

TRIBHUVAN UNIVERSITY  
INSTITUTE OF SCIENCE AND TECHNOLOGY  
SCHOOL OF MATHEMATICAL SCIENCES  
**Bachelor in Mathematical Sciences (B.Math.Sc.)**

**Course of Study**

*Code No.:* MSMT 101

***Paper:* Calculus with Analytic Geometry I**

*Nature:* Theory and Lab work

*Full Mark:* 75

*Pass Mark:* 30

*Credit:* 3

*Course Description:*

This course begins with a revisit to the concepts of limit, differentiation and integration of algebraic, trigonometric and transcendental functions, L'Hospital's rule, and Newton's method studied in + 2 mathematics and is followed by a comprehensive treatment of applications of differentiation and integration.

*Learning Objectives:*

After successful completion of this course the student will be able to

- Define precisely a limit and continuity
- Evaluate a limit at infinity and use it to locate horizontal asymptotes
- Find derivatives.
- Use L'Hospital rule.
- Solve nonlinear equations by Newton's method.
- Solve Growth and Decay problems.
- Use differential approximation.
- Use the methods of calculus to analyze the qualitative behavior of graphs of two-dimensional functions at the mastery level.
- Construct and solve an integral to determine the area between two curves.
- Construct and solve an integral to determine the volume of a solid of revolution using the Disk and Shell Methods.
- Construct and solve an integral to determine arc length and the area of a surface of revolution.
- Solve applications of integration problems involving work, moments and centers of mass, and fluid force.

*Mode of Delivery:*

The course will be taught by lecture, class discussion. In some cases the use of spreadsheet software for problem solving and computers/laptops will be encouraged. The medium of instruction will be English.

*Contents:*

**Unit 1 Limits and Continuity** **7 hrs**

Limit, Continuity, Limits at Infinity, Horizontal Asymptotes.

**Unit 2 Derivatives** **9 hrs**

Derivatives and Rates of Change, The Derivative as a Function, Derivatives of Polynomials and Exponential Functions, The Product and Quotient Rules, Derivatives of Trigonometric Functions, The Chain Rule, Implicit Differentiation, Derivatives of Logarithmic Functions, Hyperbolic Functions

**Unit 3 Application of Derivatives** **12 hrs**

Rates of Change in the Natural and Social Sciences, Exponential Growth and Decay Related Rates Linear Approximations and Differentials, Maximum and Minimum Values, The Mean Value Theorem How Derivatives Affect the Shape of a Graph , Limits at Infinity; Horizontal Asymptotes, Summary of Curve Sketching, Optimization Problems, Newton's Method

**Unit 4 Integrals** **10 hrs**

Antiderivatives, Areas and Distances, The Definite Integral , The Fundamental Theorem of Calculus, Indefinite Integrals and the Net Change Theorem, The Substitution Rule

**Unit 5 Application of Integrals** **10 hrs**

Areas Between Curves, Volumes , Volumes by Cylindrical Shells, Work, Average Value of a Function

*Text Book:*

1. *Calculus – Early Transcendental Functions*, 7<sup>th</sup> edition, J. Stewart, Thomson Brooks/Cole

*Reference Books:*

1. *Calculus: Early Transcendental Functions*, Larson, et al, Houghton Mifflin, 2011
2. *Calculus : a complete course*, Robert A. Adams, Christopher Essex. Pearson, 2010

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