RANDOM VARIABLES AND NUMERICAL METHODS

(Basic Science Elective)

Course Code: 15BM1107

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3	0	0	3

Pre requisites:

1. Fundamentals of Set theory.
2. Basic concepts of Probability.
3. Basic concepts of calculus.

Course Outcomes:

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

CO 1 Explain various concepts of discrete and continuous random variables and calculate moments about origin and mean, conditional expected values.

CO 2 Calculate joint distribution function, density function, conditional distribution and density.

CO 3 Calculate joint moments about origin and mean. Also explain the properties of Jointly Gaussian Random Variables and able to classify various types of random processes.

CO 4 Calculate a root of algebraic and transcendental equations. Explain relation between the finite difference operators.

CO 5 Compute interpolating polynomial for a given data and Solve ordinary differential equations numerically using Euler's and RK methods.

UNIT-I **(10 Lectures)**

RANDOM VARIABLES:

The Random Variable Concept, Distribution Function, Density Function, The Gaussian Random Variable, Conditional Distribution

and Density Functions, Expectation, Moments about the origin, Central moments, Variance and Skew, Chebychev's Inequality, Markov's Inequality. Transformations of a random variable (excluding nonmonotonic transformations)

(2.1 - 2.4, 2.6, 3.1, 3.2, 3.4 of Text book [1])

UNIT-II (10 Lectures)

VECTOR RANDOM VARIABLES:

Joint Distribution and its Properties, Joint Density and its Properties, Conditional Distribution and Density, Statistical Independence, Distribution and Density of a sum of Random Variables, Central Limit Theorem (without proof).
(4.1 to 4.7 of Text book [1])

UNIT-III (10 Lectures)

OPERATIONS ON MULTIPLE RANDOM VARIABLES:

Expected Value of a Function of Random Variables, Jointly Gaussian Random Variables- two Random variables, Jointly Gaussian Random Variables-N Random variables. The Random Process Concept-Classification of processes, Deterministic and Nondeterministic processes.
(5.1, 5.3, 6.1 of Text book [1])

UNIT-IV (10 Lectures)

INTRODUCTION :

SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS:

Bisection method, method of false position, Newton's Raphson 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 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. Peyton Z . Peebles, Jr., "Probability, Random Variables and Random Signal Principles", Fourth Edition, TMH, 2002.
2. Dr.B.S.Grewal "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, 2012.

REFERENCE BOOKS:

1. Athanasios Papoulis and S.Unnikrishna Pillai, "Probability, Random variables and Stochastic processes", 4th Edition, PHI, 2002.
2. M.K.Jain, S.R.K.Iyengar and R.K.Jain, "Numerical Methods form scientific and Engineering Computation", 4th Edition, New age International Publishers, 2003.