Gamma functions: properties and relationship between them.

UNIT IV

Differential Equations: Exact differential equations, integrating factors, change of variables. Differential equations of first order and first degree. Higher order differential equations: linear differential equations of order *n*.

UNIT V

Solution of homogeneous and non-homogeneous linear differential equations of order *n* with constant coefficients. Different forms of particular integrals. Formation and solution of partial differential equations.

SUGGESTED READINGS:

1. Das, B. C., & Mukherjee, B. N. (2018). Integral calculus. U. N. Dhur& Sons Publications
2. Das, B. C., & Mukherjee, B. N. (2018). Differential calculus. U. N. Dhur& Sons Publications
3. Prasad, G. (1997). Differential Calculus. Pothishala Pvt. Ltd., Allahabad
4. Prasad, G. (2000). Integral Calculus. Pothishala Pvt. Ltd., Allahabad
5. Raisinghania, M. D. (2013). Ordinary and Partial Differential Equation. S. Chand Publishing
6. Piskunov, N. S. (1965). Differential and integral calculus. Routledge

DISCIPLINE SPECIFIC CORE COURSE: DSC-151
(Probability Distributions)
(Credits: 03)
Contact Hours: 45 Hours
Full Marks = 100 [End Semester Exam (70) +Internal (30)]
Pass Marks = 40 [End Semester Exam (28) + Internal (12)]

Learning objectives

- To understand random variables, their probability distributions (discrete and continuous), and their properties.
- To learn about two-dimensional random variables, including joint, marginal, and conditional distributions, and independence.
- To gain proficiency in transformation of random variables.
- To understand the concept of expectation, including its properties and applications.
- To familiarize with the concept of variance and covariance of random variables.

Learning outcomes

- Apply probability concepts to model and analyze random phenomena.
- Analyze and interpret the distributions of two-dimensional random variables and assess independence.
- Apply transformation of random variables to obtain new distributions.
- Applications of the addition and multiplication theorems.
- Uses of moments, cumulants, and characteristic functions.

UNIT I

Random variables: discrete and continuous random variables, p.m.f., p.d.f. and c.d.f., illustrations and properties of random variables, univariate transformations with illustrations. Two dimensional random variables: discrete and continuous type, joint, marginal and conditional p.m.f, p.d.f., and c.d.f., independence of variables, bivariate transformations with illustrations.

UNIT II

Mathematical expectation of random variables and its properties (addition and multiplication theorem of expectation), Variance and Covariance in terms of expectation and their properties, examples based on expectation and its properties. Expectation of bivariate random variable.

UNIT III

Moments and Cumulants: moment generating function, cumulant generating function and characteristic function. Uniqueness and inversion theorems (without proof) along with applications. Conditional expectation and variance.

UNIT IV

Discrete Probability Distributions: Discrete Uniform, Bernoulli, Binomial, Poisson, Geometric, Negative Binomial and Hyper-geometric distributions.

UNIT V

Continuous Probability Distributions: Normal, Exponential, Uniform, Beta, Gamma, Cauchy, Weibull and Laplace distributions.

SUGGESTED READINGS:

1. Hogg, R.V., Tanis, E.A. &Rao J.M. (2005). Probability and Statistical Inference (7thed.).Pearson Education, New Delhi.
2. Freund, J. E., Miller, I., & Miller, M. (2006). John E.Freund’s Mathematical Statistics: With Applications (7th ed.). Pearson Education, India.
3. Meyer, P.L. (1970). Introductory probability and statistical applications. Oxford &IBH Publishing, New Delhi
4. Bhattacharjee,D., & Das, D. (2010). Introduction to Probability Theory. Asian Books, New Delhi