

Faculty Name :			Academic Year: 2026-2027 (ODD SEMESTER)				
Department: Mathematics							
Course Code	Course Title	Core/ Elective	Prerequisite	Contact Hours			Total Hrs/ Sessions
				L	T	P	
1BMATCS301	Probability, Distributions and Statistics	Core	Differentiation, Integration, Partial Fraction, Differential Equation	3	2	-	-
Objectives	- Apply the knowledge of modular arithmetic to computer algorithms. - To introduce the concept of random variables, probability distributions, specific discrete and continuous distributions with practical application in Computer Science Engineering and social life situations. - To Provide the principles of statistical inferences and the basics of hypothesis testing with emphasis on some commonly encountered hypotheses. - To find the association between attributes and the correlation between two variables.						
Topics Covered as per Syllabus							
Module-1: Modular Arithmetic Introduction of modular arithmetic and its applications in Computer Science and Engineering. Introduction to Congruences, Linear Congruences, The Remainder theorem, Solving Polynomials, Linear Diophantine Equation, System of Linear Congruences, Euler's Theorem, Wilson Theorem and Fermat's little theorem. Applications of Congruences-RSA algorithm.							
Module-2: Statistics Principles of least squares, Curve fitting by the method of least squares in the form: $y=a+bx$, $y=a+bx+cx^2$, and $y=ax^b$. Correlation, Coefficient of correlation, Lines of regression, Angle between regression lines, rank correlation.							
Module-3: Probability Distributions Review of basic probability theory. Random variables (discrete and continuous), probability mass and density functions. Mathematical expectation: mean and variance. Binomial, Poisson and normal distributions- problems (derivations for mean and standard deviation for Binomial and Poisson distributions only).							
Module-4: Joint probability distribution Joint Probability distribution for two discrete random variables, expectation, covariance and correlation. Markov Chain: Introduction to Stochastic Process, Probability Vectors, Stochastic matrices, Regular stochastic matrices, Markov chains, Higher transition probabilities, Stationary distribution of Regular Markov chains.							

Module-5: Statistical Inference

Sampling distribution, standard error. Levels of significance. Testing of hypothesis. Test of significances. Confidence limits, simple sampling of attributes. Sampling variables, central limit theorem and confidences limit for unknown mean. Test of significance for large samples (mean, proportion). Comparison of large samples (mean, proportion). Test of Significance for means of two small samples, students-‘t’ distribution, and Chi-square distribution as a test of goodness of fit.

Title of the Book Name of the Author/s Name of the Publisher Edition and Year

Textbooks

1. Ronald E. Walpole, Raymond H Myers, Sharon L Myers & Keying Ye “Probability and Statistics for Engineers and Scientists”, Pearson Education, Ninth edition, 2012.
2. Murray R. Spiegel, Larry J. Stephens, Statistics, Schaum’s outline series, Third edition
3. Koshy, Thomas. Elementary number theory with applications. Academic press, 2nd Edition, 2009.
4. Seymour Lipschutz and Marc Lars Lipson, Probability, Schaum’s Outline Series, Second edition, 2011.

List of Reference Books

1. Erwin Kreyszig, “Advanced Engineering Mathematics”, John Wiley & Sons, 9th Edition, 2006.
2. B. S. Grewal “Higher Engineering Mathematics”, Khanna publishers, 44th Ed., 2021.
3. Irwin Miller & Marylees Miller, John E. Freund’s “Mathematical Statistics with Applications” Pearson. Dorling Kindersley Pvt. Ltd. India, 8th edition, 2014.
4. S C Gupta and V K Kapoor, “Fundamentals of Mathematical Statistics”, S Chand and Company, Latest edition.
5. P. G. Hoel, S. C. Port and C. J. Stone, “Introduction to Probability Theory”, Universal Book Stall, (Reprint), 2003.
6. S. Ross, “A First Course in Probability”, Pearson Education India, 6 th Ed., 2002.
7. David M Burton: “Elementary Number Theory” Mc Graw Hill, 7th Ed., 2017

List of URLs, Text Books, Notes, Multimedia Content, etc

- Probability and statistics: <https://nptel.ac.in/courses/111105090>
- Introduction to Probability and Statistics for Machine Learning: <https://www.classcentral.com/course/codesignal-introduction-to-probability-and-statistics-for-machine-learning-358081>
- Probability and Statistics: <https://www.classcentral.com/course/probability-statistics-11755>
- Introduction to probability, statistics, and random processes: <https://probabilitycourse.com/>
- Introduction to Probability and Statistics: <https://ocw.mit.edu/courses/18-05-introduction-to-probability-and-statistics-spring-2022/>
- VTU e-Shikshana Program
- VTU EDUSAT Program

Course Outcomes

On completion of this course, students are able to:

- CO1:** Apply the concepts of modular arithmetic, congruences, linear Diophantine equations, Euler's theorem, Fermat's theorem, Wilson's theorem, and the RSA cryptographic algorithm to solve engineering and computational problems.
- CO2:** Apply least squares curve fitting, correlation, regression analysis, and rank correlation techniques to analyse engineering data and establish relationships between variables.
- CO3:** Solve engineering problems involving discrete and continuous random variables using probability distributions, mathematical expectation, variance, and standard probability models such as Binomial, Poisson, and Normal distributions.



	CO4: Analyse joint probability distributions and Markov chains by determining expectations, covariance, correlation, transition probabilities, stationary distributions, and absorbing states for stochastic systems. CO5: Apply statistical inference techniques including hypothesis testing, confidence intervals, large and small sample tests, Student's t-test, Chi-square test, and the Central Limit Theorem to draw valid conclusions from engineering data.
Internal Assessment Marks: 50 (A minimum of two Internal Assessment Tests(IA) shall be conducted, carrying a total of 25 marks. In addition, Continuous Comprehensive Assessment (CCA) shall be conducted for a total of 25 marks.).	

The Correlation of Course Outcomes (CO's) and Program Outcomes (PO's)

Subject Code:	1BMATCS301	TITLE: Probability, Distributions and Statistics						Faculty Name:			
List of Course Outcomes	Program Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	3	2	-	-	2	-	-	3	-	-	2
CO-2	3	2	-	-	2	-	-	3	-	-	2
CO-3	3	2	-	-	2	-	-	3	-	-	2
CO-4	3	2	-	-	2	-	-	3	-	-	2
CO-5	2	2	-	-	2	-	-	3		-	2

Note: 3 = Strong Contribution 2 = Average Contribution 1 = Weak Contribution