Course Code	Course Title	L-P-T	Credits
UMAT0O005T	**Probability and Statistics**	3-0-1	4

Objective: The goal of the course is to acquaint students with various probability distributions as well as to improve their abilities and understanding of sampling distributions and hypothesis testing. Upon successful completion of this course, students will be able to understand:

CQ1	To comprehend the essential ideas of probability, event probability, additive rules, and conditional probability, Total probability theorem, Bayes' theorem and its applications.
CO2	Random variables and distribution functions: discrete and continuous with examples and applications, expectation and moments about mean and origin, covariance and conditional expectation.
CO3	Moment inequalities-Tchebyshef, Markov, Jensen, Moment generating function (MGF) and characteristic function (CF) with their properties. Standard discrete probability distributions with examples and applications.
CO4	Standard continuous probability distributions with their properties and examples. Some important theorems based on these distributions.
CO5	More on two dimensional random variables: probability and distributions and examples, Transformation of random variables with examples, Central limit theorem and its applications, Large sample theory: types, parameter and statistics, test of significance.

Course Content

Unit-1

Review of probability theory including conditional probability, Some important theorems on probability, Exercise on probability and conditional probability, Independent Events, Total probability theorem and Bayes' Theorem, Addition and multiplication theorems of probability.

Unit-2

Random Variables and Distribution function: discrete and continuous, Exercise on distribution functions, two dimensional random variables: joint distribution function and marginal distribution, Expectation and moments about mean and origin, Covariance and conditional expectation and examples.

Unit-3

Moment inequalities: Tchebyshef, Markov, Jensen, Moment generating function (MGF) and characteristic function (CF) with their properties. Standard discrete probability distributions: Discrete uniform distribution, Bernoulli distribution, Binomial distribution, Poisson distribution, Geometric distribution, Negative binomial distribution with their properties and examples. Some important theorems based on these distributions.

Unit-4

Standard continuous probability distributions: Continuous uniform distribution, Normal distribution, Exponential distribution, Gamma distribution or Erlang distribution, Weibull distribution, Triangular distribution, Standard Laplace (Double exponential) distribution, Cauchy

distribution, with their properties and examples. Some important theorems based on these distributions.

Unit-5

More on two dimensional random variables: probability and distributions and examples, Transformation of random variables with examples, Central limit theorem and its applications, Large sample theory: types, parameter and statistics, test of significance.

Reference books:

1. **S. C. Gupta and V. K. Kapoor**: "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, New Delhi.

2. **S. Palaniammal,** "Probability and Queueing Theory", PHI Learning Private Limited, Delhi.

3. **R. S. Murray, J. S. John and Srinivasan, R. A.** "Probability and Statistics", Schaum's Outlines, Mc Graw Hill, New Delhi.