



# Capital University of Science and Technology

## Department of Computer Science

---

### MTCS1013 – Calculus and Analytical Geometry

<b>Course Title:</b>	Calculus and Analytical Geometry (MTCS1013)
<b>Pre-requisite(s):</b>	None
<b>Credit Hours:</b>	3
<b>Instructor(s):</b>	
<b>Text Book(s):</b>	Thomas' Calculus Early Transcendentals. Author: George B. Thomas, Jr.,[13th]
<b>Reference Book(s):</b>	Calculus Early Transcendentals. Author: Howard Anton,[10th]
<b>Web Reference:</b>	<ul style="list-style-type: none"><li>• <a href="https://rodrigopacios.github.io/mrpacios/download/Thomas_Calculus.pdf">https://rodrigopacios.github.io/mrpacios/download/Thomas_Calculus.pdf</a> [Calculus Book]</li><li>• <a href="http://www.geogebra.org">www.geogebra.org</a> [Graphing Tool]</li></ul>

### Course Introduction:

This course has been designed to enable the students to learn and apply the basic tools of Calculus. It includes the understanding of the basic ideas of limit, continuity, differentiation and integration and their applications in different areas of science. In applications, special focus is given to velocity & acceleration problems, related rates of changes, optimization problems and area finding problems. This course covers only the single variable case.

### Course Objectives:

- Use the concept of limit and continuity to find the instantaneous rate of change of one variable functions and hence understand the meaning of ordinary derivatives
- Use the derivatives to study various properties of functions and solve the problems of rate of change, optimization and related rates
- Find definite and indefinite integrals and use integration for problem solving like area between the curves, arc length, average value of the function, etc.



# Capital University of Science and Technology

## Department of Computer Science

---

### Course Learning Outcomes (CLOs):

At the end of this course, the students should be able to:

**CLO:1** Understand the basic concepts of limits and continuity. [C2 Understanding]

**CLO:2** Learn the idea of derivative and integration. [C2 Understanding]

**CLO:3** Apply the derivatives to study various properties of functions and solve different problems of practical nature. [C3 Applying]

**CLO:4** Solve the problems of finding areas between the curves by using the concept of integration. [C3 Applying]

### CLOs – PLOs Mapping

	CLO:1	CLO:2	CLO:3	CLO:4
PLO:1 (Academic Education)				
PLO:2 (Knowledge for Solving Computing Problems)	√	√	√	√
PLO:3 (Problem Analysis)				
PLO:4 (Design/Development of Solutions)				
PLO:5 (Modern Tool Usage)				
PLO:6 (Individual and Team Work)				
PLO:7 (Communication)				
PLO:8 (Computing Professionalism and Society)				
PLO:9 (Ethics)				
PLO:10 (Life-Long Learning)				

### Course Contents:



# Capital University of Science and Technology

## Department of Computer Science

Week	Contents
1	<ul style="list-style-type: none"><li>Preliminaries; Introduction, Functions their domain and range. Related Exercise and Examples</li></ul>
2	<ul style="list-style-type: none"><li>Rates of Change, Limits, Rules of finding limits, One Sided (Left and Right) limits (from functions and from graphs).</li></ul>
3	<ul style="list-style-type: none"><li>Sandwich Theorem for limits, Limits at Infinity, Limit of functions like <math>\sin(x)/x</math></li></ul>
4	<ul style="list-style-type: none"><li>Continuity (from functions and from graph), Continuity at a point, Continuity on an interval</li></ul>
5	<ul style="list-style-type: none"><li>Types of discontinuity, Exercises of Chapter 1</li></ul>



# Capital University of Science and Technology

## Department of Computer Science

6	<ul style="list-style-type: none"><li>Exercises of Chapter 2</li></ul>
7	<ul style="list-style-type: none"><li>Introduction of Derivatives, Derivative at a point, Differentiation Rules</li></ul>
8	<ul style="list-style-type: none"><li>Derivative as a rate of change, Derivative of Trigonometric functions, Exercises of Chap 3</li></ul>
<b>Mid-Term Exam</b>	
9	<ul style="list-style-type: none"><li>Derivative by Chain Rule, Implicit Differentiation, Exercise 3.6</li></ul>
10	<ul style="list-style-type: none"><li>Slopes, Tangent and Normal Equation of Tangent and Normal Line</li></ul>
11	<ul style="list-style-type: none"><li>Derivatives of Logarithmic function, Indeterminate Forms and L'Hospital Rule</li></ul>



# Capital University of Science and Technology

## Department of Computer Science

12	<ul style="list-style-type: none"> <li>Related Rate Problems, Applications of Derivatives</li> </ul>
13	<ul style="list-style-type: none"> <li>Applications of Derivatives, Extreme values of function</li> </ul>
14	<ul style="list-style-type: none"> <li>First Derivative and Second Derivative Test, Concavity of a function and Point of Inflection</li> </ul>
15	<ul style="list-style-type: none"> <li>Applied Optimization Problem, Integration, Indefinite Integral, Techniques of Integration, Integration by Parts</li> </ul>
16	Definite Integrals, Substitution in Definite Integrals, Area between curves and axis, Total area between curves

### Grading Policy

S.No	Grading	% of Total Marks
1	Assignments	20
2	Quizzes	20
3	Mid-term Exam	20
4	Final Exam	40
	<b>Total</b>	<b>100</b>