UNIVERSITY OF DELHI

DEPARTMENT: MATHEMATICS

COURSE NAME: Bachelor in Multidisciplinary Courses with 3 core Disciplines

(SEMESTER - I)
based on

Undergraduate Curriculum Framework 2022 (UGCF)

(Effective from Academic Year 2022-23)

University of Delhi

Course name: **Bachelor in Multidisciplinary Courses with 3 core Disciplines**

Course Title	Nature of the Course	Total Credits	Components			Eligibility Criteria/ Prerequisite	**Contents of the course and reference is in**
			Lecture	Tutorial	Practical		
Topics in Calculus	Discipline-1	4	3	1	0	**12th with Mathematics**	**Annexure-I**

Bachelor in Multidisciplinary Courses of Study with 3 Core Courses (Sem I)
Discipline A-1: Topics in Calculus

Total Marks: 100 (Theory: 75, Internal Assessment: 25) **Examination:** 3 Hrs.
Workload: 3 Lectures, 1 Tutorial (per week) **Credits:** 4

Course 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. Students will be able to understand/create various mathematical models in everyday life.

Course Learning Outcomes: This course will enable the students to:

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

Unit 1: Limits, Continuity and Differentiability
Limit of a function, $\varepsilon-\delta$ 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: 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: 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.

References:

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

Additional Readings:

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