



# NORTH SOUTH UNIVERSITY

*Centre of Excellence in Higher Education*

## DEPARTMENT OF MATHEMATICS AND PHYSICS

*School of Engineering and Physical Sciences*

<b>Course Title</b>	Calculus and Analytical Geometry I
<b>Course Code</b>	MAT-120
<b>Semester</b>	Spring 2024
<b>Course Coordinator</b>	Dr. Preetom Nag

### Instructor & Department Information

<b>Instructor's Name</b>	
<b>Office Room</b>	
<b>Office Hours</b>	
<b>Office Phone</b>	
<b>Email Address</b>	
<b>Links</b>	

### Course & Section Information

<b>Prerequisites</b>	None
<b>Class Time</b>	
<b>Course Credit Hours</b>	3.0
<b>Text Book</b>	Calculus, Early Transcendentals, Howard Anton, Irl Bivens, Stephen Davis, 10 <sup>th</sup> edition, John Wiley & Sons, Inc., 2013, ISBN NO. 978-1-11809240-8
<b>Reference Book</b>	Calculus, James Stewart, 7 <sup>th</sup> edition, Cengage Learning, 2012, ISBN NO. 978-0-538-49781-7

### Course Short Description

This course is intended to develop practical skills in differential and integral calculus, including their applications to various technical problems. The basic differential rules will be introduced as well as the methods of differentiating algebraic and transcendental functions will be developed. The definite integrals and indefinite integrals, along with their applications in finding the area, will be studied.

### Course Objectives

1. To classify different types of functions, approximate their limits both numerically and graphically as well as their continuity at a point or determine the intervals of continuity.
2. To apply the concept of limits and continuity to understand the principles of differentiation and integration.
3. To differentiate all types of functions, including implicit and explicit type using different methods, and apply differentiation to determine the rate of change, maxima and minima of functions.
4. To integrate different types of functions either by using the integral table or substitution technique and apply the definite integral to obtain the area under curves.

## Course Learning Outcomes

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

- **(CO-1)** Demonstrate the ability to identify the type of a given function, approximate its limit both numerically and graphically, as well as its continuity at a given point, or determine the intervals of continuity of the function.
- **(CO-2)** Determine the differentiability and integrability of functions using the concepts of limits and continuity. Determine the differentiability and integrability of functions using the concepts of limits and continuity.
- **(CO-3)** Differentiate various types of functions comprising both the implicit and explicit types using different methods and apply differentiation to determine the rate of change and maxima and minima of functions.
- **(CO-4)** Evaluate the integral associated with different types of functions either by using the integral table or substitution technique; interpret the geometric meaning of integral and apply this concept to solve geometric and physical problems, such as finding the area under curves.

### Mapping of Course Outcomes

CLOs	Course Outcomes (CO)	Bloom's taxonomy domain/level (C: Cognitive P: Psychomotor A: Affective)	Delivery methods and activities	Assessment tools
CO-1	Demonstrate the ability to identify the type of a given function, approximate its limit both numerically and graphically, as well as its continuity at a given point, or determine the intervals of continuity of the function.	C1, C2, C3	Lectures, Notes	Quiz, Assignment, Discussions
CO-2	Determine the differentiability and integrability of functions using the concepts of limits and continuity.	C3, C4	Lecture, group discussion	Assignment, Class participation, Midterms
CO-3	Differentiate various types of functions comprising both the implicit and explicit types using different methods and apply differentiation to determine the rate of change and maxima and minima of functions.	C1, C3, P2	Lecture, group discussion	Assignment, Class participation, Midterms
CO-4	Evaluate the Integrals associated with different types of functions either by using the integral table or substitution technique; interpret the geometric meaning of integral and apply this concept to solve geometric and physical problems, such as finding the area under curves.	C1, C3, P2	Lecture, group discussion	Assignment, Class Participation, Final Exam

### Course Assessment System:

Category	Attendance	Assignments	Quizzes	Mid-term	Final-Exam
Weight	10%	10%	20%	25%	35%

## Lesson Plan

Lecture No.	Topics	Article no. in the textbook	Assessment tools	Learning Outcomes
1-3	Functions, Families of Functions, Inverse Functions, Inverse Trigonometric Functions, Exponential and Logarithmic Functions	0.2,0.3, 0.4, 0.5	Discussions, Quiz 1 Assignment I	CO-1
4-6	Limits, Computing Limits, End Behavior of Functions, Continuity, Continuity of Functions	1.1,1.2,1.3, 1.5,1.6	Quiz 1, Midterm Assignment I	CO-1
7-9	Tangent lines, Rates of Change, The Derivative Function, Techniques of Differentiation,	2.1, 2.2, 2.3	Quiz 2, Midterm Assignment I	CO-2, CO-3
10-12	The Product and Quotient Rules, Derivatives of Trigonometric Functions, The Chain Rule	2.3, 2.4, 2.5,2.6	Midterm	CO-3
13	<b>Midterm</b>			
14-16	Implicit Differentiation, Derivatives of Logarithmic Functions, Derivatives of Exponential and Inverse Trigonometric Functions	3.1, 3.2, 3.3	Quiz 3, Final Exam Assignment II	CO-3
17-19	Related Rates Problem, L'Hopital's Rule; Indeterminate Forms	3.4, 3.6	Quiz 3, Final Exam Assignment II	CO-3
20-23	Analysis of Functions: Increase, Decrease, Concavity, Relative Extrema, Absolute Maxima, and Minima and their application	4.1, 4.2, 4.4, 4.5	Quiz 4, Final Exam Assignment III	CO-3
24-26	The Indefinite Integral and Integration by Substitution, The Definition of Area as a Limit; Sigma Notation	5.2, 5.3, 5.4	Quiz 4, Final Exam Assignment III	CO-4
27-28	The Definite Integral and The Fundamental Theorem of Calculus, Evaluating Definite Integrals by Substitution	5.5, 5.6, 5.9	Final Exam	CO-4
29	Review and discussion about the final exam			
<b>Final Exam (Declared by the Controller of Examinations)</b>				

**Note:** The instructor reserves the right to make changes to the syllabus if necessary.

### Classroom Rules of Conduct

Please Refer to NSU Student Handbook, Sections: “Disciplinary Actions” and “Procedures and Guidelines.”

### Exams & Make-up Exam Policy

NO makeup for quizzes and NO Formative assessment will be retaken under any circumstances. If a student misses the Midterm and/or Final exams due to circumstances beyond their control (official valid documents are required) and is informed beforehand (if possible), reasonable arrangements may be considered. Please note that the retake exam questions are generally a bit tricky and critical compared to the regular exam questions. **Students may get the opportunity to see/recheck their midterm and Final exam scripts.** **Cell phones are prohibited in exam sessions.**

**Attendance Policy:** As per NSU policy.

**Grading Policy:** As per NSU policy.