# PROBABILITY, STATISTICS AND NUMERICAL METHODS

## (Basic Science Elective)

**Course Code: 15BM1103**

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**Pre requisites:**

1 Fundamentals of Set theory and calculus.

2. Basic concepts of Basic concepts of Probability, Binomial distribution, Poisson distribution.

**Course Outcomes:**

At the end of the Course, Student will be able to:

**CO 1** Examine, analyze, and compare Probability distributions.

**CO 2** Determine confidence intervals for population parameters.

**CO 3** Prepare null and alternative hypothesis and test its validity based on random samples.

**CO 4** Determine numerical solution of algebraic and transcendental equations and discuss different difference operators.

**CO 5** Use interpolation techniques for data analysis and numerically solve initial value problems.

**UNIT-I** **(10 Lectures)**

Random Variables: Discrete Random variables, Continuous Random variables - Probability density, Distribution. Calculating probabilities from Probability density, Determining Mean and Variance using Probability density, The Normal Distribution- Density and Properties, Calculating Normal Probabilities, Normal Approximation to Binomial Distribution.

(4.1, 4.4, 5.1, 5.2, 5.3 of [1])

## UNIT-II (10 Lectures)

Sampling distributions and Estimation: Population and sample, The Sampling distribution of the mean ($\sigma$ known), Central Limit theorem ( without Proof) and Problems, Sampling distribution of the mean ($\sigma$ unknown), Point Estimation, Maximum error and determination of sample size, Interval Estimation ( Large sample and small sample),

Tests of Hypotheses: Introduction, Null hypotheses, Alternative hypotheses, Type –I,II errors, Level of significance, Hypotheses concerning one mean ( Large and Small samples),

(6.1, 6.2, 6.3, 7.1, 7.2, 7.4, 7.5, 7.6 of [1])

## UNIT-III (10 Lectures)

### TESTS OF HYPOTHESES:

Experimental design for comparing two treatments. Comparisons – two independent large samples, two independent small samples, Matched pair comparisons

Estimation of Proportions, Hypotheses concerning one Proportion, Hypotheses concerning several Proportions.

(8.1 - 8.4, 10.1 – 10.3)

## UNIT-IV (10 Lectures)

Solution of algebraic and transcendental equations: bisection method, method of false position, Newton's method,

Finite differences: Forward differences, backward differences, Central differences, Differences of a polynomial, Other Difference operators, Relations between the operators, To find one or more missing terms.

(28.1 to 28.3, 29.1, 29.2, 29.4, and 29.5 of Text book [2])

## UNIT-V (10 Lectures)

Polynomial Interpolation: Newton's forward interpolation formula, Newton's backward interpolation formula, Interpolation with unequal intervals: Lagrange interpolation, Inverse interpolation.

Numerical solutions of Ordinary differential equations: Euler's Method, Modified Euler's Method, Runge-Kutta method of order 4.

(29.6, 29.9 - 29.10, 29.13, 32.4, 32.5, 32.7 of Text book [2])

## TEXT BOOKS

1. Richard A.Johnson, " Miller.& Freund's Probability and Statistics for Engineers", eighth edition, PHI Learning India Private Limited, 2011.
2. Dr.B.S.Grewal, "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, 2012.

## REFERENCE BOOKS:

1. S. S. Sastry, "Introductory Methods of Numerical Analysis", 4th edition, Prentice Hall India Pvt., Limited, 2005.
2. S.C. Gupta and V.K. Kapoor, "Fundamentals of Mathematical Statistics", Ninth Revised Edition , Sultan Chand & Sons Educational Publishers, 2007.