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 (σ known), Central Limit theorem (without Proof) and Problems, Sampling distribution of the mean (σ 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.