GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Computer Engineering (Artificial Intelligence And Data Science)

Course / Subject Code : ME01095011

Subject Name: Probability and Statistics

WEF Academic Year:	2024-25
Semester:	1st Semester
Category of the Course:	PCC

Prerequisite:	Must have knowledge of Differential and Integral Calculus, sequences and series, Linear Algebra and Matrices
Rationale:	This course is essential for developing a comprehensive understanding of data and its implications. It provides students with the foundational tools to analyze and interpret data, make informed decisions, and understand the uncertainties inherent in various processes.

Course Scheme:

Teaching Scheme			Total Credits	Assessment Pattern and Marks				Total Marks
				Theory		Practical		
L	T	PR	C	ESE (E)	PA(M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Course Content:

Sr. No.	Course Content	No. of Hours	% of Weightage
1	Basic Probability Concepts: Definitions and Rules of Probability, Sample Spaces and Events, Conditional Probability and Independence, Random Variables and Probability Distributions, Discrete **and** Continuous Random Variables: Probability Mass Functions (PMF) and Probability Density Functions (PDF), Cumulative Distribution Functions (CDF).	10	20
2	Discrete Random Variables and Their Distributions: Binomial Distribution, Poisson Distribution, Geometric and Negative Binomial Distributions, Expectation and Variance of Discrete Random	7	15

	Variables: Properties of Expectation, Functions of Random Variables, Applications and Examples.		
3	Continuous Random Variables and Their Distributions: Uniform Distribution, Normal Distribution, Exponential and Gamma Distributions, Expectation and Variance of Continuous Random Variables	6	15
4	Sampling Distribution of the Mean and The Sampling Distribution of the Variance. Point Estimation and Properties of Estimators, Interval Estimation and Confidence Intervals, Maximum Likelihood Estimation,	10	25
5	Hypothesis Testing: Hypothesis Testing Framework, Hypothesis Tests for Single Mean, Single Proportion and Single Variance. Hypothesis Tests for Difference Between Two Population Means and Difference Between Two Population Proportions, F-Ratio Test for Equality of two Variances, Single-Factor ANOVA, Multiple Comparisons in ANOVA,	12	25
	Total	**45**	**100**

Reference Book:

1. Probability and Statistics for Engineers and Scientists | Includes Case studies with Statistical Software coverage such as SAS & MINITAB, Updated 9th Edition Paperback – 7 March 2024, Ronald E. Walpole , Raymond H. Myers, Sharon L. Myers, Pearson Education.
2. Miller and Freund's - Probability and Statistics for Engineers, Richard A. Johnson, Miller and Freund, 9th Edition , Pearson Education.
3. Probability and Statistics for Engineering and the Sciences , Jay L. Devore, Cengage Learning.
4. Introduction to Probability and Statistics for Engineers and Scientists by S.M. Ross , 5th Edition, Elsevier.
5. Probability and Statistical Inference, Robert V. Hogg, Elliot Tanis, Dale Zimmerman,10th Edition, Pearson Education

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level*
01	Gain a foundational understanding of probability theory including concepts like sample spaces, events, and probability distributions.	UN

02	Ability to analyze discrete random variables and their distributions, including Binomial, Poisson, Geometric, and Negative Binomial distributions.	UN
03	Understanding the properties of random variables, including concepts like expectation and variances	AN
04	Proficiency in Hypothesis Testing: Understanding the framework, conducting tests for means and proportions, interpreting p-values and significance levels, recognizing Type I and Type II errors, and applying statistical inference techniques.	AP
05	Ability to perform and interpret z-tests and confidence intervals for differences between two population means, conduct two-sample t-tests, apply ANOVA.	EV

*RM: Remember, UN: Understand, AP: Apply, AN: Analyse, EL: Evaluate, CR: Create

Suggested Course Practical List:

N/A

List of Open Course wares:

- https://archive.nptel.ac.in/courses/111/105/111105090/
- https://www.coursera.org/learn/machine-learning-probability-and-statistics
- https://ocw.mit.edu/courses/18-05-introduction-to-probability-and-statistics-spring-2022/
- https://youtube.com/playlist?list=PLxaL_Pkhcom-ITN6odlYxQuRe4gwhknhJ&si=Q-_DsQmZy3HVn2Ek
- https://oli.cmu.edu/courses/probability-statistics-open-free/

* * * * * * *