

**N O R T H S O U T H U N I V E R S I T Y**

Centre of Excellence in Higher Education **DEPARTMENT OF MATHEMATICS AND PHYSICS**[*School of Engineering and Physical Sciences*](http://www.northsouth.edu/faculty-members/seas/)

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| **Course Title** | Calculus and Analytical Geometry I |
| **Course Code** | MAT-120 |
| **Semester** | Spring 2022 |
| **Course Coordinator** | Dr. Preetom Nag (preetom.nag@northsouth.edu) |

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| **Instructor & Department Information** | |
| **Instructor's Name** | Dr. Preetom Nag | |
| **Office Room** |  | |
| **Office Hours** |  | |
| **Office Phone** |  | |
| **Email Address** |  | |
| **Links** | North South University (NSU) Website: <http://www.northsouth.edu>  Department Website: <http://www.northsouth.edu/academic/seps/mp.html> | |

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| **Course & Section Information** | |
| **Prerequisites** | MAT 116 | |
| **Class Time** |  | |
| **Course Credit Hours** | 3:0 | |
| **Text Book** | Calculus, Early Transcendentals, Howard Anton, Irl Bivens, Stephen Davis,  10th edition, John Wiley & Sons, Inc., 2013, ISBN NO. 978-1-11809240-8 | |
| **Reference Book** | Calculus, James Stewart, 7th edition, Cengage Learning, 2012, ISBN NO. 978-0-538-49781-7 | |

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| **Marks Distribution:** | **Grading Policy:** |
| |  |  | | --- | --- | | ***Category*** | ***Percentage*** | | Class Assessment | 5% | | Attendance | 10 % | | Assignments (4) | 10% | | Quizzes (Best 2 of 4) | 20% | | Mid-Term | 25% | | Final Exam | 30% | | |  |  |  | | --- | --- | --- | | Numerical Scores | Letter Grade | Grade Points | | 93 & above | A | 4.0 | | 90 - 92 | A- | 3.7 | | 87 – 89 | B+ | 3.3 | | 83 – 86 | B | 3.0 | | 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 | |

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| **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, and the methods of differentiating algebraic and transcendental functions will be developed. The definite integrals and indefinite integrals and their applications in finding the area will be studied. | |

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| **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 types using different methods and applying 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 applying 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, and 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**

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| **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, and 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 |

**Lesson Plan**

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| **Lecture** | **Topics** | **Article no. in the textbook** | **Assessment tools** | **Learning Outcomes** |
| 1 | Introduction, Functions, Families of Functions | 0.1,0.2,0.3 | Discussions,  Quiz 1 | 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 I | CO-1 |
| 6 | Tangent lines, Rates of Change,  The Derivative Function | 2.1, 2.2 | Quiz 2, Midterm  Assignment II | 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  Assignment II | CO-3 |
| 12 | **Midterm** | | | |
| 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 | 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 4, 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 | 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  Assignment IV | CO-4 |
| 24 | Review and discussion about final exam | | | |
| **Final Exam (Declared by the Controller of Examinations)** | | | | |

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

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| **Classroom Rules of Conduct** |
| 1. Electronic devices, e.g**., cell phone**, **laptop, notepad, iPad, iPod, mp3, etc.,** are strictly prohibited in the class.      1. The students must maintain absolute discipline in class. Students are also expected to arrive on time for the class, as frequent late attendance will not be accepted. 2. **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 offenses.  Please Refer to NSU Student Handbook, Sections: "Disciplinary Actions" and "Procedures and Guidelines." | |

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| **Exams & Make-up Exam Policy** |
| Three quizzes will be taken (best **Two** out of **three** will be considered). **No make-up quizzes or midterms will be taken under any circumstances.** If a student missed the Midterm exam due to circumstances beyond their control (valid official documents are required) and informed beforehand (if possible), a reasonable arrangement may be considered. There will be **no extra questions** in the Midterm and Final exams so that students should have to answer all the questions given in the exam script.  Cell phones are **prohibited** in exam sessions. |

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| **Attendance Policy** |
| Students are required and expected to attend all classes regularly and on time and participate in class discussions. North South University mandates to fail students who are absent 25% or more from their classes, even if such absences are excusable. It is the student's responsibility to become aware of other course-related announcements missed during an absence.  Please Refer to NSU Student Handbook, Section: "Study Principles and Policies." |
| **Communication Policy** |
| All communications should take place using the instructor's **email**. Announcements in class will override any statement made here or in any other handouts. It is the student's responsibility to be aware of any class announcements. |
| **Appropriate Use Policy** |
| All members of the North South University community must responsibly use electronic communications. The University may restrict its computers and network systems for electronic communications subject to university policies/codes, local laws, or national laws. Also, the University reserves the right to limit access to its networks through university-owned or other computers and to remove or limit access to material posted on university-owned computers. |

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| **Students Complaints Policy** |
| Students at North South University have the right to pursue complaints related to faculty, staff, and other students.  The nature of the complaints may be either academic or non-academic.  For more information about the policy and processes related to this policy, you may refer to the students' handbook. |
| **Students with Special Needs** |
| North South University will provide educational opportunities that ensure fair, appropriate, and reasonable accommodation to students with disabilities/special needs that may affect their ability to participate in course activities or meet course requirements. Students with disabilities are encouraged to contact their instructors to ensure that their needs are met. The University, through its Special Needs section, will exert all efforts to accommodate special needs.  **Special Needs Section**  Telephones: +88-02-**5566 8200 ext-1220**  Location: **Room # 413/A, Admin Building (**4th floor).  Please Refer to NSU Student Handbook, Section: "Special Needs Services" |