

**COMMON POOL OF GENERIC ELECTIVES (GE) COURSES  
OFFERED BY DEPARTMENT OF MATHEMATICS**

**CATEGORY-IV**

**GENERIC ELECTIVES: FUNDAMENTALS OF 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		
Fundamentals of Calculus	4	3	1	0	Class XII pass with Mathematics	NIL

**Learning Objectives**

The Learning Objectives of this course is as follows:

- Understand the quantitative change in the behaviour of the variables and apply them on the problems related to the environment.

**Learning Outcomes**

Upon completion of this course, students will be able to:

- Understand continuity and differentiability in terms of limits.
- Describe asymptotic behavior in terms of limits involving infinity.
- Understand the importance of mean value theorems and its applications.
- Learn about Maclaurin's series expansion of elementary functions.
- Use derivatives to explore the behavior of a given function, locating and classifying its extrema, and graphing the polynomial and rational functions.

**SYLLABUS OF GE**

**Theory**

**Unit – 1**

**(20 hours)**

**Continuity and Differentiability of Functions**

Limits and continuity, Types of discontinuities; Differentiability of functions; 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; Expansion of functions: Taylor's theorem, Taylor's series, Maclaurin's series expansion of  $e^x$ ,  $\sin x$ ,  $\cos x$ ,  $\log(1+x)$  and  $(1+x)^m$ ; Indeterminate forms.

**Unit – 3** (20 hours)

**Tracing of Curves**

Concavity and inflexion points, Asymptotes (parallel to axes and oblique), Relative extrema, Tracing graphs of polynomial functions, rational functions, and polar equations.

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

**Essential Readings**

- Anton, Howard, Bivens, Irl, & Davis, Stephen (2013). Calculus (10th ed.). Wiley India Pvt. Ltd. New Delhi. International Student Version. Indian Reprint 2016.
- Prasad, Gorakh (2016). Differential Calculus (19th ed.). Pothishala Pvt. Ltd. Allahabad.

**Suggestive Reading**

- Thomas Jr., George B., Weir, Maurice D., & Hass, Joel (2014). Thomas' Calculus (13th ed.). Pearson Education, Delhi. Indian Reprint 2017.

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

**GENERIC ELECTIVES: THEORY OF EQUATIONS AND SYMMETRIES**

**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		
Theory of Equations and Symmetries	4	3	1	0	Class XII pass with Mathematics	NIL

**Learning Objectives**

The goal of this course is to acquaint students with certain ideas about:

- Integral roots, rational roots, an upper bound on number of positive or negative roots of a polynomial.