

**B.Sc. (Physical Sciences/ Mathematical Sciences) with Mathematics as one of the Core Disciplines**

**Category III**

**DISCIPLINE SPECIFIC CORE COURSE: TOPICS IN 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		
Topics in Calculus	4	3	1	0	Class XII pass with Mathematics	Nil

**Learning Objectives**

The primary objective of this course is to:

- Introduce the basic tools of calculus which are helpful in understanding their applications in many real-world problems.
- Understand/create various mathematical models in everyday life.

**Learning outcomes**

This course will enable the students to:

- Understand continuity and differentiability in terms of limits and graphs of certain functions.
- Describe asymptotic behaviour in terms of limits involving infinity.
- Use of derivatives to explore the behaviour of a given function locating and classify its extrema and graphing the function.
- Apply the concepts of asymptotes, and inflexion points in tracing of cartesian curves.
- Compute the reduction formulae of standard transcendental functions with applications.

**SYLLABUS OF DSC**

**Theory**

**Unit – 1**

**(20 hours)**

**Limits, Continuity and Differentiability**

Limit of a function,  $\epsilon - \delta$  definition of a limit, Infinite limits, Continuity and types of discontinuities; Differentiability of a function, Successive differentiation: Calculation of the nth derivatives, Leibnitz theorem; Partial differentiation, Euler's theorem on homogeneous functions.

**Unit – 2****(20 hours)****Mean Value Theorems and its Applications**

Rolle's theorem, Mean value theorems and applications to monotonic functions and inequalities; Taylor's theorem, Taylor's series, Maclaurin's series expansions of  $e^x$ ,  $\sin x$ ,  $\cos x$ ,  $\log(1+x)$  and  $(1+x)^m$ ; Indeterminate forms.

**Unit – 3****(20 hours)****Tracing of Curves and Reduction Formulae**

Asymptotes (parallel to axes and oblique), Concavity and inflexion points, Singular points, Tangents at the origin and nature of singular points, Curve tracing (cartesian and polar equations). Reduction formulae for  $\int \sin^n x dx$ ,  $\int \cos^n x dx$ , and  $\int \sin^m x \cos^n x dx$  and their applications.

**Practical component (if any) – NIL****Essential Readings**

- Prasad, Gorakh (2016). Differential Calculus (19th ed.). Pothishala Pvt. Ltd. Allahabad.
- Prasad, Gorakh (2015). Integral Calculus. Pothishala Pvt. Ltd. Allahabad.

**Suggestive Readings**

- Apostol, T. M. (2007). Calculus: One-Variable Calculus with An Introduction to Linear Algebra (2nd ed.). Vol. 1. Wiley India Pvt. Ltd.
- Ross, Kenneth. A. (2013). Elementary Analysis: The Theory of Calculus (2nd ed.). Undergraduate Texts in Mathematics, Springer. Indian reprint.

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