

# North South University



Department of Mathematics & Physics (DMP)  
**Spring 2023**

**MAT250: Calculus and Analytical Geometry (Calculus III)**

Instructor

Office

E-mail

Course coordinator

:Prof. Dr. Md. Mamun Molla

Office hour:

**Course Objectives**

1. To demonstrate the function of several variables and plotting 3D figures.
2. To teach the concept of partial derivatives and their applications.
3. To develop the ability of multiple integration in different coordinate systems.
4. To analyze the vector calculus and their physical significance.

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

**Course Learning Outcomes:**

- (CO-1) Classify the difference between single and several variables functions and limits as well as plotting 3D figures.
- (CO-2) Evaluate the partial derivatives for several variables functions and distinguish ordinary and partial derivatives.
- (CO-3) Apply multiple integration techniques to find area and volume of the different model geometries.
- (CO-4) Demonstrate their understanding of vector calculus and vector algebra.
- (CO-5) Apply line and surface integrals to evaluate the work done and the corresponding flux.

**Mapping of Course Outcomes**

#	Course Outcomes (CO)	Bloom's taxonomy domain/level (C: Cognitive P: Psychomotor A: Affective)	Delivery methods and activities	Assessment tools
CO-1	Classify the difference between single and several variables functions and limits as well as plotting 3D figures.	C1, C2, C3	Lecture Discussion	Quiz, Assignment
CO-2	Evaluate the partial derivatives for several variables functions and distinguish ordinary and partial derivatives.	C3, C4, P2	Lecture, in-class group discussion,	Concept clarification, Midterm exam, Assignment
CO-3	Apply multiple integration techniques to find area and volume of the different model geometries.	C2, C3, P2	Lecture, Discussion	Class work, Quiz, Assignment, Final Exam
CO-4	Demonstrate their understanding of vector calculus and vector algebra.	C2, P2	Lecture, Discussion	Concept, Demonstration, Quiz, Assignment, Final Exam
CO-5	Apply line and surface integrals to evaluate the work done and the corresponding flux.	C2, C3, C4, P2	Lecture Demonstration	Assignment, Final Exam

*Text book : 1. Calculus: Early Transcendental; Anton, Bivens and Davis, 10th Edition.*

<b>Marks Distribution:</b>	Attendance	10%
	Quiz	20%
	Assignment	10%
	Mid-Term Exam	20%
	<u>Final Exam</u>	<u>40%</u>
	Total	100%

**Course Schedule:**

<b>Lesson</b>	<b>Topics</b>	<b>Learning Activities</b>	<b>Assessment tools</b>	<b>Learning Outcome</b>
<b>1</b>	Functions of two variables: drawing of natural domain	Lecture1	Discussions Mid term	CO-1
<b>2</b>	Function of two variables: 3D graph plotting	Lecture1		
<b>3</b>	Limits and Continuity	Lecture  Assignment		CO-1
<b>4</b>	Partial Derivatives: first order derivatives and their physical significance	Lecture  Group Discussion	Discussions Mid term	CO-2
<b>5</b>	Partial Derivatives: 2 <sup>nd</sup> and mixed order derivatives and their applications	Lecture  Discussion	Mid term	CO-2
<b>6</b>	Differentiability and Chain Rule	Lecture	Mid term	CO-2
<b>7</b>	Directional Derivatives	Lecture  Assignment	Mid term	CO-2
<b>8</b>	Tangent planes and normal line	Lecture	Mid term	CO-2
<b>9</b>	maxima and minima	Discussion  Lecture  Assignment	Mid term	CO-2
<b>10</b>	Double Integrals over rectangular regions	Lecture  Assignment	Mid term	CO-3
<b>11</b>	Double Integrals over non-rectangular regions	Lecture	Mid term	CO-1

<b>12</b>	Double Integrals over non-rectangular regions: volume calculation			
<b>13</b>	Revision of the previous lectures	Lecture assignment	Mid term	
<b>14</b>	Midterm (Maximum 13 lectures)			
<b>15</b>	Double Integrals in Polar Coordinates	Lecture assignment	Mid term	CO-3
<b>16</b>	Double Integrals in Polar Coordinates			
<b>17</b>	Triple Integrals: in Cartesian coordinates	Lecture assignment	Mid term	CO-3
	Triple Integrals: in Cartesian coordinates	Lecture assignment	Mid term	CO-3
<b>18</b>	Change of variables in Multiple Integrals; Jacobean (chapter 14.7)	Lecture	Final	CO-3
<b>19</b>	Change of variables in Multiple Integrals; Jacobean (chapter 14.7)			
<b>20</b>	Cylindrical and Spherical Coordinates: chapter 11.8.  We need this chapter for understanding Cylindrical and Spherical Coordinates	Lecture	Final	CO-3
<b>21</b>	Triple Integrals: Cylindrical and spherical coordinates (chapter 14.6)  In this chapter we need the Jacobean concept from the chapter 14.7	Lecture	Final Exam	CO-3
<b>22</b>	Triple Integrals: Cylindrical and spherical coordinates (chapter 14.6)	Lecture	Final Exam	CO-3
<b>23</b>	Vector fields	Lecture	Final Exam	CO-4

<b>24</b>	Line integrals: for scalar function	Lecture	Final Exam	CO-4
<b>25</b>	Line integrals: for vector field	Lecture	Final Exam	CO-4
<b>26</b>	Line integrals: work done calculation	Lecture	Final Exam	CO-4
<b>27</b>	Green's Theorem	Lecture	Final Exam	CO-4
28	Surface Integrals: for scalar function	Lecture	Final exam	CO-5
29	Surface Integrals: for scalar function	Lecture	Final exam	CO-5
30	Divergence theorem	Lecture	Final exam	CO-5
<b>31</b>	Divergence theorem	Lecture	Final exam	CO-5
<b>33</b>	Stokes theorem: verification	Lecture,	Final exam	CO-5
<b>34</b>	Stokes theorem: evaluation of line integral	Lecture,	Final exam	CO-4
<b>35</b>	Stokes theorem: relation with Green's theorem	Lecture,	Final exam <b>Formative assessment</b>	CO-4
<b>36</b>	Revision on the previous lecture for final exam	Lecture,	Final exam	
	<b>Final Exam</b>			

### **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 arrangement may be considered. Please note that the retake exam questions are generally a bit tricky and critical compare 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.