

## NIRMA UNIVERSITY

<b>Institute:</b>	Institute of Technology
<b>Name of Programme:</b>	B. Tech. (All Programme)
<b>Course Code:</b>	
<b>Course Title:</b>	Statistics
<b>Course Type:</b>	Common
<b>Year of introduction:</b>	2022-2023

L	T	Practical				C
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### Course Learning Outcomes (CLOs):

At the end of the course, the students will be able to –

1. know the basic concepts of probability, random variables and probability distribution and its uses (BL1)
2. compute and interpret descriptive statistics using numerical and graphical techniques (BL3)
3. use hypothesis testing methods to make appropriate decision for scientific and social problems (BL3)
4. analyze real data using software (BL4)

### Syllabus:

**Total Teaching hours: 30**

Unit	Syllabus	Teaching hours
Unit I	<b>Probability and Random Variable:</b> Deterministic and probabilistic approaches, Definition of Probability, Mutually Exclusive and exhaustive events, Conditional probability, Independence of events, Bayes' Theorem, Discrete & Continuous Random Variables, Probability Mass Functions, Probability Density Functions, Cumulative Distribution Functions, Mean, Variance and Expectation of Random Variables.	07
Unit II	<b>Probability Distributions:</b> Bernoulli Distribution, Binomial Distribution, Poisson Distribution and Normal Distribution	05
Unit III	<b>Descriptive Statistics:</b> Measures of central tendency, Measures of Dispersion, Numerical Summaries of Data, Frequency Distributions and Histograms, scatter diagrams, Stem and Leaf Diagram, Box plots, Types of Sampling	05
Unit IV	<b>Hypothesis Testing:</b> Null and alternative hypotheses, the critical and acceptance regions, p-value in hypothesis test, Type of error, power of test, hypothesis testing for large and small sample, test on the mean of normal distribution, tests on the variance and standard deviation of a normal distribution, Tests on population proportion	07
Unit V	<b>Correlation and Regression:</b> Least square method, Linear correlation and regression, Karl Pearson's and Spearman's Correlation coefficient, Properties of the linear regression, least square regression line y on x and x on y, basic non- linear regression, statistical fallacy	06

### Self-Study:

Self-study contents will be declared at the commencement of the semester. Around 10 % of the questions will be asked from the self-study contents.

### Laboratory Works:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated

### Suggested Readings/ References:

1. C.M. Douglas and G.C. Runger, Applied Statistics and Probability for Engineers, Wiley.
2. J. Susan Milton and Jesse Arnold, Introduction to Probability and Statistics: Principles and Applications for Engineering and the Computing Sciences, McGraw Hill Education.
3. Timothy C. Urda, Statistics in Plain English, Routledge.
4. Bertsekas, Dimitri and J. Tsitsiklis, Introduction to Probability, Athena Scientific
5. Alvin Drake, Fundamentals of Applied Probability Theory, McGraw-Hill
6. Sheldon Ross, A First Course in Probability, Prentice Hall

### Practical List

Sr.	Practical
1	Introduction to MATLAB
2	Vector, matrix, basic operations on matrices using MATLAB
3	Flow controls: If, If else, while, for and switch
4	Two dimensional and three-dimensional plotting
5	Library for Statistics in MATLAB
6	Program to implement conditional probability (Bayes' Theorem)
7	Program to graphical represent the data using Piechart, bargraph, boxplot, stem & leaf and validate the result using Excel
8	Program to evaluate measures of central tendency and dispersion for given data and validate the result using Excel
9	Program to find correlation coefficient using Spearman's rank and validate the result using Excel
10	Program to find correlation coefficient using Karl Pearson correlation method and validate the result using Excel
11	Program for linear and nonlinear curve fitting for given data and validate the result using Excel
12	Program to find the linear regression for given and validate the result using Excel
13	Program to find critical and acceptance region using Z-test and testing of hypothesis
14	Program to find critical and acceptance region using T-test and testing of hypothesis
15	Rice Virtual Lab in Statistics: Case study on correlation