Rajarshi Janak University
Faculty of Science, Technology, and Engineering
Course of Study for B.Sc.CSIT
(First Year / First Semester)

Course Title: Mathematics-I   **Course Code:** CSMT 101
Nature of Course: Theory (6 Hrs)   **Full Marks:** Ext(60)+Int(40)
Credit Hrs: 3   **Pass Marks:** Ext(24)+Int(16)

Course Description:
Functions, limits, continuity, differentiation, and integration of a single variable are all covered in this course. logarithmic, exponential, derivatives and antiderivatives, their applications, differential equations, vectors, and their uses, partial derivatives, and multiple integration are all covered.

Course Objectives:
This course aims to increase students' understanding and ability to translate real-world situations into mathematical assertions, generate course-appropriate solutions to mathematical problems, and represent mathematical answers visually or numerically.

Course Contents
Unit-1
Review of Elementary Concept of Sets and Functions: **[4 hrs.]**
Sets(only review), Representing function of one variable, Polynomial, Trigonometric, Exponential and Logarithmic functions, Range and domain of functions and their graphs, and inverse of functions.
Unit-2
Limits, Continuity, Discontinuous, and Derivatives: **[5 hrs.]**

Concept of Limit, Limit at infinity, Continuity, Conditions for function to be continuous and Location of finite Discontinuity, Asymptotes of Graphs, Concept of Derivative, Differentiation rules, Linearization and Differentials, Higher order Derivatives, Rolle's Theorem, Lagrange's Mean Value Theorem, Cauchy Mean Value Theorem, Maclaurin's, and Taylor's Theorem, and their applications.

Unit-3
Application of Derivatives: [**5 hrs.**]
Extreme Values of Functions on Closed Intervals, Monotonic Functions and the First Derivative Test, Concavity and Curve Sketching, Applied Optimization, and Newton's Method.
Unit-4
Antiderivatives: **[4 hrs.]**
Review of Antiderivatives, Area and Estimating with Finite Sums, Sigma Notation and Limits of Finite Sums, The Definite integral, The Fundamental Theorem of Integral Calculus (Without Proof), Indefinite Integrals and the Substitutions, and the area between curves.

Unit-5
Application of Antiderivatives: [5 hrs.]
Volumes Using Cross-Sections, Volume using Cylindrical Shells, Arc Length, Areas of Surfaces of Revolution, Approximate Integrations.

Unit 6 [5 hrs.]
Double Integrals:
Double and Iterated Integrals over Rectangles, Double Integrals over General Regions, Area by Double Integration, Double Integrals in Polar Form, Applications of Double Integrals.

Unit-7
Ordinary Differential Equations: [5 hrs.]
Introduction, First Order Differential Equations, Variables Separable Equations, Linear Equations, Homogeneous and Non-homogeneous Equations, Exact equations, and Second Order Linear Differential Equations.

Unit-8
Partial Derivatives: [4 hrs.]
Functions of Several Variables, Partial Derivatives, Homogeneous functions, Euler's Theorem on Homogeneous Functions, Verification of Euler's Theorem with Examples.

Unit-9
Plain and Space Vectors: [4 hrs.]
Introduction, Applications, Dot product and Cross Product, Equations of Lines and Planes, Derivatives and Integrals of Vector Functions, Arc length and Curvature, Normal and Binomial Vectors.

Unit-10
Infinite Sequences and Series: [4 hrs.]
Sequences, Infinite Series, the Integral Test, Comparison Tests, Absolute Convergence; the Ratio and Root Tests, Alternating Series and Conditional Convergence, Power Series, and Taylor and Maclaurin Series**.**

Text Books/ Reference Books:
1. James Stewart, *"Calculus Early Transcendentals"*, 7E CENGAGE Learning.
2. George B. Thomas, *"Early Transcendentals"*, 12thEd. Wesley.
3. Howard Anton, IRL Bivens, and Stephen Davis, Calculus, 10th Edition, John Willey & Sons, Inc.