DISCIPLINE SPECIFIC CORE COURSE – 3: CALCULUS

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Calculus	4	3	0	1	Class XII pass with Mathematics	NIL

Learning Objectives

The Learning Objectives of this course are as follows:

- To familiarize students with the basic mathematical tools.
- It helps students to understand the other statistical concepts.

Learning Outcomes

The Learning Outcomes of this course are as follows:

- Understand to solve applied problems using differentiation and integration.
- Understand to solve applied problems under integral sign and changes of order of integration.

SYLLABUS OF DSC – 3

Theory

Unit – 1 **(15 hours)**

Differential Calculus

Review of limits, continuity and differentiability, partial differentiation and total differentiation. Indeterminate forms: L-Hospital's rule, Leibnitz rule for successive differentiation. Euler's theorem on homogeneous functions.

Unit – 2 **(15 hours)**

Integral Calculus

Review of integration and definite integral. Differentiation under integral sign, double integral, changes of order of integration. Beta and Gamma functions: Properties and relationship between them.

Unit – 3 **(15 hours)**

Differential Equations

Exact differential equations. Differential equations of first order and first degree. Higher Order Differential Equations: Linear differential equations of order n, Homogeneous and non-homogeneous linear differential equations of order n with constant coefficients, Different forms of particular integrals. The Cauchy-Euler's equation of order n. Formation and solution of a partial differential equations. Equations easily integrable. Linear partial differential equations of first order. Homogeneous linear partial differential equations with constant coefficients. Different cases for complimentary functions and particular integrals.

Practical – 30 Hours

List of Practicals:

1) Verification of Euler's Theorem.
2) Applications of differentiation
   a. Calculate income and price elasticity of demand.
   b. Determination of price and quantity for which total revenue is maximum.
   c. Find the level of output for which the average cost is minimum.
   d. Solve profit maximization problems.
   e. Evaluate first and second order partial derivatives of functions of the form $ZZ = ff(xx, yy)$.
   f. Examine a function of two variables for relative maxima and relative minima.
   g. Find the nature of the commodities by using the concept of partial marginal demand functions.
   h. Find four partial elasticities for a demand function of two variables.
3) Applications of Integration
   a) Derive total cost function from given marginal cost function.
   b) Derive total revenue function and demand function form a given marginal revenue function.
   c) Calculate the maximum profit if marginal revenue and marginal cost are given.
   d) Find the demand function when the price elasticity of demand is given.
4) Applications of Differential Equations
   a) Application on growth and decay.
   b) Application of the form $^{dd}_{2yy} = ff(xx)$ and $^{dd}_{2yy} = ff(yy)$ to physical problems
   c) Application on coordinate geometry.
5) Verify that the area under the curve is unity under the given p.d.f. and also calculate
   a) Arithmetic Mean
   b) Median
   c) Mode
   d) Standard Deviation

Essential Reading

- Prasad, G. (2017). Differential Calculus, 19th Ed. (Revised), Pothishala Pvt. Ltd., Allahabad.
- Prasad, G. (2017). Integral Calculus, 17th Ed. (Revised), Pothishala Pvt. Ltd., Allahabad.
- Ahsan, Z. (2004). Differential Equations and their Applications, 2nd Ed., PHI, Pvt. Ltd., New Delhi.
- Shanti Narayan and P K Mittal (2018). Differential Calculus. 15th Ed (Revised)., S Chand Publication, New Delhi
- Shanti Narayan and P K Mittal (2016). Integral Calculus. 11th Ed (Revised), S Chand Publication, New Delhi.
- Business Mathematics Theory and Applications, V. K. Kapoor (2012), Sultan Chand & Sons.

Suggestive Reading

- R. S. Soni (2000) Business Mathematics with applications in Business and Economics, 3rd ed., Pitamber Publishing Company (P) Ltd.
- Brahma Nand, B. S. Tyagi and B. D. Sharma, Integral Calculus, Kedar Nath Ram Nath.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.