



# 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>	Fall 2022
<b>Course Coordinator</b>	Dr. Preetom Nag (preetom.nag@northsouth.edu)

### 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>	North South University (NSU) Website: <a href="http://www.northsouth.edu">http://www.northsouth.edu</a> Department Website: <a href="http://www.northsouth.edu/academic/seps/mp.html">http://www.northsouth.edu/academic/seps/mp.html</a>

### Course & Section Information

<b>Prerequisites</b>	MAT 116
<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

<b>Course Assessment System:</b>		<b>Grading Policy:</b>		
<b>Category</b>	<b>Weight</b>	<b>Numerical Scores</b>	<b>Letter Grade</b>	<b>Grade Points</b>
Attendance	10%	93 & above	A	4.0
Assignments (Minimum 3)	10%	90 - 92	A-	3.7
Quizzes (Best 3 of 4)	15%	87 - 89	B+	3.3
Mid-Term	30%	83 - 86	B	3.0
Final Exam	35%	80 - 82	B-	2.7
		77 - 79	C+	2.3
		73- 76	C	2.0
		70 - 72	C-	1.7
		67 - 69	D+	1.3
		60 - 66	D	1.0

### 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 its 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 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.

## Mapping of Course Outcomes

CLOs	Course Outcomes (CO)	Bloom's taxonomy domain/level <i>(C: Cognitive P: Psychomotor A: Affective)</i>	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	C1, C3, P2	Lecture, group discussion	Assignment, Class participation, Midterms

	the rate of change and maxima and minima of functions.			
CO-4	Evaluate the Integrals associated with different type 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

## Lesson Plan

Lecture	Topics	Article no. in the textbook	Assessment tools	Learning Outcomes
1	Introduction, Functions, Families of Functions	0.1,0.2,0.3	Discussions, Assignment I	CO-1
2	Inverse Functions, Inverse Trigonometric Functions	0.4	Discussions, Quiz 1 Assignment I	CO-1
3	Exponential and Logarithmic Functions	0.5	Discussions, Quiz 1 Assignment I	CO-1
4	Limits, Computing Limits, End Behavior of Functions	1.1,1.2,1.3	Quiz 1, Midterm Assignment I	CO-1
5	Continuity, Continuity of Functions	1.5,1.6	Quiz 2, Midterm Assignment II	CO-1
6	Tangent lines, Rates of Change, The Derivative Function	2.1, 2.2	Quiz 2, Midterm Assignment I	CO-2, CO-3
7	Techniques of Differentiation, The Product and Quotient Rules	2.3, 2.4	Quiz 2, Midterm Assignment II	CO-3
8	Derivatives of Trigonometric Functions, The Chain Rule	2.5,2.6	Quiz 2, Midterm Assignment II	CO-3
9	Implicit Differentiation	3.1	Midterm Assignment II	CO-3
10	Derivatives of Logarithmic Functions	3.2	Midterm Assignment II	CO-3
11	Derivatives of Exponential and Inverse Trigonometric Functions	3.3	Midterm	CO-3
12	<b>Midterm</b>			
13	Related Rates	3.4	Quiz 3, Final Exam Assignment III	CO-3
14	L'Hopital's Rule; Indeterminate Forms	3.6	Quiz 3, Final Exam Assignment III	CO-2
15	L'Hopital's Rule; Indeterminate Forms	3.6	Quiz 3, Final Exam Assignment III	CO-2
16	Analysis of Functions: Increase, Decrease, Concavity	4.1	Quiz 3, Final Exam Assignment III	CO-3
17	Relative Extrema, Absolute Maxima and Minima	4.2, 4.4	Quiz 3, Final Exam Assignment III	CO-3
18	The Indefinite Integral	5.2	Quiz 4, Final Exam Assignment IV	CO-4
19	Integration by Substitution	5.3	Quiz 4, Final Exam Assignment IV	CO-4

20	The Definition of Area as a Limit; Sigma Notation	5.4	Quiz 4, Final Exam Assignment IV	CO-4
21	The Definite Integral	5.5	Quiz 4, Final Exam Assignment IV	CO-4
22	The Fundamental Theorem of Calculus	5.6	Discussions	CO-4
23	Evaluating Definite Integrals by Substitution	5.9	Final Exam	CO-4
24	Review and discussion about final exam			

### **Final Exam (Declared by the Controller of Examinations)**

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

#### **Classroom Rules of Conduct**

1. Electronic devices e.g., **cell phone, laptop, notepad, iPad, iPod, mp3, etc.** are strictly prohibited in the class.
2. It is imperative that the students maintain absolute discipline in class. Students are also expected to arrive on time for the class, as frequent late attendance will not be accepted.
3. **Academic Integrity Policy:** Department of Mathematics and Physics does not tolerate academic dishonesty by its students. At minimum, students must not be involved in cheating, copyright infringement, submitting the same work in multiple courses, significant collaboration with other individuals outside of sanctioned group activities, and fabrications.

Students are advised that violations of the Student Integrity Code will be treated seriously, with special attention given to repeated offences.

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

#### **Exams & Make-up Exam Policy**

**Four** quizzes will be taken (best **Three** out of **Four** will be considered). **No make-up quizzes or midterm will be taken under any circumstances.** If a student misses any of the Midterm exams due to the circumstances beyond their control (official valid documents are required) and informed beforehand (if possible), reasonable arrangement may be considered. **The right to reserve all these conditions goes to the instructor.** There will be **no extra question** in the Midterm. One extra question will be allowed in Final exam. Please note the retake exam questions are generally a bit tricky and critical compare to the regular exam questions.

**Students will 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