Course Code MAT3003	Probability, Statistics and Reliability	Course Type: LT
		Credits: 4
		Version: 1.1

Prerequisites	Basic knowledge of statistics

Course Objectives:
To provide the mathematical support by way of probabilistic models and statistical methodology to tackle problems encountered in Science and Engineering applications.

Course Outcomes:
CO1: Apply elementary theorems of probability for problem-solving. (KL1, KL2)
CO2: Use theoretical distributions for problem-solving. (KL2, KL3)
CO3: Compare marginal, conditional, and joint distribution functions for applications. (KL3)
CO4: Evaluate expectations, variances, covariances, and MGF of random variables for testing the hypothesis (KL4)
CO5: Formulate mathematical models using Excel or any other relevant mathematical tool for problem-solving (KL4).

Correlation of COs with Pos

CO/PO	CKL	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
PKL		3	5	6	5	6	3	3	3	NA	M	3	M			
CO1	2	3	2	1	2	1			3	0	2	0				
CO2	3	3	2	2	2	2			1	0	2	0				
CO3	3	3	2	2	2	2			1	0	2	0				
CO4	4	3	3	2	3	2			3	0	2	0				
CO5	4	3	3	2	3	2			3	0	2	0				

COs	Topics to be discussed	Lectures
CO1	**Probability Theory:** Introduction to probability concepts, Random experiments, Events, Conditional probability, Independent events, Theorem of Total Probability, Baye's theorem Sample space.	6
CO2	**Random variables (RV):** Introduction to Random variables (One-two dimension) - Discrete and Continuous RV - Probability function and Distribution function of RV, Expectation, Variance, and its properties, Moment Generating function upto second moments. **Special Distributions:** Bernoulli distribution, Binomial distribution, Poisson distributions, Uniform distribution and Normal distribution.	10
CO3	**Bivariate Random Variables** Joint density function, joint probability distribution, Marginal Probability Distribution, Conditional Probability Distribution, Covariance, Correlation Coefficient, Regression Analysis (partial and multiple correlation).	8

CO4	**Test of Significance** Testing of hypothesis – Introduction - Types of errors, critical region, procedure of testing hypothesis. Large sample tests - Z test for Single Proportion, Difference of Proportion, Single mean and difference of means. Small sample tests - Student's t-test, F-test - Chi-square test - Goodness of fit - Independence of Attributes.		9
CO5	**Design of Experiments** and **Reliability Engineering** Analysis of Variance (ANOVA): One-Way Classification, Two-Way Classification, Experimental Designs: Completely Randomized Design (CRD), Randomized Block Design (RBD), Reliability Engineering: Reliability Function, Hazard Function, Reliabilities of Series and Parallel Systems, System Reliability.		7
6	**Guest Lectures by experts on contemporary Lecture Topics**		2
	Total Lecture: **(1 Lecture = 1.5 Hrs.)**		**42**

Mode of Teaching and Learning:
Class room teaching
Use of mathematical/Statistical software (such as R, Python, Excel) as teaching aid.
Minimum of 2 lecture periods by experts on contemporary Lecture Topics.

Mode of Evaluation and assessment: Digital Assignments, Continuous Assessment Tests, Final Assessment Test and unannounced open book examinations, quizzes, student's portfolio generation and assessment, innovative assessment practices.

Text Books:
1. R.E.Walpole, R.H.Mayers, S.L.Mayers and K.Ye, Probability and Statistics for engineers and scientists, 9th Edition, Pearson Education, 2012.
2. Bilal M. Ayub and Richard H. McCuen, Probability, Statistics and Reliability for Engineers and Scientists, 3rd edition, CRC press, 2011.

Reference Books:
1. E.Balagurusamy, Reliability Engineering, Tata McGraw Hill, Tenth reprint 2010.
2. R.A.Johnson, Miller & Freund, Probability and Statistics for Engineers, 8th edition, Prentice Hall India, 2010.
3. Hogg, R.V., Tanis, E. and Zimmerman, D., Probability and Statistical Inference. 9th Edition, Pearson, Upper Saddle River, 2015.

Recommendation by the Board of Studies on	**22/04/2017, 19/6/2019, Revised on 15 March 2024**
Approval by Academic council on	**07/09/17/ 23.05.2024**
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Revised by	**Dr. Jyoti Badge &** **Dr. Sayed Mohammed Zeeshan**