M.: Time Series Analysis – Forecasting and Control, Holden – day, San rancisco. 2. Chatfield, C.: Analysis of Time Series, An Introduction, CRC Press	1. Ruey S. Tsay :Multivariate Time series Analysis: with R and Financial Application, Wiley& Sons. 2. Montgomery, D. C. and Johnson, L. A.:Forecasting and Time series Analysis, McGraw Hill.

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasantha, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani,SRMIST

Course Code	UST23D06J	Course Name	Queueing Theory and Inventory Models	Course Category	D	Discipline Specific Elective Course	L 3	T 0	P 3	O 2	C 4
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Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):		The purpose of learning this course is to:		
CLR-1 :	Understand the basic characteristic features of a queueing system and acquire skills in analyzing queueing models.			
CLR-2 :	Introduction to queues, measures of system performance, characteristics of queueing systems, Little's law and other general results; Transforms and generating functions			
CLR-3 :	Analyze a network of queues with Poisson external arrivals, exponential service requirements and independent routing.			
CLR-4:	Being able to explain the theories related to international trade in the theories related to international trade			
CLR-5:	Being able to possess the management knowledge that is required from qualified personnel in national and international enterprises			

Learning			Program Learning Outcomes (PLO)														
1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Thinking (Bloom)	Proficiency (%)	Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning

Course Learning Outcomes (CLO):	<i>At the end of this course, learners will be able to:</i>	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	<i>Demonstrate basic principles of probability and understand a random variable that describe randomness or an uncertainty in certain realistic situation. It can be of either discrete or continuous type.</i>	3	85	80	L	M	M	M	M	H	H	M	M	L	L	H	M	M	L
CLO-2 :	<i>Comprehend concepts of discrete, continuous probability distributions and able to solve problems of probability using Binomial, Poisson, Uniform Distribution, Exponential Distribution, Normal distributions.</i>	3	80	75	H	H	M	L	M	H	M	M	M	L	L	M	M	M	M
CLO-3 :	<i>Understand about different Queueing models and its applications</i>	3	85	80	H	H	M	H	M	M	M	M	M	M	L	M	M	M	M
CLO-4 :	<i>Will be able to define inventory and inventory types</i>	3	85	80	H	M	L	M	M	H	H	L	L	M	L	M	M	M	M
CLO-5 :	<i>Will be able to explain the importance of inventory control and inventory control systems</i>	3	85	80	M	H	L	M	L	H	M	L	L	M	L	M	H	L	L

Duration (hour)		Learning Unit / Module 1 18	Learning Unit / Module 2 18	Learning Unit / Module 3 18	Learning Unit / Module 4 18	Learning Unit / Module 5 18
S-1	SLO-1	Introduction – Basics	Introduction – Multiple servers	Introduction – Erlangian Models	Introduction – Inventory Theory	Introduction – Deterministic Inventory Models
	SLO-2	Markovian Models	<i>Poisson Queueing Models with multiple servers- Descriptions of the model</i>	<i>Descriptions & Characteristics of queueing models</i>	Necessity for Maintaining Inventory- Advantages and Disadvantages	<i>Classification of Deterministic models</i>
S-2	SLO-1	<i>Poisson Queueing Models with single server - Assumptions</i>	Problems solved based on the above concept	<i>Non-Poisson Queueing Models</i>	<i>Scope and notion of Inventory</i>	<i>Deterministic Inventory models without shortages</i>
	SLO-2	<i>Descriptions & Characteristics of queueing models</i>	<i>Poisson Queueing Models with multiple servers- Assumption</i>	<i>Erlong Family Distribution</i>	Classification of Inventories	<i>Deterministic Inventory models with Demand rate uniform, simultaneous replenishment infinite (No Shortage permitted)</i>

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		18	18	18	18	18
S-3	SLO-1	Waiting Time and Idle Time costs	Operating Characteristics of a Queueing Model	Erlong Family of Service time distribution	Classification of fixed order Quantity inventory models	Deterministic Inventory models with Demand rate non-uniform, simultaneous replenishment infinite (No Shortage permitted)
	SLO-2	Transient and Steady States of the system	Probability distributions for number of Units (steady state)	Descriptions of the model	Elementary Model and types	Deterministic Inventory models with Demand rate uniform, simultaneous replenishment finite (No Shortage permitted)
S-4 - S-6	SLO-1	Practical: Single server queueing models	Practical: Multiple server queueing models	Practical: Erlong distribution in queueing process	Practical: Probabilistic Models	Practical: Deterministic Inventory models without shortages
	SLO-2	Multiple server queueing models	Waiting time distribution	Non-Poisson Queueing Models (Erlangian): Assumptions	Instantaneous demand, set-up cost zero, stock levels discrete, lead time zero.	Deterministic Inventory models with shortages
S-7	SLO-1	Kendall's Notation for Representing Queueing Models	Derivation of characteristics on (M/M/C): (∞/FIFO) Model	Models for Arrival and Service Times	Instantaneous demand, set-up cost zero, stock levels continuous, lead time zero.	Deterministic Inventory models with Demand rate uniform, simultaneous replenishment infinite (Shortage permitted)
	SLO-2	Classification of Queueing Models	Multi-Channel Queueing Theory, Exponential Service, Infinite-Population	Probability distributions for number of Units (steady state),	Continuous demand, set-up cost zero, stock levels discrete, lead time zero.	Deterministic Inventory models with Demand rate uniform, simultaneous replenishment infinite (Shortage permitted) time interval fixed
S-8	SLO-1	Derivation of L_s, L_q	Derive and explain L_s, L_q, W_s, W_q	waiting time distribution	Continuous demand, set-up cost zero, stock levels continuous, lead time zero.	Deterministic Inventory models with Demand rate uniform, simultaneous replenishment finite (Shortage permitted)
	SLO-2	Derivation of W_s, W_q	Finite – Population Models	Generalisation of model	Continuous demand, set-up cost zero, stock levels discrete, lead time Significant.	Economic lot size models or economic order quantity models (EOQ)
S-9	SLO-1	Little's formula	Queues with finite waiting rooms	Multi – Phase Service Model	Continuous demand, set-up cost zero, stock levels continuous, lead time Significant.	Concept of EOQ and other parameters
	SLO-2	Practical: Problems using Little's formula	Practical: (M/M/C): (N/FIFO) Model	Practical: Erlang queueing Models- (M/Ek/1) Model	Practical: Deterministic Models	Practical: EOQ under certainty and uncertainty
S-10 - S-12	SLO-1	Generalized Birth and death processes	Generalisation of model	Derivation of characteristics on (M/Ek/1) Model	Optimality issues with Inventory	Economic Lot size formula for Made-in items when lead time is zero and shortage are not allowed.
	SLO-2	Steady-state Birth and death processes - Assumptions	Models for Arrival and Service Times	Erlang service time with k phases, Single Channel, First come, First serve and Infinite population	Deterministic Inventory models without shortage	Fixed time period and fixed quantity models
S-14	SLO-1	Single-Channel Queueing Theory	Assumptions and Limitations of finite Queueing Models	Derivation of L_s, L_q	Inventory Models with deterministic demand	Inventory models based on price Breaks
	SLO-2	Probability distributions for number of Units (steady state)	Multi-Channel Queueing Theory, Exponential Service, Finite-Population	Derivation of W_s, W_q	Economic lot size models or economic order quantity models (EOQ)	Deterministic Inventory models with Single price Breaks

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		18	18	18	18	18
S-15	SLO-1	Waiting time distribution	Derivation of L_s, L_q	Derive Expressions for the expected number of units in the system	Finding EOQ and other characteristics	Deterministic Inventory models with multiple price Breaks
	SLO-2	Queues with finite waiting rooms	Derivation of W_s, W_q	Derive expressions for the expected number of units in the queue	Assumptions in EOQ Model, Limitations of (Objections to) EOQ formula	Simple problems
S-16 - S-18	SLO-1	Practical: Problems on Single-Channel Queueing Theory	Practical: (M/M/C): (C/FIFO) Model	Practical: Erlong distribution with parameters $\mu + K$	Practical: Classical EOQ Model	Practical: Deterministic Inventory models with single price breaks, multiple price Breaks
	SLO-2					

Learning Resources	Text Books:			References:		
	1. KantiSwarup et al.: Operations Research, Sultan Chand and Sons, New Delhi 2. S.D Sharma: Operations Research			1. Hiller F S and Libermann G J (1995): Introduction to operations Research, 6th Edition, McGraw Hill 2. Prabhu N.U. (1965) Applied Stochastic Processes, Mc.Millan		

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

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Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasantha, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1.Ms. MADHUMITHA J, SRMIST
		2. Dr. S. LAKSHMI PRIYA. SRMIST

Course Code	UST23G05J	Course Name	Statistical Data Mining Techniques	Course Category	G	Generic Elective Course	L	T	P	O	C
							3	0	2	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Applications	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)
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CLR-1 :	Learn in-depth concepts, methods and applications of data mining	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Learn how to start looking at data from the perspective of data analyst																		
CLR-3 :	Experimenting with different data mining techniques for knowledge discovery																		
CLR-4 :	Use R software for data import and export, data exploration and visualization, and for data analysis tasks																		
CLR-5 :	Demonstration on how to perform classification and clustering data mining tasks on real time datasets																		

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	To understand data mining process and the resulting patterns, types of data, attributes and knowledge discovery process	1	85	80	M	H	M	M	M	M	M	M	M	H	L	M	M	M	M
CLO-2 :	To study the different data preprocessing techniques before applying the data mining process	2	85	80	M	H	M	M	H	M	H	M	M	H	L	M	M	M	M
CLO-3 :	To characterize the kinds of patterns that can be discovered by association rule mining	2	85	80	M	H	M	H	M	M	H	M	M	H	L	M	M	M	M
CLO-4 :	To learn the different prediction, classification and clustering algorithms	3	85	80	M	M	M	H	H	M	M	M	M	H	L	M	M	M	M
CLO-5 :	To categorize and carefully differentiate between situations for applying different datamining techniques for different applications	3	85	80	M	M	L	M	H	M	H	M	M	H	L	M	M	M	M

Duration (hour)	15	15	15	15	15
S-1	SLO-1 Introduction to Data Mining	Data Pre-processing- Introduction to Data Pre-processing	Data Generalization	Classification and Prediction	Cluster Analysis - concepts
	SLO-2 Why Data Mining? Evolution of Information Technology	Data Cleaning	Data Summarization	What is Prediction?	Overview of Basic Clustering Approaches
S-2	SLO-1 Datamining Foundations Stages of the Data Mining Process	Missing Values Inconsistent Data	Analysis of attribute relevance. Mining Class Comparisons	Preparing the data for classification and prediction	Requirements for Cluster Analysis
	SLO-2 Different Types of Data in Data Mining. Data Mining Functionalities	Data Integration and Transformation	Different measures of Dispersion, Frequent item-set mining	Comparing Classification and Prediction methods	Similarity and Distance Metrics. Characteristics of Clustering Algorithms
S-3	SLO-1 The Architecture of Data Mining, Data Mining Tools	Entity Identification Problem:-	Frequent pattern mining	Basic Concepts- Classification, General Approach to Classification	Partitioning Algorithms
	SLO-2 Knowledge Discovery in Databases or KDD process	Redundancy and Correlation Analysis	Association rule mining	Decision Tree Induction, Attribute Selection Methods	k-Means Clustering- Centroid Based Technique
S 4-S-5	SLO-1 Lab 1: : Installation of WEKA Tool - Investigation the Application interfaces of the Weka tool	Lab 4: Pre-process a given dataset based on Attribute selection	Lab 7: Generate Association Rules using the Apriori Algorithm	Lab 10: Naïve bayes classification on a given data set	Lab 13: Applying k-means clustering on a given data set
	SLO-2				
S-6	SLO-1 KDD Vs Data Mining	Tuple Duplication , Data Reduction	Methods to discover Association Rules	Decision Tree Classifier- Using Entropy	Partitioning Method: k-Means Clustering- Example

	SLO-2	Steps in KDD Process	Wavelet Transforms	Market Basket Analysis: A motivational Example	Decision Tree Classifier- Using Gini Index	k-Medoids Algorithms
S-7	SLO-1	Types of Data Mining Techniques	Principal Components Analysis	Basic Concepts: Frequent Item Sets, Closed Item Sets	Tree Pruning Techniques, Rule Based Classifier	Example: k-Medoids
	SLO-2	<i>Pattern of data mining</i>	Attribute Subset Selection, Numerosity Reduction	Frequent Item Set Mining- Apriori Algorithm	Using IF-THEN rules for Classification, Rule Extraction from Decision Tree	Hierarchical method. Agglomerative and Divisive Methods
S-8	SLO-1	Data Objects and Attribute Types Nominal, Binary, Ordinal, Numeric	Bar Graphs and Histograms	Candidate Generation - Generating Frequent Item Sets-Example, Apriori Algorithm-Examples	Bayes Classification Methods – Bayes theorem	Distance Measures in Algorithmic Methods
	SLO-2	Discrete data types	Under Sampling and Over Sampling	Improving the Efficiency of Apriori	Naïve Bayes Classifier	Dendrogram, Density Based Methods: DBSCAN
S 8-S-10	SLO-1	Lab2: Overview -Working in the Console	Lab 5: Pre-process a given dataset based on Handling Missing Values	Lab 8: Generate Association Rules using the Apriori Algorithm	Lab 11: Finding Association Rules for Employee data.	Lab14:Distance Measures in Algorithmic Methods
	SLO-2					
S-11	SLO-1	Data Mining Functionalities	Data Cube Aggregation	A Pattern Growth Approach for Mining Frequent Item Sets	Naïve Bayes –Example	DBScan Algorithm
	SLO-2	Data exploration and visualization	Data Discretization, Discretization by Binning	FP-Growth Algorithm – Basic Idea	Model Evaluation and Selection	Evaluation of Clustering
S-12	SLO-1	Data Visualization Techniques	Concept Hierarchy Generation	FP-Growth Algorithm with example	Techniques to improve Classification Accuracy	Measuring Clustering Quality, Determining the number of Clusters
	SLO-2	Visualizing Complex data and relations	Discretization by Histogram Analysis	Mining Closed and Max Patterns	Classification by Back propagation	Scalable Clustering Algorithms
S-13	SLO-1	Issues and Challenges in Data mining	Discretization by Cluster	Mining Frequent Item Sets Using Vertical Data format	Support Vector Machines	Applications of Data Mining in Finance
	SLO-2	Application in Data Mining	Feature extraction, Feature Transformation	Pattern Evaluation Methods, From Association analysis to correlation analysis Comparison of Pattern Evaluation Measures	Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor. Ensemble Methods	Applications of Data Mining in Business and Social Networks
S 14-15	SLO-1	Lab 3: Getting Help in weka tool and Quitting WEKA	Lab 6: Create a Weather Table with the help of Data Mining Tool WEKA.	Lab 9:Build a Decision Tree by using J48 algorithm	Lab 12: To Construct Decision Tree for Weather data and classify it..	Lab 15: Write a procedure for Employee data using MakeDensityBased Cluster Algorithm
	SLO-2					

Learning Resources	Text Books:			References:		
	1. Arun K Pujari, <i>Data Mining Techniques</i>, Univeristy Press 2. J Han and M Kamber, <i>Data Mining : Concepts and Techniques</i>, Third Edition, Morgan Kaufmann Publishers			1. G. K. Gupta, 2006, "Introduction to Data Mining with Case Studies", Eastern Economy Edition, Prentice Hall of India. 2. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, 2007, "Introduction to Data Mining", Pearson .		

Learning Assessment												
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)		
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (5%)#				
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	ATTENDANCE (5%)	15%	15%
	Understand											
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%		20%	20%
	Analyze											
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%		15%	15%
	Create											
	Total	100 %		100 %		100 %		100 %			100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasanth, ICMR, Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. M.Kalaivani, SRMIST
		2. M.Ramla, SRMIST

Course Code	UST23G06J	Course Name	Big Data Analytics	Course Category	G	Generic Elective Course	L	T	P	O	C
							3	0	2	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards			

Course Learning Rationale (CLR):		Learning		Program Learning Outcomes (PLO)	
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CLR-1:	Understand the Big Data Platform and its Use cases	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2:	Provide an overview of Apache Hadoop																		
CLR-3:	Provide HDFS Concepts and Interfacing with HDFS																		
CLR-4:	Understand Map Reduce Jobs																		
CLR-5:	Provide hands on Hadoop Eco System																		
Course Learning Outcomes (CLO):		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1:	Identify Big Data and its Business Implications.	3	80	70	M	H	M	M	H	M	L	L	L	H	L	H	L	M	M
CLO-2:	List the components of Hadoop and Hadoop Eco-System	3	85	75	H	H	M	M	H	M	M	L	M	H	L	H	L	M	M
CLO-3:	Access and Process Data on Distributed File System	3	75	70	M	H	M	M	H	M	M	M	M	H	L	H	M	M	M
CLO-4:	Understand the YARN Infrastructure	3	85	80	H	H	L	M	H	L	M	M	M	M	L	H	M	M	M
CLO-5:	Manage Job Execution in Hadoop Environment	3	85	75	M	M	L	M	M	M	L	M	L	H	L	H	M	M	M

Duration (hour)	15	15	15	15	15
S-1	SLO-1	Introduction of Big Data	Big Data Hadoop	Big Data HDFS	How does MapReduce Work?
	SLO-2	Big Data Tools Overview	Overview of Hadoop	Overview of Eco System	Business benefits of MapReduce
S-2	SLO-1	Hadoop	Apache Hadoop overview	HDFS	Business Challenges of MapReduce
	SLO-2	Apache Storm	Business Benefits of Apache Hadoop	YARN	MapReduce Architecture

S-3	SLO-1	Hadoop	Need of Apache Hadoop	Map Reduce	MapReduce Example	Pig Latin
	SLO-2	Apache Strom	Components of Hadoop	Spark	Implementation of MapReduce	User Defined Function
S-4 - S-5	SLO-1	Lab 1: Normalizing data	Lab 4: Creating Modules	Lab 7: Set up Hadoop cluster configuration	Lab 10: Import data from MS Excel into HDFS	Lab 13: Implement partitioner in Hadoop
	SLO-2					
S-6	SLO-1	Big Data Technologies Overview	Processing Layer (MapReduce)	Pig	Job Scheduling Optimizations, MR Task Distribution Optimization	Data Processing Operators
	SLO-2	Data Management	Storage Layer (HDFS)	Hive	Networking & I/O Optimizations	Hive Shell
S-7	SLO-1	Data Mining	Hadoop YARN	HBase	Iterative Processing	Hive Services
	SLO-2	In-Memory Analytics	Apache Spark overview	Mahout	Join Operations	Hive Meta store
S-8	SLO-1	Predictive Analytics	Benefits of Apache Spark	Zookeeper	Data Access	Comparision with Traditional Database
	SLO-2	Text Mining	Need of Apache Spark	Oozie	Load Balancing	HiveQL
S-9 - S-10	SLO-1	Lab 2: Formatting data	Lab 5: Install and configure Hadoop, set working directory and various processes	Lab 8: Implement HDFS and explore its characteristics	Lab 11: Import data from MySQL into HDFS	Lab 14: Implement nested MapReduce
	SLO-2					
S-11	SLO-1	Big Data Analytics	Components of Apache Spark	Basic File System	Data Flow Optimization	Tables
	SLO-2	Text Analytics	Spark Core Engine	Operations in File system	Short Job Optimization	Querying Data
S-12	SLO-1	Information extraction	Spark SQL	Data Flow	Controlling Map Reduce Excecution	User Defined Function
	SLO-2	Text Summarization	Spark Streaming	Data Ingest	Input Format	HBasic
S-13	SLO-1	Question Answering, Role of Bigdata	MLib , GraphX , Hadoop 2.X versus Hadoop 3.X	Flume and Scoop, Hadoop archives, Hadoop I/O: Compression	Reader , Writer, Combiner, Partitioners	Concepts in HBase, Hbase Versus RDBMS
	SLO-2	Working with Semi-structured Data, UnStructured Data	Processing data with Hadoop and Interacting with Hadoop Eco System	Serialization, Avro and File-Based Data structures	Developing simple MapReduce Application.	Hive Services, Data types in Hive, Built in function in Hive, Big SQL
S-14 - S-15	SLO-1	Lab 3: Importing Modules	Lab 6: Implement basic commands in Hadoop to manipulate big data.	.Lab 9: Explore the properties of YARN	Lab 12: Implement reducer in Hadoop	Lab 15: Create a scenario based on real time domain
	SLO-2					

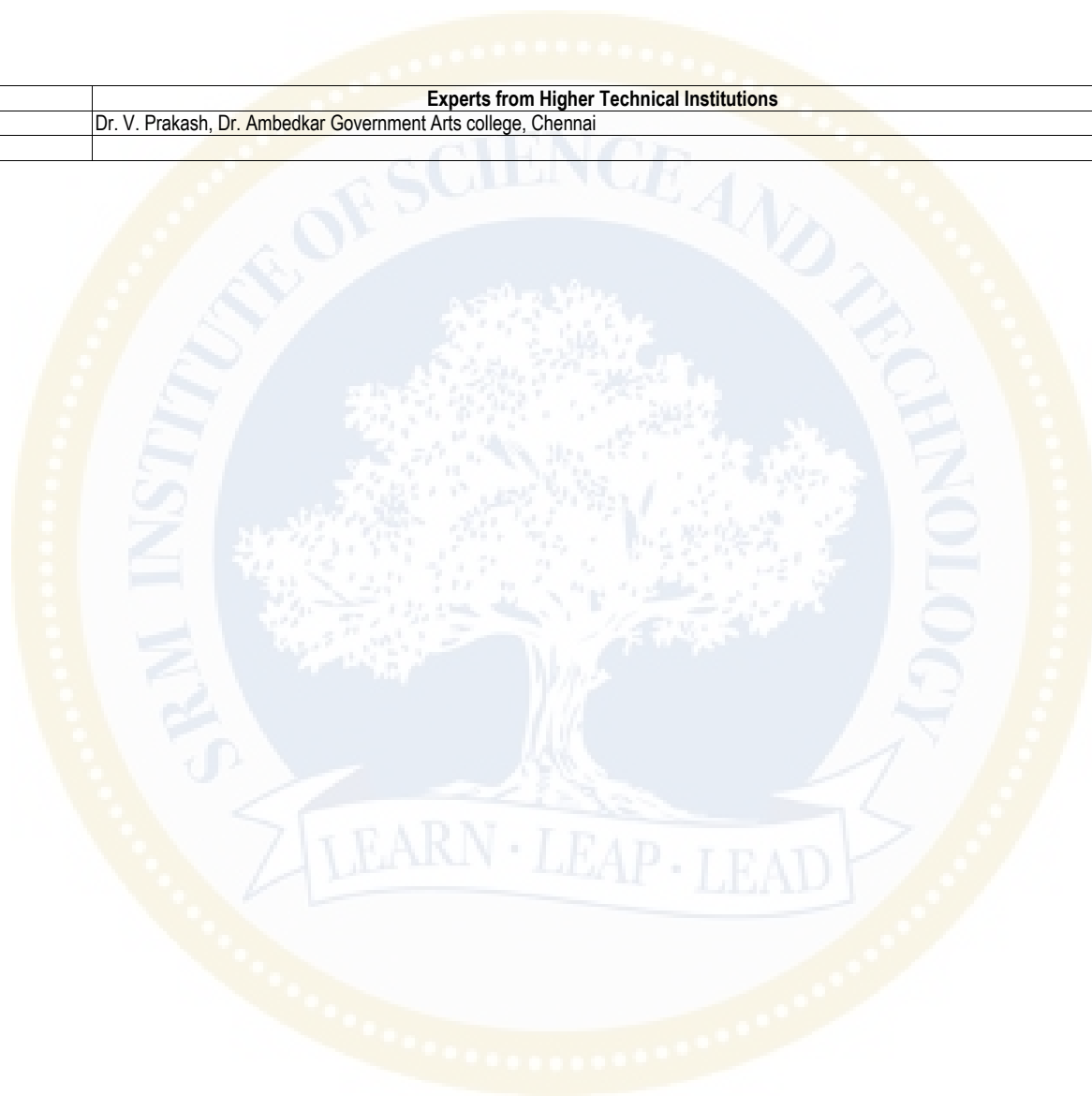
Learning Resources	Text Books:	References:
	1. Tom White “Hadoop: The Definitive Guide” Third Edit on, O’reily Media, 2012. 2. SeemaAcharya, SubhashiniChellappan, Big Data and Analytics, Wiley Publications, 2nd Edition, 2014, DT Editorial Services.	1. Black Book Big Data, Dream tech publications, 1st Edition, 2017.

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	20%	20%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	10%	10%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr. M.Vasantha, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. M.Kalaivani,SRMIST
		2. M. Ramla, SRMIST



Course Code	UST23P03L	Course Name	INTERNSHIP - III	Course Category	IAPC	Internship/Apprenticeship / Project/ Community Outreach	L	T	P	C
							-	-	-	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards			Nil

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)
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CLR-1:	Demonstrate skills learnt in the real time environment.	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2:	Explore the different industries that are using IT																		
CLR-3:	Enhance the skills in the system aspects																		
CLR-4:	Understanding the professional connections with the knowledge learnt																		
CLR-5:	Applying the skills in problem solving																		
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLO-1:	To get an insight of an industry and organization/company	3	80	70	L	L	H	L	M	M	M	M	H	L	M	M	M	H	M
CLO-2:	To gain valuable skills and knowledge	3	85	75	M	M	H	L	M	L	M	L	H	M	M	L	M	H	M
CLO-3:	To make professional connections and enhance networking	3	75	70	M	M	H	L	M	M	M	M	H	M	M	L	M	H	M
CLO-4:	To get experience in a field to allow the student to make a career transition	3	85	80	M	M	H	L	L	L	M	L	H	M	L	M	L	H	L
CLO-5:	To get an inside view of an industry and organization/company	3	85	75	H	M	H	L	L	M	M	M	H	L	L	M	L	M	L

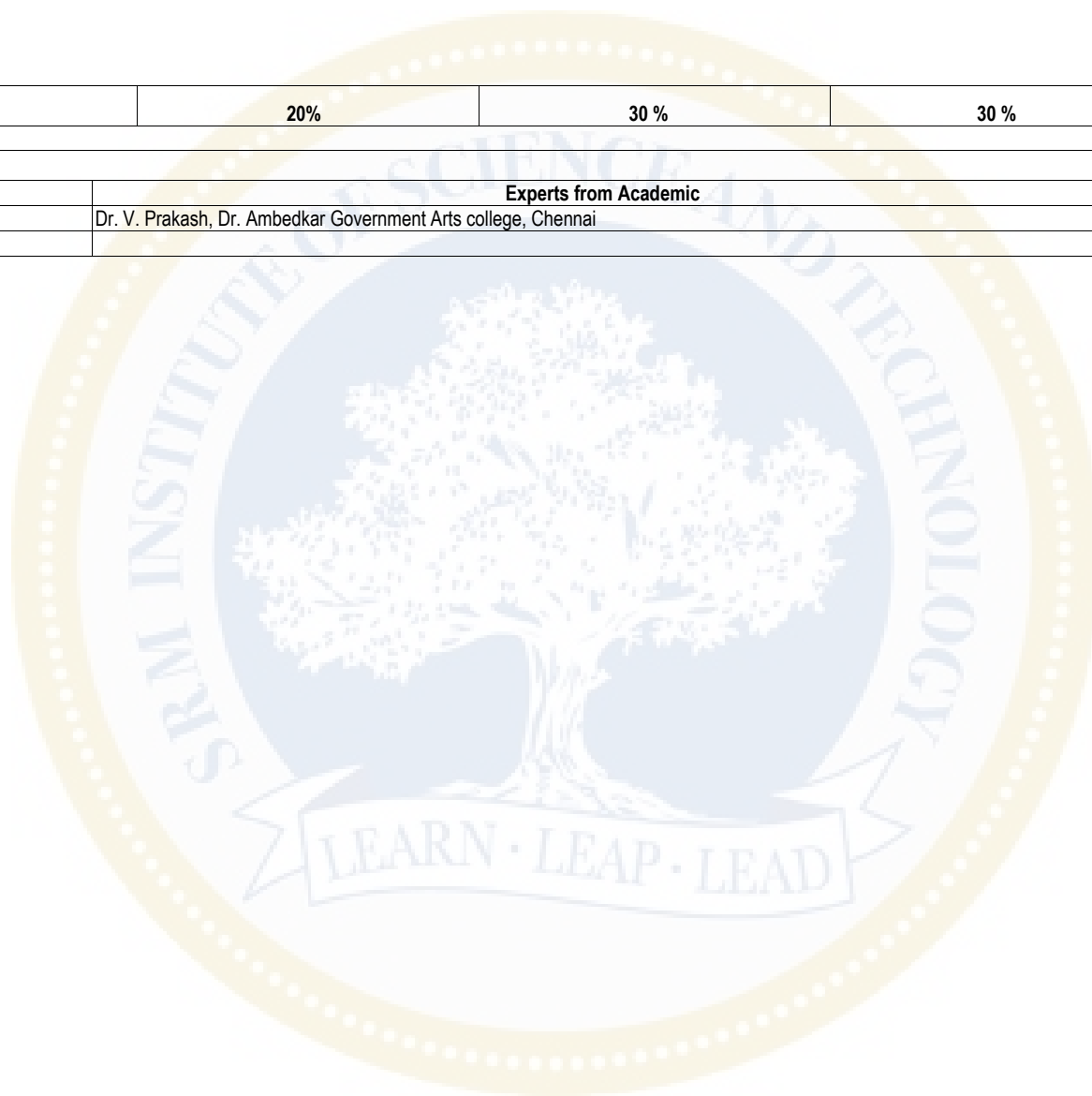
Students can choose a company of their own interest for internship for a period of minimum four weeks to learn about the application of IT in real time environment. In the first week of July, all the students have to give a presentation about their observations made by them in internship. At the end of the internship period, every student shall submit a structured internship report within 15 days from the date of the completion of the internship period.

Learning Assessment			
Project Work / Internship	Continuous Learning Assessment (50% weightage)		Final Evaluation (50% weightage)
	Review – 1	Review – 2	Internship Report Viva-Voce

	20%	30 %	30 %	20 %
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Course Designers

Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasantha, ICMR, Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani, SRMIST



Course Code	UST23P05L	Course Name	Project Phase-I	Course Category	IAPC	Internship/Apprenticeship / Project/ Community Outreach	L	T	P	0	C
							0	0	8	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards			Nil

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)
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CLR-1 :	Demonstrate skills learnt in the real time environment.	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Explore the different industries that are using IT																		
CLR-3 :	Enhance the skills in the system aspects																		
CLR-4 :	Understanding the professional connections with the knowledge learnt																		
CLR-5 :	Applying the skills in problem solving																		

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLO-1 :	To get an inside view of an industry and organization/company	3	80	70	L	M	H	L	L	M	L	L	H	L	L	L	L	H	M
CLO-2 :	To gain valuable skills and knowledge	3	85	75	M	M	H	L	M	M	M	M	M	M	M	H	M	H	M
CLO-3 :	To make professional connections and enhance networking	3	75	70	M	M	H	L	M	L	L	M	H	M	M	M	M	H	M
CLO-4 :	To get experience in a field to allow the student to make a career transition	3	85	80	M	M	H	L	M	M	M	M	H	M	M	M	M	H	M
CLO-5 :	To get an inside view of an industry and organization/company	3	85	75	M	L	H	L	L	L	M	L	H	M	M	M	M	H	M

Students can choose a company of their own interest for internship for a period of minimum four weeks to learn about the application of IT in real time environment. In the first week of July, all the students have to give a presentation about their observations made by them in internship. At the end of the internship period, every student shall submit a structured internship report within 15 days from the date of the completion of the internship period.

Learning Assessment			
Project Phase-I	Continuous Learning Assessment (50% weightage)		Final Evaluation (50% weightage)
	Review – 1	Review – 2	Project Report
	20%	30 %	30 %
			Viva-Voce
			20 %

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasanth, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani,SRMIST

SEMESTER - VIII

Course Code	UST23801J	Course Name	Survival Analysis	Course Category	C	Discipline Specific Core Course	L	T	P	O	C
							3	0	2	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards			

Course Learning Rationale (CLR):		The purpose of learning this course is to:		
CLR-1 :	To know the concept of Biostatistics			
CLR-2 :	To apply the different methods in clinical trials			
CLR-3 :	To understand the Survival time and Distributions			
CLR-4 :	To apply the method in different case studies			
CLR-5 :	To estimate the survival time			

Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:		
CLO-1 :	They can do further studies in Biostatistics			
CLO-2 :	Clinical trials can be performed by them			
CLO-3 :	They can apply different distributions in survival analysis			
CLO-4 :	They will have a knowledge to use different survival functions			
CLO-5 :	Can apply the appropriate study design in various trails			

Learning			
1	2	3	
Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
H	M	H	L	L	M	M	M	H	L	M	M	M	H	M
M	M	H	L	L	M	M	M	H	L	M	M	M	H	M
M	M	H	M	M	M	M	M	H	M	M	M	M	H	L
M	L	H	L	M	L	L	M	H	M	L	L	M	H	M
M	L	H	M	M	L	L	L	H	M	L	L	L	H	M

Duration (hour)		Learning Unit / Module 1 15	Learning Unit / Module 2 15	Learning Unit / Module 3 15	Learning Unit / Module 4 15	Learning Unit / Module 5 15
S-1	SLO-1	<i>The scope of survival analysis</i>	<i>Parametric Inference</i>	<i>Nonparametric Inference-Introduction</i>	<i>Semi-parametric Inference</i>	<i>Concept of frailty</i>
	SLO-2	<i>Failure time, censoring</i>	<i>Longitudinal studies</i>	<i>Actuarial and Kaplan–Meier estimators- definition, formulas</i>	<i>Explanatory variables</i>	<i>Shared frailty models</i>
S-2	SLO-1	<i>Hazard function</i>	<i>Discussion</i>	<i>Actuarial and Kaplan–Meier estimators- proof</i>	<i>Factors and variate of the Semi-parametric Inference</i>	<i>Identifiability of frailty models.</i>
	SLO-2	<i>Hazard function for all the distributions (exponential, gamma, weibull)</i>	<i>Censoring mechanisms</i>	<i>Actuarial and Kaplan–Meier estimators- examples</i>	<i>Cox proportional hazards model</i>	<i>Various Frailty models.</i>
S-3	SLO-1	<i>Hazard function for all the distributions (log normal, log logistic, inverse Gaussian)</i>	<i>Type I left right censoring</i>	<i>Treatment of ties</i>	<i>The partial likelihood of the estimation</i>	<i>Gamma models, positive stable</i>
	SLO-2	<i>Parametric statistical analysis, likelihood function</i>	<i>Type I interval censoring</i>	<i>Properties of the estimators</i>	<i>The partial likelihood of the estimation- problems</i>	<i>Bivariate frailty models</i>

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		15	15	15	15	15
S-4-S-5	SLO-1	Exponential distribution of failure function	Type II left right censoring	Actuarial and Kaplan–Meier estimators-problems	estimation of regression coefficients- proof	Correlated frailty models
	SLO-2	Cumulative hazard function	Type II interval censoring	Actuarial and Kaplan–Meier estimators-problems	estimation of regression coefficients- sums	Sum on Correlated frailty models
S-6	SLO-1	Proportional hazards family	Likelihood functions	Self-consistency property	standard errors of regression coefficients	Inverse Gaussian, power variance function, compound Poisson and compound negative binomial shared frailty models.
	SLO-2	Likelihood estimation	Likelihood functions under censoring	asymptotic properties of K–M estimator	Breslow's estimator	Frailty regression models.
S-7	SLO-1	Likelihood estimation of weibull distribution	Likelihood functions under estimation.	Pointwise confidence interval for S(t)	Breslow's estimator- sums	Frailty regression models.
	SLO-2	Likelihood estimation of weibull distribution- problem	Test based on LR	Pointwise confidence interval for S(t)- problems	Statement of asymptotic properties of the estimator	Bivariate frailty models- definition
S-8	SLO-1	MLE- exponential distribution	Test based on LR- problems	Nelson-Aalen estimator of cumulative hazard function	Confidence interval for regression coefficients	Bivariate frailty models-examples
	SLO-2	MLE- exponential distribution with example	Test based on MLE	Nelson-Aalen estimator of cumulative hazard function and estimation of S(t) based on it	Wald, Rao and likelihood tests for β	correlated frailty models- procedure
S-9-S-10	SLO-1	survival characteristics of Exponential, Weibull, Pareto	Test based on MLE- problems	Nelson-Aalen estimator of cumulative hazard function and estimation of S(t) - problem	Wald, Rao and likelihood tests for B- problems	Correlated frailty models-examples
	SLO-2	survival characteristics of logistic, log-logistic, normal, log normal and mixture models	Efficient Likelihood Estimation	Two-sample method- procedure	Accelerated life model	Reversed hazard rates- procedure
S-11	SLO-1	mean residual life	Kullback - Leibler information- proof	Two-sample method-problem	Accelerated life model- problem	Reversed hazard rates- sums
	SLO-2	Quantiles of parametric models	Kullback - Leibler information- derivation	Two-sample method- problem	Model selection criteria	Additive frailty models- definition
S-12	SLO-1	survival characteristics	The Wald, Likelihood ratio, and Score (or Rao) Tests- proof	Comparison of survival functions	Cox Proportional Hazards Model- formula, definition	Additive frailty models-examples
	SLO-2	Parametric models for study of event time data- procedure	The Wald, Likelihood ratio, and Score (or Rao) Tests- derivation	Comparison of survival functions- log rank test	Cox Proportional Hazards Model - problem	Additive frailty models-sums
S-13	SLO-1	Parametric models for study of event time data- examples	Consistency of the likelihood ratio, Wald, and score tests	Comparison of survival functions- problems	Using information on prognostic variables in a competing risks model	Reversed hazard rates
	SLO-2	Parametric models for study of event time data- examples	Testing a Composite Null Hypothesis	Comparison of survival functions- Tarone-Ware tests	models -2logLAIC, BIC	Reversed hazard rates
S-14-S-15	SLO-1	Hazard function of Exponential, Weibull, Pareto	Likelihood ratio, Wald, Rao statistics for composite null under null	Tarone-Ware tests	Comparison of nested models (- 2logL, AIC, BIC)	Cox's proportional reversed hazards model- procedure

Duration (hour)	Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
	15	15	15	15	15
SLO-2	Hazard function of logistic, log-logistic, normal, log normal and mixture models	Example with normal distribution	Comparison of survival functions- log rank test and Tarone-Ware tests	Comparison of nested models (-2logL, AIC, BIC)	Cox's proportional reversed hazards model- sums

Learning Resources	Text Books: 1. Cox, D.R. and Oakes, D. (1984). Analysis of Survival Data, Chapman and Hall. 2. Deshpande, J.V. and Purohit S.G. (2005). Life Time Data: Statistical Models and Methods, Word Scientific.	References: 1. Hanagal, D. D. (2011). Modeling Survival Data Using Frailty Models. CRC Press: New York. 2. Hougaard, P. (2000). Analysis of Multivariate Survival Data. Springer: New York.
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Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasanth, ICMR, Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani, SRMIST

Course Code	UST23D07J	Course Name	Advanced Optimization Techniques	Course Category	D	Discipline Specific Elective Course	L 3	T 0	P 2	O 2	C 4
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Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Statistical Table and Graph sheet		

Course Learning Rationale (CLR):		The purpose of learning this course is to:			Learning			Program Learning Outcomes (PLO)														
CLR-1 :	To understand the methodology of OR problem solving and formulate linear programming problem.				1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	To develop formulation skills in transportation models and finding solutions				Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-3 :	To understand the basics in the field of game theory and assignment problems																					
CLR-4 :	To know how project management techniques help in planning and scheduling a project																					
CLR-5 :	To know the basics of dynamic programming and simulation.																					
Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:																				
CLO-1 :	Solve linear programming problems using appropriate techniques and optimization solvers, interpret the results obtained.				3	85	80	M	H	H	M	M	L	M	H	M	M	L	M	M	M	L
CLO-2 :	construct linear integer programming models and discuss the solution techniques.				3	80	75	M	M	H	M	M	M	M	H	M	H	L	M	M	M	M
CLO-3 :	Determine optimal strategy for Minimization of Cost of shipping of products from source to Destination/ Maximization of profits of shipping products using various				3	85	80	H	H	M	M	M	M	M	H	M	M	L	M	M	M	M
CLO-4 :	Formulate Network models for service and manufacturing systems, and apply operations research techniques and algorithms to solve these Network problems				3	85	80	M	H	H	H	L	L	M	M	L	M	L	M	L	L	L
CLO-5 :	propose the best strategy using decision making methods under uncertainty and game theory.				3	85	80	H	H	M	H	L	M	M	M	M	M	L	M	L	L	M

Duration (hour)	Learning Unit / Module 1 15	Learning Unit / Module 2 15	Learning Unit / Module 3 15	Learning Unit / Module 4 15	Learning Unit / Module 5 15
S-1	SLO-1 Introduction – Basics	Introduction- Dual Simplex method	Introduction – Dynamic programming problem (D.P. P)	Introduction – Network theory	Introduction – Replacement problems
	SLO-2 Basics of Operations Research (OR)	Primal and dual of LPP	Need of Dynamic programming problem	Definitions and applications of Networks	Types of Replacement problems
S-2	SLO-1 Characteristics of O.R, Importance and limitations of O.R	Some important results in duality	Characteristics of Dynamic programming problem	Basic components of networks	Individual replacement policies
	SLO-2 Main phases of O.R	Working procedure - Dual Simplex method	Applications of Dynamic programming problem	Logical sequencing	Replacement policy for items whose maintenance cost increase with time, and money value is not considered
S-3	SLO-1 Linear programming problem (LPP)– Introduction	Problems on Dual Simplex method	Dynamic Programming Approach	Rules of Network constructions	Replacement policy for items whose maintenance cost increase with time, and money value is not considered
	SLO-2 Formulation of LPP - problems	Difference between simplex method and dual simplex method	Formulation of Dynamic programming problem	Construction of Networks	Problems based on maintenance cost increase with time and money value is not considered
S-4	SLO-1 Practical - Formulation of LPP	Practical – Dual Simplex method	Practical - Classical method	Practical – Construction of Networks	Practical - Replacement policy for items whose maintenance

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		15	15	15	15	15
S-5	SLO-2	for a real life problem				cost increase with time
S-6	SLO-1	Canonical form of LPP	Sensitivity analysis- Introduction	Optimal Sub-division problem – Classical method	Numbering the events	Group replacement policies
	SLO-2	Problems on Canonical form of LPP	Sensitivity analysis- Variations in the cost vector	Problems on Dynamic programming problem	Problems based on Successor and Predecessor	Money value, Present worth factor, Discount rate
S-7	SLO-1	Standard form of LPP	Sensitivity analysis- Variations in the requirement vector	Dynamic programming problem – forward computational procedure	Critical Path Method Procedure	Replacement policy for items whose maintenance cost increases with time and money value decreases with with constant rate- Procedure
	SLO-2	Problems on Standard form of LPP	Sensitivity analysis- Variations in the elements of the coefficient matrix	Problems using forward computational procedure	Method of finding Earliest Start, earliest Finish, Latest start, and Latest finish. Problems on float	Problems on Replacement policy for items whose maintenance cost increases with time and money value decreases with with constant rate- Procedure
S-8	SLO-1	Procedure of simplex Method	Sensitivity analysis- Addition and deletion of a new variable	Dynamic programming problem – backward computational procedure	Difference between CPM and PERT	Problems on Replacement policy for items whose maintenance cost increases with time and money value decreases with with constant rate- Procedure
	SLO-2	Simplex algorithm (maximization case – procedure	Sensitivity analysis- Addition and deletion of a new constraint	Problems using backward computational procedure	Project Evaluation Review Technique PERT - Introduction Definition of Optimistic, Pessimistic, and most likely time	Problems with Salvage value is considered
S-9, S-10	SLO-1	Practical - Simplex Method	Practical – Sensitivity analysis	Practical - Dynamic programming problem – forward, backward computational	Practical - CPM-PERT calculations	Practical - Replacement policy for items whose maintenance cost increases with time and money value decreases with with constant rate and salvage cost considered
	SLO-2					
S-11	SLO-1	Revised simplex method - Introduction	Integer programming problems - Introduction	Problems using forward computational procedure	Problems on Expected Project time and variance time	Difference between individual and group replacement
	SLO-2	Fundamentals of Revised simplex method	Pure Integer programming problems	Problems using backward computational procedure	Practice problems on PERT	Group replacement policy -Procedure
S-12	SLO-1	Difference between Simplex method and Revised simplex method	Mixed Integer programming problems	Deterministic Dynamic programming - Introduction	Introduction - Decision Theory	Group replacement policy -Problems
	SLO-2	Procedure of Revised simplex Method	I.P.P – Applications and importance	Deterministic Dynamic programming - Problems	Formula & Concepts - Decision Theory	Calculation of replacement period
S-13	SLO-1	Revised Simplex algorithm (maximization case – procedure	Introduction - Gomory's cutting plane algorithm.	Probabilistic Dynamic programming - Introduction	Decision-making under certainty	Calculation of optimum period
	SLO-2	Problems on Revised simplex method	I.P.P using Gomory's cutting plane algorithm.	Probabilistic Dynamic programming - Problems	Decision-making under uncertainty	Replacement of items that fail completely
S-14, S-15	SLO-1	Practical - Revised simplex method	Practical - Integer programming problems	Practical - Deterministic Dynamic programming problem, Probabilistic Dynamic programming Problem	Practical - Decision-making under certainty and uncertainty	Practical - Group replacement policy
	SLO-2					

Learning Resources	Text Books: Sundaresan, V, Ganapathy Subramanian, K.S. and Ganesan, K (2011), Resource Management Techniques, A.R. Publications-Nagapattinam.	References: - Taha, Hamdy A. Operations research: an introduction. Pearson Education India, 2013. - C.R. Kothari – Quantitative Techniques, Vikas Publishing House, 1986
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Learning Assessment											
Bloom's Level of Thinking		Continous Learning Assessment(50% Weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4# (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasantha, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1.Ms. MADHUMITHA J, SRMIST
		2.Dr. S. Lakshmi Priya, SRMIST

Course Code	UST23D08J	Course Name	Statistical Quality Management and Reliability Theory	Course Category	D	Discipline Specific Elective Course	L 3	T 0	P 2	O 2	C 4
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Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):		The purpose of learning this course is to:			Learning			Program Learning Outcomes (PLO)																	
CLR-1 :	Apply the various sampling inspections in real life situations				1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
CLR-2 :	Study and Analyze the continuous sampling plan				Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning			
CLR-3 :	Understand the continuous sampling plan techniques																								
CLR-4 :	Application of life time distributions																								
CLR-5 :	To enhance the knowledge of statistical applications in industries																								
Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:																							
CLO-1 :	To draw and obtaining results of various modified control charts				3	85	80	M	H	M	M	M	L	M	H	M	H	L	M	M	M	L			
CLO-2 :	To study the Cusum, V-mask and moving average control charts				3	80	75	M	H	M	M	M	H	M	M	M	H	L	M	M	M	M			
CLO-3 :	Understanding the concepts of acceptance sampling plans and their functions.				3	85	80	M	H	H	M	M	M	M	M	L	H	L	M	M	M	M			
CLO-4 :	Understand the various concepts of reliability and their applications.				3	85	80	M	H	M	L	L	L	M	H	M	H	L	M	L	L	L			
CLO-5 :	To know the structure of various systems				3	85	80	M	H	M	L	L	M	M	H	L	H	L	M	L	L	M			

Duration (hour)		Learning Unit / Module 1 15	Learning Unit / Module 2 15	Learning Unit / Module 3 15	Learning Unit / Module 4 15	Learning Unit / Module 5 15
S-1	SLO-1	Principles and construction of modified control charts	Multiple sample plans – concepts	Process capability – definition	Definition of time, event - concepts	Component and system – concepts
	SLO-2	construction of modified control charts – s chart	Properties of multiple sample plan	Limits of process capability	life distributions - concepts	Configuration of systems
S-2	SLO-1	Selecting subgroups	Example for multiple sample plan	Process capability indices Cp and Cpk – definition	Reliability function – definition	Example for component
	SLO-2	Variability in subgroups	Example for multiple sample plan	Formula – Cp and Cpk	Properties of reliability function	Example for systems and their configuration
S-3	SLO-1	Limits of s charts	Dodge – roming sampling plan	Estimation of Cp	Quantiles – cocepts	Structure function
	SLO-2	Example for s chart	Procedure – Dodge-roming plan	Estimation of Cpk	Uses of quantiles in life distributions	Series configuration – definition Formula for iid components
S 4-S-5	SLO-1	Problems on s control chart	Problems on multiple sampling plan	Problems on Cp and Cpk	Problems on quantiles	Problems on series system
	SLO-2	Problems on s control chart	Problems on multiple sampling plan	Problems on Cp and Cpk	Problems on quantiles	Problems on series system

Duration (hour)		Learning Unit / Module 1 15	Learning Unit / Module 2 15	Learning Unit / Module 3 15	Learning Unit / Module 4 15	Learning Unit / Module 5 15
S-6	SLO-1	CUSUM control chart - definition	Military standard 105E - definition	Confidence interval based on normal distributed samples	Hazard rate – definition, formula	parallel configuration – definition Formula for iid components
	SLO-2	Cumulative sum $C(k)$ - formula	Procedure - Military standard 105E	Confidence interval based on normal distributed data - procedure	Cumulative Hazard function – definition, formula	Example for parallel configuration
S-7	SLO-1	CUSUM control chart – V-masks	Properties of above two methods	Hypothesis testing on normal distributed data, Effect of measurement on capability indices	Relationship between reliability function and hazard rate	k-out of -n structure – definition
	SLO-2	Algebraic version of $C(K)$	Properties of above two methods	Hypothesis testing on normal distributed data - procedure	Example for relationship	Formula for k-out of-n
S-8	SLO-1	Procedure for CUSUM control chart	Continuous sampling plan – definition	Example – confidence interval	Residual life time – definition	Example for k-out of- n
	SLO-2	Procedure for CUSUM control chart	Properties for continuous sampling plan	Example on testing of hypothesis	Formula for residual life time	Series – parallel system and parallel series system– terminology
S-9-S-10	SLO-1	Problems on CUSUM chart	Problems on Military standard	Problems on confidence interval	Problems on reliability	Problems on series, parallel, k-out of-n system
	SLO-2	Problems on CUSUM chart	Problems on continuous sampling plan	Testing of hypothesis - problems	Problems on mean residual life	Problems on series-parallel and parallel series system
S - 11	SLO-1	Average length for CUSUM charts table	Bulk and chain sampling plan	Example for confidence interval	Standard lifetime distributions – parameters, IFR and DFR distributions	Reliability of coherent system – definition
	SLO-2	Average length for CUSUM charts table	Procedure for Bulk and chain sampling plan	Example for testing of hypothesis	Exponential and its reliability characteristics	Characteristics of coherent systems
S-12	SLO-1	Multivariate statistical technique- Hotelling's T square method	Bayesian sampling plan - procedure	Gauge capability – basic concepts	Gamma and its reliability characteristics	Cuts and path – definition, terminology
	SLO-2	Procedure for Hotelling's T square method	Example for Bayesian sampling plan	Properties of Gauge capability	Weibull and its reliability characteristics	Cuts and path – definition, terminology
S-13	SLO-1	Principal component Analysis	Role of statistical techniques in quality management	Precision to tolerance ratio	Normal and its reliability characteristics	Modular decomposition – concepts
	SLO-2	Principal component Analysis - procedure	Role of statistical techniques in quality management	Signal to noise ratio	Estimation of parameters	Procedure for decomposition of components of a system
S-14-S-15	SLO-1	Problems on multivariate techniques	Problems on bulk and chain sampling	Problems on gauge capability	Problems based on standard distributions	Problems on coherent system
	SLO-2	Problems on multivariate techniques	Problems on Bayesian sampling plan	Problems on gauge capability	Problems based on standard distributions	Problems on coherent system

Learning Resources	Text Books:		References:	
	1. Douglas C. Montgomery (2005): Introduction to Statistical Quality Control, Sixth edition, John Wiley & Sons, New York 2. Duncan A.J (1959). Quality control and Industrial Management by Duncan A.J. (Richard D.Irwin Inc.USA)		1. Bain, L.J and Englehard, M. (1991). Statistical Analysis of Reliability and Life Testing Models, Marcel Dekker. 2. Sinha, S.K. (1979), Reliability and Life-Testing, Wiley Eastern, New Delhi.	

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasantha, ICMR, Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani, SRMIST

Course Code	UST23D09T	Course Name	BASIC ECONOMETRICS	Course Category	D	Discipline Specific Elective Course	L	T	P	O	C
							4	0	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Statistical Table and Graph sheet		

Course Learning Rationale (CLR):		The purpose of learning this course is to:		
CLR-1 :	To understand the basics econometrics and the knowledge of regression models			
CLR-2 :	To learn the estimation of regression parameters			
CLR-3 :	To knowledge about the concepts of multicollinearity			
CLR-4 :	To acquire the knowledge of fitting of discrete distribution			
CLR-5 :	To understand the concepts of functional forms and simultaneous equations			
Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:		
CLO-1 :	To acquire the knowledge of regression models			
CLO-2 :	To acquire the skills of parameters estimation of regression models			
CLO-3 :	To understand the nature of multicollinearity			
CLO-4 :	To gain the knowledge of ANOVA and ANCOVA in regression models			
CLO-5 :	To understand the inconsistency in regression models			

Learning		
1	2	3
Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
3	85	80
3	80	75
3	85	80
3	85	80
3	85	80

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
H	H	M	H	M	M	L	M	M	M	L	L	M	M	M
H	H	M	M	H	M	M	M	L	L	L	M	M	L	L
H	M	H	M	H	L	L	M	L	M	L	L	M	L	M
H	H	H	M	M	L	M	M	M	M	L	M	M	M	M
H	M	H	H	M	M	M	M	M	L	L	M	M	M	L

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		12	12	12	12	12
S-1	SLO-1	Definition, scope, objectives econometrics	Basic ideas to estimate the PRF on the basis of the SRF	Multi-collinearity – nature, introduction	Functional forms - concepts	Simultaneous equations – nature, definition
	SLO-2	uses of econometrics	Methods of estimation: Ordinary Least Square (OLS)	Multi-collinearity – assumptions	R square for regression through origin	Simultaneous equations –examples
S-2	SLO-1	Nature of regression model-terminology and notation, interpretation of regression model	OLS assumptions, derivation of OLS estimators - simple linear regression	OLS estimation	R square for regression- problems	Simultaneous equations bias
	SLO-2	Relationships between statistical and deterministic variables. Regression versus causation	OLS assumptions, derivation of OLS estimators - simple linear regression	OLS estimation in the presence of multicollinearity	Double log model-Measurement of elasticity-semi-log linear model	inconsistency of OLS estimators procedure
S-3	SLO-1	Relationship between regression and correlation	OLS assumptions, derivation of OLS estimators - simple linear regression	OLS estimation in the presence of multicollinearity- examples	Measure of growth rate – log-linear model	inconsistency of OLS estimators model

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		12	12	12	12	12
	SLO-2	Types of data – sources of data, accuracy of data. Measurement scales of variables-ratio, interval, ordinal and nominal scale	Dérivation of variance and standard error of OLS estimators	Violation of assumptions and consequences - examples	Measure of growth rate - log-linear model	Identification problems – notations and definitions
S- 4	SLO-1	Basics of two variable regression analysis - examples	Dérivation of variance and standard error of OLS estimators	Detection of multicollinearity – using high R ² value	Dummy variables - nature	Structural equation and its parameters – reduced form
	SLO-2	Basics of two variable regression analysis - examples	Dérivation of variance and standard error of OLS estimators	Detection of multicollinearity – using high R ² value	Dummy variables – scope, advantages and limitations	Structural equation and its parameters – reduced form
S-5	SLO-1	Conditional expectation function (CEF) - concepts	Application - Gauss – Markov theorem	Detection of multicollinearity – problems	Dummy variables – scope, advantages and limitations	Identification problem – just or exact identification
	SLO-2	Conditional expectation function (CEF) - concepts	Application - Gauss – Markov theorem	Detection of multicollinearity – problems	ANOVA models – caution in the use of dummy variables and interaction	Identification problem – just or exact identification
S-6	SLO-1	Examples on CEF	Three variable model estimation – concepts only	Heteroscedasticity - nature	ANOVA models with two quantitative variables	Over identification – rules for identification
	SLO-2	Examples on CEF	Three variable model estimation – concepts only	OLS estimation in the presence of Heteroscedasticity	ANCOVA models-dummy variables and its interaction effects	Over identification – rules for identification
S-7	SLO-1	Population regression line (PRL) – concepts	Hypothesis testing -t- test – single sample	Consequences of Heteroscedasticity	Piecewise linear regression	Order condition of identifiability – examples
	SLO-2	linearity in the variables and parameters	Hypothesis testing -t- test – single sample	Consequences of Heteroscedasticity	Auto regressive and distributed lag model – time or lag in economics	Order condition of identifiability – examples
S-8	SLO-1	Linear PRF - examples	Paired t – test using regression coefficients	Consequences of Heteroscedasticity	Reasons for lags	Rank condition of identifiability – examples
	SLO-2	Linear PRF - examples	Paired t – test using regression coefficients	Consequences of Heteroscedasticity	Reasons for lags- examples	Rank condition of identifiability – examples
S-9	SLO-1	In empirical data the influence of uncertainty	Paired t – test- procedure	Detection of Consequences of Heteroscedasticity – graphical methods	Ad HOC estimation of distributed lag models - concepts	Rank condition of identifiability – examples
	SLO-2	Stochastic specification of PRF	Paired t – test- problems	Detection of Consequences of Heteroscedasticity – graphical methods	Ad HOC estimation of distributed lag models - formulation	Rank condition of identifiability – examples
S-10	SLO-1	significance of stochastic disturbance term U	Hypothesis testing -F- test- procedure	Remedial Measure suing weighted least squares	Ad HOC estimation of distributed lag models – procedure	Estimation of a just identified equation – indirect least square – model
	SLO-2	Simple examples on PRF	Hypothesis testing -F- test- problems	Auto correlation - nature	Ad HOC estimation of distributed lag models - problems	Estimation of a just identified equation – indirect least square – model simple problems
S-11	SLO-1	examples on PRF	Goodness of fit – R ² - definition, formula	OLS estimation in the presence of autocorrelation	Koyck approach – mean lag - definition	indirect least square – model simple problems
	SLO-2	Sample Regression Function (SRF) – model definition	Goodness of fit – R ² procedure	Consequences of autocorrelation	Koyck approach – mean lag - procedure	Properties of indirect least square estimators
S-12	SLO-1	Uses of stochastic SRF to estimate PRF	Goodness of fit – R ² problems	Detection of autocorrelation – graphical method	Koyck approach – mean lag - problem	Estimation of an over identified equation – two stage least square - model
	SLO-2	Examples of SRF to PRF	Goodness of fit – R ² examples	Remedial measures - OLS	Koyck approach – mean lag -examples	Estimation of an over identified equation – two stage least square – model simple problems

Learning Resources	Text Books:	References:
	1. Saluja,M.R(1972): Indian official statistical systems: Statistical publishing society, Calcutta and The Indian Econometric Society, Hyderabad (check). 2. Goon, A.M. Gupta, M.K., and Das Gupta, B. (1980): Fundamentals of statistics , Vol.II, 6th revised ed. World Press limited, Calcutta.	

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA_1 (10%)		CLA_2 (10%)		CLA_3 (20%)		CLA_4 (10%)		Theory	Practice
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice		
Level 1	Remember	40%	-	40%	-	40%	-	40%	-	40%	-
	Understand										
Level 2	Apply	30%	-	30%	-	30%	-	30%	-	30%	-
	Analyze										
Level 3	Evaluate	30%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Academic	Internal Experts
Dr. M.Vasanth, ICMR,Chennai	Dr. V. Prakash, Dr. Ambedkar Government Arts college, Chennai	1. Dr. A. Venmani, SRMIST
		2. M.Kalaivani,SRMIST

Course Code	UST23D10T	Course Name	Bayesian Inference	Course Category	D	Discipline Specific Elective Course	L	T	P	O	C
							4	0	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):		The purpose of learning this course is to:		
CLR-1 :	To know Bayesian approach to solve statistical decision problems			
CLR-2 :	To acquire the knowledge of beliefs of data			
CLR-3 :	To know Basic principle of Bayesian estimation			
CLR-4 :	To gain the approximation procedure in Bayesian			
CLR-5 :	To use Bayesian techniques for computation			

Learning		
1	2	3
Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
H	M	M	M	H	H	M	M	M	M	L	M	M	L	M
H	H	M	M	M	M	M	M	H	M	L	M	M	L	M
H	H	M	M	M	H	L	M	M	M	L	M	M	M	L
H	M	M	M	H	M	M	L	L	L	L	H	M	M	M
H	H	M	L	H	M	M	L	M	M	L	M	M	M	M

Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:		
CLO-1 :	Distinguish between frequentist and Bayesian approach.			
CLO-2 :	Employ prior information for analyse of real life data.			
CLO-3 :	select appropriate prior distributions.			
CLO-4 :	Compute Bayes estimates for the population parameters			
CLO-5 :	Apply Bayesian theory in testing of hypothesis problems			

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		12	12	12	12	12
S-1	SLO-1	Decision model - introduction	Prior distribution	Prior distribution - introduction	Point estimation – Bayesian	Bayesian Approximation techniques – introduction
	SLO-2	Basic elements of descicion problem	Selection of prior distribution	Types of prior function	Concept of loss functions	Various techniques of posterior models
S-2	SLO-1	Decision rule– conditional probability	Prior probability P(w)	Non-informative prior– definition	Symmetric loss function	Normal approximation method – terminology
	SLO-2	Bayes rule	Likelihood function - terminology	Properties	Posterior expected loss function using symmetric loss function	Theorem for normal approximation - statment
S-3	SLO-1	Evidence P(X) definition	Expression of Likelihood function – discrete distribution	Examples for improper prior	Example Bayesian estimation using symmetric loss function	Theorem for normal approximation - PROOF
	SLO-2	Prior probability P(w)	Example for Likelihood function – Binomial, Poisson distribution	Improper priors – concepts	Example Bayesian estimation using symmetric loss function	Procedure for Estimation of parameters using normal approximtion
S-4	SLO-1	Likelihood function	Example for Likelihood function – Geometric distribution	Examples for improper prior	Bayes credible intervals – terminology	Taylor series expansion of posterior distribution

Duration (hour)	Learning Unit / Module 1		Learning Unit / Module 2		Learning Unit / Module 3		Learning Unit / Module 4		Learning Unit / Module 5	
	12		12		12		12		12	
	SLO-2	Posterior probability -	Example for Likelihood function – Multinomial distribution		Jeffrey's prior - definition		Highest posterior density region 95% and 99%		Converting Taylor series to normal distribution	
S-5	SLO-1	Loss function	Example for Likelihood function – multinomial distribution		Formula for Jeffrey's prior using Fisher information		Example for credible intervals		Tierney-Kadane approximation – concepts	
	SLO-2	Expected loss for a decision – notation and overall risk	Expression of Likelihood function - continuous distribution		Theorem Jeffrey's prior is transformation invariant – statement		Example for credible intervals		Procedure for T-K approximation	
S-6	SLO-1	Classical estimation approach - concepts	Example for Likelihood function - exponential and gamma distribution		example		Hypothesis testing – concepts		Example f for T-K approximation	
	SLO-2	Bayesian estimation - approach	Example for Likelihood function - normal distribution		Importance of non-informative priors		Specify loss function under different hypothesis		Example f for T-K approximation	
S-7	SLO-1	Maximum likelihood estimation	Subjective inference - introduction		Conjugate prior - concepts		Find optimal decision		Monte Carlo (MC) method - introduction	
	SLO-2	Maximum likelihood estimation	Need of subjective inference		Posterior distribution with conjugate prior		Compare expected losses given evidence $X=x$		How Monte Carlo works?	
S-8	SLO-1	Moments	Posterior distribution - introduction		Conjugate prior for continuous Exponential family models		Fixing the hypothesis		MC to estimate Posterior distribution	
	SLO-2	example	Features of posterior distribution		Conjugate prior Example – gamma distribution		Example – quality control problem		MC integration and Bayesian statistics – concept	
S-9	SLO-1	Random variable from subjectivist approach	Fundamental identity of Bayes inference		Sampling distribution with conjugate prior and posterior		Procedure for testing of hypothesis – parametric form		Direct MC estimation for posterior expected value	
	SLO-2	Example	Posterior distribution formula		Posterior distribution for discrete exponential family distributions		Procedure for testing of hypothesis – parametric form		Simulation procedure for MC estimation for posterior expected value	
S-10	SLO-1	Comparison between classical approach Vs subjective approach	Posterior distribution for discrete random variable		Sufficient statistics for construction of conjugate prior – discrete distribution		Compare testing of hypothesis with classical procedures		MC estimation for posterior expected value	
	SLO-2	Confidence interval	Posterior distribution for discrete random variable		Sufficient statistics for construction of conjugate prior – continuous distribution		Compare testing of hypothesis with classical procedures		Example MC estimator – normal distribution	
S-11	SLO-1	Credible interval	Determination of prior distribution		Admissible rule on posterior density		Predictive inference – one sample procedure		Accept-Reject method – Posterior predictive check	
	SLO-2	Confidence interval Vs credible interval	Rules for selecting prior distribution		Minimax rule on posterior density		Example for one sample		Implementing Accept-Reject method	
S-12	SLO-1	Advantages of Bayesian inference	Rules for selecting prior distribution		Limitations of non - informative prior		Predictive inference – two sample procedure		Introduction of Markov chain Monte Carlo (MCMC) technique	
	SLO-2	Advantages of Bayesian inference	Limitations of informative prior		Limitations of informative prior		Example for two sample		Application of MCMC	

Learning Resources	Text Books:				References:			
	1. Leonard, T. and Hsu, J.S.J.: Bayesian Methods, Cambridge University Press. 2. Bernardo, J.M. and Smith, A.F.M.: Bayesian Theory, John Wiley and Sons				1. Geman, D.: Markov Chain Monte Carlo: Stochastic Simulation for Bayesian Inference, Chapman Hall. 2. Box, G.P. and Tiao, G. C.: Bayesian Inference in Statistical Analysis, Addison-Wesley.			

	Learning Assessment										
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	-	30%	-	30%	-	30%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	30%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
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		2. M.Kalaivani, SRMIST

Course Code	UST23G07T	Course Name	Biostatistics	Course Category	G	Generic Elective Course	L 4	T 0	P 0	O 2	C 4
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Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards			

Course Learning Rationale (CLR):		The purpose of learning this course is to:			Learning			Program Learning Outcomes (PLO)																
CLR-1 :	To know the concept of Biostatistics				Level of Thinking (Bloom)	1	2	3	Fundamental Knowledge	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	To apply the different methods in clinical trials																							
CLR-3 :	To understand the categorical data analysis																							
CLR-4 :	To apply the method in different case studies																							
CLR-5 :	To estimate the ANOVA measures																							
Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:			Expected Proficiency (%)	85	80	Expected Attainment (%)	Application of Concepts	H	H	M	L	M	M	L	L	H	M	L	M	L	M	L
CLO-1 :	They can do further studies in Biostatistics																							
CLO-2 :	Clinical trials can be performed by them																							
CLO-3 :	They can apply in analysis of data																							
CLO-4 :	They will have a knowledge to use different estimation models																							
CLO-5 :	Can apply the appropriate study design in various trails				85	80	Life Long Learning																	

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		12	12	12	12	12
S-1	SLO-1	Biostatistics- Introduction, Definition	Biological Assays: Introduction	Categorical Data Analysis	ROC Curve analysis	ANOVA introduction, definition
	SLO-2	Introduction to clinical trial	parallel-line assay	Categorical response data –definition, types	Estimation of Binomial Model – statement, discussion	ANOVA types , models
S-2	SLO-1	phases I	slope- ratio assays	Categorical response data- sums	Estimation of Binomial Model - procedure	Repeated Measures ANOVA
	SLO-2	phases II	quantile- response assay	Categorical response data- examples	Estimation of Binomial Model proof	One way ANOVA analysis
S-3	SLO-1	phases III	Feller's theorem- statement	logistic regression-odds ratio	Area under the Curve	One way ANOVA procedure
	SLO-2	phases IV	Feller's theorem- proof	logistic regression-odds ratio applications	Area under the Curve proof	One way ANOVA calculation
S-4	SLO-1	Statistical designs	Dose-response relationships	logistic regression-odds ratio examples	Area under the Curve example	One way ANOVA sums
	SLO-2	statistical inference - explanation	Qualitative response	logistic regression-odds ratio sums	Area under the Curve applications	One way ANOVA sums

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		12	12	12	12	12
S-5	SLO-1	fixed sample trials	quantitative response	Wald's statistic	Properties of ROC curve	Two way ANOVA analysis
	SLO-2	Simple randomized design	dose response relation	Wald's Statistic application	Kullback –Leibler Divergence definition	Two way ANOVA procedure
S -6	SLO-1	stratified randomized crossover design	estimation of median effective dose	Wald's Statistic examples	Kullback –Leibler Divergence proof	Two way ANOVA calculation
	SLO-2	Sequential design	estimation of median effective dose-proof	logistic regression model	functional relationship between Kullback –Leibler Divergence and the slope of the ROC curve	Two way ANOVA sums
S-7	SLO-1	open sequential design	estimation of median effective dose-problems	logistic regression applications	functional relationship between Kullback –Leibler Divergence and the slope of the ROC curve applications	Two way ANOVA sums
	SLO-2	close sequential design	PK-PD Analysis	logistic regression examples	functional relationship between Kullback –Leibler Divergence and the slope of the ROC curve examples	Measures of disease frequency
S-8	SLO-1	Randomization	Pharmacokinetic analysis with drug discrimination	logistic regression and its diagnostics	KLD expressions	incidence
	SLO-2	Dynamic randomization	Pharmacodynamic analysis with drug discrimination	logistic regression and its diagnostics examples	KLD expressions for Bi-normal ROC model	prevalence
S -9	SLO-1	Permuted block randomization	PK-PD efficacy relationship	Poisson regression model	KLD expressions for Bi-normal ROC model proof	relative risk
	SLO-2	Blinding	Planned and executed study of PK-PD	Poisson regression applications	KLD expressions for Bi-normal ROC model derivations	Epidemiological study designs
S- 10	SLO-1	Single Blinding	pharmacometrics	Poisson regression examples	KLD expressions for Bi-normal ROC model examples	Cohort study design
	SLO-2	Double Blinding	Applications of PK analysis	Poisson regression diagnostics	Problems on Bi-normal ROC model	Analysis Cohort study design
S-11	SLO-1	Triple Blinding	Applications of PD analysis	Poisson regression diagnostics examples	ROC Curve analysis examples	Case control study design
	SLO-2	Applications of Blinding	Examples	Relative risk	ROC Curve analysis	Analysis Case control study design
S -12	SLO-1	Examples on Blinding	Experimental Studies	Estimation of relative risk	ROC Curve analysis derivation	concept of bias
	SLO-2	sums	Odds - Odds Ratio	Estimation of relative risk applications	ROC Curve analysis sums	information bias and selection bias

Learning Resources	Text Books:		References:	
	1. Elisa T.Lee & John Wenyu Wang (2003): Statistical methods for Survival Data analysis,		1. Hosmer and Lemeshow (2000): "Applied Logistic Regression", 2/e, Wiley Series	
	2. 3rd Edition, John Wiley		2. Alan Agresti (2002): Categorical Data analysis, 2/e, John Wiley	
	3. Jerrold H. Zar (1999): Biostatistical Analysis, 4th edition. Pearson			

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA_1 (10%)		CLA_2 (10%)		CLA_3 (20%)		CLA_4 (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40%	-	40%	-	40%	-	40%	-	40%	-
	Understand										
Level 2	Apply	30%	-	30%	-	30%	-	30%	-	30%	-
	Analyze										
Level 3	Evaluate	30%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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The logo of SRM Institute of Science and Technology is a circular emblem. It features a tree in the center, with the text "SRM INSTITUTE OF SCIENCE AND TECHNOLOGY" around the top and "LEARN · LEAP · LEAD" on a banner at the bottom. The entire logo is rendered in a light blue and yellow color scheme.

Additional Credit Courses

SEMESTER – II

Course Code	UCD23P01L	Course Name	Internship Report – I	Course Category	IAPC	Internship/Apprenticeship / Project/ Community Outreach	L	T	P	O	C
							0	0	8	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards			Nil

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)
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CLR-1 :	Demonstrate the skills learnt in the real-life environment.
CLR-2 :	Explore the different industries that are using Statistical tools and techniques
CLR-3 :	Enhance the skills in the analytical aspects
CLR-4 :	Understanding the professional connections with the knowledge learnt
CLR-5 :	Applying the skills in problem solving

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	To get an inside view of an industry and organization/company	3	80	70
CLO-2 :	To gain valuable skills and knowledge of statistical data analysis	3	85	75
CLO-3 :	To make professional connections and enhance networking	3	75	70
CLO-4 :	To get experience in a field to allow the student to make a career transition	3	85	80
CLO-5 :	To gain the value of data-driven decision making	3	85	75

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
L	H	M	H	L	M	L	L	L	L	L	H	M	L	L
M	H	H	M	L	M	L	L	M	L	L	H	M	L	L
M	H	M	H	L	M	M	L	M	L	M	H	M	L	L
M	H	M	H	L	M	M	L	M	L	M	H	M	L	L
H	H	M	H	L	M	M	M	M	L	M	M	M	L	L

Students can choose a company of their own interest for internship for a period of minimum TEN weeks (Part-time) to learn about the application of their related field in real life environment. All students have to give a presentation about their observations made by them in internship as per the schedule given. At the end of the internship period, every student shall submit a structured internship report within 15 days from the date of the completion of the internship period.

Learning Assessment				
Internship	Continuous Learning Assessment (50% weightage)		Final Evaluation (50% weightage)	
	Review – 1	Review – 2	Project Report	Viva-Voce
	20%	30 %	30 %	20 %

Course Code	UCD23P02L	Course Name	Project Work – I	Course Category	IAPC	Internship/Apprenticeship / Project/ Community Outreach	L	T	P	O	C
							0	0	8	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards			Nil

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)
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CLR-1 :	Demonstrate skills learnt in the real-life environment.	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Explore the different industries that are using Statistical tools and techniques	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLR-3 :	Enhance the skills in the analytical aspects				L	H	M	H	L	M	L	L	L	L	L	H	M	L	L
CLR-4 :	Understanding the professional connections with the knowledge learnt				M	H	H	M	L	M	L	L	M	L	L	H	M	L	L
CLR-5 :	Applying the skills in problem solving				M	H	M	H	L	M	M	L	M	L	M	H	M	L	L
					M	H	M	H	L	M	M	L	M	L	M	H	M	L	L
					H	H	M	H	L	M	M	M	M	L	M	M	M	L	L

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	To provide data collection experience	3	80	70
CLO-2 :	To gain knowledge of selecting variables of interest	3	85	75
CLO-3 :	To handle the realistic statistical data analysis	3	75	70
CLO-4 :	To get experience in a field to allow the student to make a decision	3	85	80
CLO-5 :	To get an inside view of an industrial/social field work	3	85	75

Students can choose problems/case studies that interest them to analyze using the statistical tools and techniques. There will be two reviews conducted during the project period for all the students. At the end of the project, every student shall submit a structured project report and will take a Viva Voce examination.

Learning Assessment				
Project	Continuous Learning Assessment (50% weightage)		Final Evaluation (50% weightage)	
	Review – 1	Review – 2	Project Report	Viva-Voce
	20%	30 %	30 %	20 %

Course Code	UCD23P03L	Course Name	Apprenticeship – I	Course Category	IAPC	Internship/Apprenticeship / Project/ Community Outreach	L	T	P	O	C
							0	0	8	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards			Nil

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)
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CLR-1 :	Demonstrate skills learnt in the real-life environment.	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Explore the different industries that are using Statistical tools and techniques	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLR-3 :	Enhance the skills in the analytical aspects				L	H	M	H	L	M	L	L	L	L	L	H	M	L	L
CLR-4 :	Understanding the professional connections with the knowledge learnt				M	H	H	M	L	M	L	L	M	L	L	H	M	L	L
CLR-5 :	Applying the skills in problem solving				M	H	M	H	L	M	M	L	M	L	M	H	M	L	L
					M	H	M	H	L	M	M	L	M	L	M	H	M	L	L
					H	H	M	H	L	M	M	M	M	L	M	M	M	L	L
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1 :	To provide data collection experience	3	80	70															
CLO-2 :	To gain knowledge of selecting variables of interest	3	85	75															
CLO-3 :	To handle the realistic statistical data analysis	3	75	70															
CLO-4 :	To get experience in a field to allow the student to make a decision	3	85	80															
CLO-5 :	To get an inside view of an industrial/social field work	3	85	75															

Students can choose a company of their own interest for *Apprenticeship* for a period of minimum TEN weeks (Part-time) to learn about the application of their related field in real time environment. All students have to give a presentation about their observations made by them in internship as per the schedule given. At the end of the internship period, every student shall submit a structured internship report within 15 days from the date of the completion of the internship period.

Learning Assessment				
Apprenticeship	Continuous Learning Assessment (50% weightage)		Final Evaluation (50% weightage)	
	Review – 1	Review – 2	Project Report	Viva-Voce
	20%	30 %	30 %	20 %

SEMESTER - IV

Course Code	UCD23P04L	Course Name	Internship Report– II	Course Category	IAPC	Internship/Apprenticeship / Project/ Community Outreach	L	T	P	O	C
							0	0	8	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)
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CLR-1 :	Demonstrate skills learnt in the real - life environment.	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Explore the different industries that are using Statistical tools and techniques	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLR-3 :	Enhance the skills in the analytical aspects				L	H	M	H	L	M	L	L	L	L	L	H	M	L	L
CLR-4 :	Understanding the professional connections with the knowledge learnt				M	H	M	H	L	M	M	L	M	L	M	H	M	L	L
CLR-5 :	Applying the skills in problem solving				M	H	M	H	L	M	M	L	M	L	M	H	M	L	L
					H	H	M	H	L	M	M	M	M	L	M	M	M	L	L
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1 :	To get an inside view of an industry and organization/company	3	80	70															
CLO-2 :	To gain valuable skills and knowledge of statistical data analysis	3	85	75															
CLO-3 :	To make professional connections and enhance networking	3	75	70															
CLO-4 :	To get experience in a field to allow the student to make a career transition	3	85	80															
CLO-5 :	To gain the value of data-driven decision making	3	85	75															

Students can choose a company of their own interest for internship for a period of minimum TEN weeks (Part-time) to learn about the application of their related field in real time environment. All students have to give a presentation about their observations made by them in internship as per the schedule given. At the end of the internship period, every student shall submit a structured internship report within 15 days from the date of the completion of the internship period.

Learning Assessment				
Internship	Continuous Learning Assessment (50% weightage)		Final Evaluation (50% weightage)	
	Review – 1	Review – 2	Project Report	Viva-Voce
	20%	30 %	30 %	20 %

Course Code	UCD23P05L	Course Name	Project Work – II	Course Category	IAPC	Internship/Apprenticeship / Project/ Community Outreach	L	T	P	O	C
							0	0	8	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)
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CLR-1 :	Demonstrate skills learnt in the real life environment.
CLR-2 :	Explore the different industries that are using Statistical tools and techniques
CLR-3 :	Enhance the skills in the analytical aspects
CLR-4 :	Understanding the professional connections with the knowledge learnt
CLR-5 :	Applying the skills in problem solving

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	To provide data collection experience	3	80	70
CLO-2 :	To gain knowledge of selecting variables of interest	3	85	75
CLO-3 :	To handle the realistic statistical data analysis	3	75	70
CLO-4 :	To get experience in a field to allow the student to make a decision	3	85	80
CLO-5 :	To get an inside view of an industrial/social field work	3	85	75

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
L	H	M	H	L	M	L	L	L	L	L	H	M	L	L
M	H	H	M	L	M	L	L	M	L	L	H	M	L	L
M	H	M	H	L	M	M	L	M	L	M	H	M	L	L
M	H	M	H	L	M	M	L	M	L	M	H	M	L	L
H	H	M	H	L	M	M	M	M	L	M	M	M	L	L

Students can choose problems of their own interest to develop software package using the programming languages/tools available. There will be two reviews conducted during the project period for all the students .At the end of the project, every student shall submit a structured project report and will take a Viva Voce examination.

Learning Assessment				
Project	Continuous Learning Assessment (50% weightage)			Final Evaluation (50% weightage)
	Review – 1	Review – 2		Project Report
	20%	30 %		Viva-Voce
				30 %
				20 %

Course Code	UCD23P06L	Course Name	Apprenticeship – II	Course Category	IAPC	Internship/Apprenticeship / Project/ Community Outreach	L	T	P	O	C
							0	0	8	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards			Nil

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)
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CLR-1 :	Demonstrate skills learnt in the real-life environment.
CLR-2 :	Explore the different industries that are using Statistical tools and techniques
CLR-3 :	Enhance the skills in the analytical aspects
CLR-4 :	Understanding the professional connections with the knowledge learnt
CLR-5 :	Applying the skills in problem solving

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	To provide data collection experience	3	80	70
CLO-2 :	To gain knowledge of selecting variables of interest	3	85	75
CLO-3 :	To handle the realistic statistical data analysis	3	75	70
CLO-4 :	To get experience in a field to allow the student to make a decision	3	85	80
CLO-5 :	To get an inside view of an industrial/social field work	3	85	75

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
L	H	M	H	L	M	L	L	L	L	L	H	M	L	L
M	H	H	M	L	M	L	L	M	L	L	H	M	L	L
M	H	M	H	L	M	M	L	M	L	M	H	M	L	L
M	H	M	H	L	M	M	L	M	L	M	H	M	L	L
H	H	M	H	L	M	M	M	M	L	M	M	M	L	L

Students can choose a company of their own interest for *Apprenticeship* for a period of minimum TEN weeks (Part-time) to learn about the application of their related field in real time environment. All students have to give a presentation about their observations made by them in internship as per the schedule given. At the end of the internship period, every student shall submit a structured internship report within 15 days from the date of the completion of the internship period.

Learning Assessment				
Apprenticeship	Continuous Learning Assessment (50% weightage)		Final Evaluation (50% weightage)	
	Review – 1	Review – 2	Project Report	Viva-Voce
	20%	30 %	30 %	20 %