Course Code	UMS20G03T	Course Name	STATISTICAL METHODS	Course Category	G	Generic Elective Course	L	T	P	C
							3	1	0	4

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*Mathematics and Statistics*	Data Book / Codes/Standards	*Graph sheet needed; t, F and χ^2 table is needed*		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*
CLR-1 :	*To provide foundations in Bio Statistics*
CLR-2 :	*To provide a strong foundations of organizing the data, diagrammatic and graphical presentation.*
CLR-3 :	*To apply Statistical techniques for biological problems.*
CLR-4 :	*To understand the characteristics of biological problems.*
CLR-5 :	*To provide the application of correlation and regression in biological sciences.*
CLR-6 :	*To analyze the sample data in order to estimate or predict characteristics of the larger population from which the sample is drawn.*

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	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
CLO-1 :	*To understand the statistical modeling and its limitations, and have skill in description, interpretation and exploratory analysis of data by graphical and other means;*	*3*	*85*	*80*	*L*	*L*	*L*	*M*	*L*	-	-	-	*L*	*M*	*H*	*M*	-	-	-
CLO-2 :	*To calculate and apply measures of central tendency - grouped and ungrouped data cases.*	*3*	*80*	*75*	*M*	*M*	*M*	*M*	*M*	-	-	-	*M*	*M*	*H*	*M*	-	-	-
CLO-3 :	*To understand and apply measures of dispersion - grouped and ungrouped data cases.*	*3*	*85*	*80*	*H*	*H*	*M*	*H*	*M*	-	-	-	*M*	*M*	*H*	*H*	-	-	-
CLO-4 :	*Find the relationship between two or more variables using correlation and regression.*	*3*	*85*	*80*	*M*	*H*	*M*	*H*	*M*	-	-	-	*M*	*M*	*H*	*H*	-	-	-
CLO-5 :	*Perform Test of Hypothesis for small sample. Learn non-parametric test such as the Chi-Square test for Independence and Goodness of Fit.*	*3*	*85*	*80*	*H*	*H*	*M*	*H*	*H*	-	-	-	*M*	*M*	*H*	*M*	-	-	-
CLO-6 :	*Perform the Analysis of Variance - One way Classifications.*	*3*	*75*	*80*	*H*	*H*	*M*	*H*	*M*	-	-	-	*M*	*M*	*H*	*M*	-	-	-

		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
Duration (hour)		12	12	12	12	12
S-1	SLO-1	*Nature and scope of statistical methods* Definition of statistics Numerical Data	*Measures of Central tendency* *i.* Definition *ii.* Functions of average *iii.* Characteristics of a typical average	*Measures of Dispersion,*	*Correlation Analysis:* *Correlation - Definition and uses* Types of correlation	*Testing of Hypotheses* *-Testing Procedures*
	SLO-2	Nature of statistics	Arithmetic mean Individual series	*Range –Individual, Discrete series and Continuous series*	Methods for Finding Correlation Coefficient, *Properties of correlation coefficient*	*Definition of test statistic t and its uses*
S-2	SLO-1	Importance of statistics	*Arithmetic mean* *Discrete series*	*Quartile Deviation - Individual and Discrete series*	*Karl Pearson's Correlation Co-efficient*	t-test Small Sample tests
	SLO-2	Functions of statistics	*Arithmetic mean*	*Quartile Deviation - Individual and*	*Karl Pearson's Correlation Co-*	Testing Procedure

			Continuous series	*Discrete series*	*efficient*	
S-3	SLO-1	*Limitations*	*Arithmetic mean* *Continuous series*	*Quartile Deviation - Continuous series*	Spearman's Rank Correlation Coefficient with non-repeated Ranks	t-test - Test for Single Mean
	SLO-2	Distrust of Statistics	*Arithmetic mean* *Cumulative series*	*Quartile Deviation - Continuous series*	Spearman's Rank Correlation Coefficient with non-repeated Ranks	t-test - Test for Single Mean
S 4	SLO-1	*Classification* *i)* Meanings *ii)* Objects iii) Rules of classification	*Arithmetic mean* *Meritsand Demerits*	*Mean Deviation about Mean – Individual Series*	Spearman's Rank Correlation Coefficient with repeated Ranks	t-test -Test for two Sample Means
	SLO-2	*Classification* *i.* Types of classification *ii.* Characteristics of good classification	*Median* *Individual series*	*Mean Deviation about Mean – Discrete series*	Spearman's Rank Correlation Coefficient with repeated Ranks	t-test -Test for two Sample Means
S-5	SLO-1	*Tabulation:* *i.* Parts of Tabulation *ii.* Rules of Tabulation	*Median* *Discrete series*	*Mean Deviation about Mean – Continuous series*	*Spearman's Rank Correlation Co-efficient*	t-test - t Test Statistic, when sample standard deviations are not known, but Population Standard Deviations are known
	SLO-2	Types of tables Objective of Tabulation	*Median* *Continuous series*	*Mean Deviation about Median – Individual series*	Problems on finding the best pair of judgements	t-test - t Test Statistic, when sample standard deviations are not known, but Population Standard Deviations are known
S-6	SLO-1	Components of Good Table Rules of construction of the table.	*Median* *Continuous series*	*Mean Deviation about Median – Discrete series*	Bivariate Distribution	*Chi-Square distribution* - Definition and its Uses
	SLO-2	Difference between classification and tabulation.	*Median* *Merits and Demerits*	*Mean Deviation about Median– Continuous series*	Bivariate Distribution	Chi-Square test - Testing Procedure
S -7	SLO-1	*Diagrammatic representation of various types of statistical data :* Bar Diagram	*Mode* *Individual series*	*Standard Deviation – Individual and Discrete Series*	Regression Analysis: Regression - Definition and Uses	Test based on Goodness of fit
	SLO-2	Types of Bar diagram	*Mode* *Discrete series*	*Standard Deviation – Individual and Discrete Series*	Regression Coefficients	Test based on Goodness of fit
S -8	SLO-1	One dimensional Diagrams	*Mode* *Continuous Series*	*Standard Deviation-Continuous Series*	Regression Equations	Testing the Independence of Attributes using *Chi-Square*
	SLO-2	Two dimensional Diagrams	*Mode* *Continuous Series*	*Standard Deviation-Continuous Series*	Types of Regression Equations	Testing the Independence of Attributes using *Chi-Square*
S-9	SLO-1	Pie chart	*Mode* *Continuous series*	*Coefficient of Variation*	Regression Equation of X on Y and Regression Equation of Y on X	F-test - Test Statistic of F-test

	SLO-2	Histogram	*Mode* *Meritsand Demerits*	*Coefficient of Variation*	Regression Equation of X on Y and Regression Equation of Y on X	Uses and testing Procedures
S-10	*SLO-1*	*Frequency Polygon*	Empirical Relation	*Graphical solution of Dispersion* *Lorenz curve*	Regression Equation of X on Y and Regression Equation of Y on X	*Testing the equality of variance using F distribution*
	SLO-2	Frequency Curve	Empirical Relation	*Graphical solution of Dispersion* *Lorenz curve*	Regression Equation of X on Y and Regression Equation of Y on X	*Testing the equality of variance using F distribution*
S-11	*SLO-1*	*Less than O gives*	*Graphical solution of Median*	*Skewness* *Bowley's coefficient of Skewness*	Relationship between Correlation and Regression Coefficients	Analysis of Variance – Definition and Uses
	SLO-2	*More than O gives*	*Graphical solution of Median*	*Skewness* *Bowley's coefficient of Skewness*	Problems on the Relationship between the Coefficients	Analysis of Variance – testing procedure
S-12	*SLO-1*	Lorenz Curve	*Graphical solution of Mode*	*Concept of Kurtosis*	Finding the corrected Correlation Coefficient values by correcting the wrongly entered inputs	ANOVA - One Way Classification
	SLO-2	Lorenz Curve	*Graphical solution of Mode*	*Concept of Kurtosis*	Finding the corrected Correlation Coefficient values by correcting the wrongly entered inputs	ANOVA - One Way Classification

Learning Resources	*Theory:* 1. Pillai, R.S.N, Bagavathi, V. (2009), Statistics, Theory and Practice, 7th Edition, S.Chand Ltd, New Delhi. 2. Gupta, S.P. (2012), Statistical Methods, 4th Edition, Sultan Chand & Sons, New Delhi. 3. Khan and Khanum, (2008), Fundamentals of Bio Statistics, 3rd Edition, Ukaaz Publications, Hyderabad. 4. Ken Black, (2013), Business Statistics for Contemporary Decision Making, 7th Edition, John Wiley Publications

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	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 Academic	**Internal Experts**
Dr.M.A.Baskar, Professor & Head, Dept. Of Mathematics, Loyola college, Chennai	S. Suruthi, Assistant Professor, Dept. Mathematics and Statistics, FSH, SRMIST

Dr.P.Dhanavanthan, Professor & Head, Dept. Of statistics, Pondicherry University	