DISCIPLINE SPECIFIC CORE COURSE: DSC-102
(Calculus)

(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 limits, continuity, and their properties.
- To develop proficiency in partial differentiation and total differentiation.
- To learn optimization techniques, including maxima and minima, constrained optimization with Lagrange multipliers, concavity and convexity analysis.
- To gain knowledge and skills in integral calculus, including integration techniques and variable transformations.
- To solve differential equations, including exact, linear, and partial differential equations and formulation of partial differential equations.

Learning outcomes

- Apply properties of continuous functions and evaluate limits and continuity of functions.
- Computation of partial derivatives and differentials of functions.
- Apply optimization techniques to find extrema, solve constrained optimization problems, and analyze problems related to concavity and convexity.
- Evaluate definite integrals, use differentiation under the integral sign, and perform variable transformations.
- Apply differential equations of various orders and types and formulation of partial differential equation in practical problems.

UNIT I

Differential Calculus: limits of function, continuity of functions, properties of continuous functions, partial differentiation and total differentiation. Indeterminate forms: L-Hospital's rule, Leibnitz rule for successive differentiation. Euler's theorem on homogeneous functions.

UNIT II

Maxima and minima of functions of one and two variables, constrained optimization techniques (with Lagrange multiplier) along with some problems. Jacobian, concavity and convexity, points of inflexion of function, singular points.

UNIT III

Integral Calculus: review of integration and definite integral. Differentiation under integral sign, double integral, change of order of integration, transformation of variables. Beta and

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.