Course Code	21MAB301T	Course Name	Probability and Statistics		Course Category	B	Basic Sciences	L	T	P	C
								3	1	0	4

Pre-requisite Courses	21MAB102T	Co-requisite Courses	Nil	Progressive Courses		Nil
Course Offering Department	Mathematics		Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR)	The purpose of learning this course is to:	Learning	Program Outcomes (PO)											
			1	2	3	4	5	6	7	8	9	10	11	12
CLR-1:	Apply the basic rules and theorems of probability theory and evaluate the expectation and variance using random variables.													
CLR-2:	Gain knowledge of theoretical distributions.													
CLR-3:	Understand how to develop Null and Alternate hypothesis and draw conclusions using hypothesis tests.													
CLR-4:	Apply the knowledge of regression lines and analysis of variance.													
CLR-5:	Acquire knowledge to solve the problems of process control.													
CLR-6:	Interpret random variables and statistics in engineering problems.													

Course Outcomes (CO):	At the end of this course, learners will be able to:	Blooms Level (1-6)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning
CO-1:	Implement the concepts of probability and random variables.	4	3	3	-	-	-	-	-	-	-	-	-	-
CO-2:	Identify the random variables and model them using various distributions.	4	3	3	-	-	-	-	-	-	-	-	-	-
CO-3:	Infer results by using hypothesis testing on large and small samples.	4	3	3	-	-	-	-	-	-	-	-	-	-
CO-4:	Examine the regression lines and interpret the results in the analysis of variance.	4	3	3	-	-	-	-	-	-	-	-	-	-
CO-5:	Utilize quality control techniques to solve real-world problems.	4	3	3	-	-	-	-	-	-	-	-	-	-
CO-6:	Apply the probability techniques and statistics in science and engineering.	4	3	3	-	-	-	-	-	-	-	-	-	-

Unit-1: Probability and One-dimensional random variable

Probability concepts, Types of Events, Axioms and theorems - Conditional probability, Baye's theorem – without proof- Applications of Baye's Theorem. Random variables – Discrete case and continuous case- Mathematical expectation, Variance –discrete case and continuous case - Raw Moments - Central Moments - Moment generating function - MGF- discrete and continuous random variable.

Unit-2: Theoretical Distributions

Discrete distributions – Introduction- Mean and Variance of Binomial Distribution- Fitting a Binomial distribution- M.G.F of Binomial Distribution- Poisson Distribution- Mean and Variance of Poisson Distribution- Fitting a Poisson distribution- MGF of Poisson distribution- Geometric distribution- mean and variance, Memoryless property- Continuous distributions – Introduction- Uniform distribution – MGF, Mean and Variance- Exponential distribution - MGF, Mean and Variance, Memoryless property- Normal distribution.

Unit-3: Testing of Hypothesis

Sampling Distributions – Type I and Type II errors- large sample test-Test of significance for single proportion- Test of significance for difference of proportions- Test of significance for single mean- Test of significance for difference of means- Small sample tests- Student's t- test for single mean- t- test for the difference of means- Fisher's F-test- Test of significance for two sample variances- Chi - square test- for the goodness of fit- Chi-square test- for the independence of attributes.

Unit-4: Correlation, Regression and ANOVA

Correlation and its Properties- Karl Pearson's coefficient of correlation- Spearman's rank correlation coefficient for repeated and non-repeated ranks- Linear Regression lines and Properties- Relation between correlation and regression coefficient- Introduction to Analysis of Variance (ANOVA) - One-way Classification – two-way classification.

Unit-5: Statistical Quality Control
Introduction – Process control – control charts for variables - $\bar{X}$ and R, $\bar{X}$ and S charts control charts for attributes: p-chart, np-chart, c-chart and their applications in process control.

Learning Resources	1. S. Ross, A First Course in Probability, 8th Ed., Pearson Education India, 2010. 2. Johnson. R.A., Miller &Freund's, Probability and Statistics for Engineers, 8th Edition, Prentice Hall India, 2011. 3. Veerarajan T., Probability and Statistics, Tata McGraw-Hill, New Delhi, 2010. 4. Devore (JL), Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage Learning, 2012. 5. S.C. Gupta, V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Sons, 11th Edition, 2015. 6. Vijay K. Rohatgi., A.K. Md. Ehsanes Saleh, An Introduction to Probability and Statistics, 2nd Edition, Wiley, 2008

Student learning shall be assessed with a weightage of 60% for internal assessment and 40% for end semester examination

	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) - By the Course Faculty				By The CoE	
		Formative CLA-1 Average of unit test (50%)		Life Long Learning CLA-2 (10%)		Summative Final Examination (40% weightage)	
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	-	20%	-	20%	-
Level 2	Understand	20%	-	20%	-	20%	-
Level 3	Apply	30%	-	30%	-	30%	-
Level 4	Analyze	30%	-	30%	-	30%	-
Level 5	Evaluate	-	-	-	-	-	-
Level 6	Create	-	-	-	-	-	-
Total		100 %		100 %		100 %	

Course Designers		
a) Experts from Industry	**b) Experts from Higher Technical Institutions**	**c) Internal Experts**
Mr. Madhan Shanmugasundaram, Infosys Technologies madshan@gmail.com	Prof. Y.V.S.S. Sanyasiraju, **IIT Madras** sryedida@iitm.ac.in	Dr. B.Vennila hod.maths.ktr@srmist.edu.in
	Prof. K.C. Sivakumar, IIT Madars kcskumar@iitm.ac.in	Dr.R.Varadharajan varadhar@srmist.edu.in

13/01/2023

(Course Co-ordinator)

Dr. R. VARADHAKAJAN

V. [signature] 13/01/2023