

# MATH 119

## Calculus with Analytic Geometry

**Frequency:** Fall/Spring Terms

**METU Credit & ECTS Credit:** (4-2)5 & 7.5

**Catalog description:** Functions. Limits and Continuity. Tangent lines and derivatives. Chain rule. Implicit differentiation. Inverse functions. Related rates. Linear approximations. Extreme values. Mean Value Theorem and its applications. Sketching graphs. Indeterminate forms and L'Hospital's rules. Definite integral. Fundamental Theorem of Calculus. Substitution. Areas between curves. Formal definition of natural logarithm function. Techniques of integration. Improper integrals. Arc length. Volumes and surface areas of solids of revolution. Parametric plane curves. Polar coordinates. Arc length in polar coordinates.

**Course Objectives:** The sequence Math 119-120 is the Standard complete introduction to the concepts and methods of calculus. It is taken by all engineering students. The emphasis is on concepts, solving problems, theory and proofs. All sections are given a uniform midterm and a final exam. Students will develop their reading, writing and questioning skills in Mathematics.

**Course Coordinator:** Lect. Dr. Muhiddin Uğuz

MidTerm1: 30 % (April 05<sup>th</sup> 2025 at 13:30)  
MidTerm2: 30 % (May 10<sup>th</sup> 2025 at 13:30)  
Final Exam: 40 % (June 14<sup>th</sup> 2025 at 13:30)

**Suggested textbook:**



Robert A. Adams, Christopher Essex  
CALCULUS  
A Complete Course Calculus. Eight or a Higher Edition.  
ISBN 978 0-321-78107-9  
QA303.2.A33 2013

**Reference Books:** Calculus, James Stewart, Fifth or a Higher Edition

**Current Semester Course Home Page:** <http://www.ma119.math.metu.edu.tr/>

**Contact:** [wwwma119@metu.edu.tr](mailto:wwwma119@metu.edu.tr)

Only the e-mails sent to [wwwma119@metu.edu.tr](mailto:wwwma119@metu.edu.tr) will be answered. Mass e-mails will be ignored.

| Week | Dates   | MATH 119 Syllabus 2024-2025 Fall (2024-2)   |   |
|------|---|---|---|
| 1    | Feb.17-21   | <b>Ch 0: Preliminaries</b><br><i>0.1 Real Numbers and the Real Line</i><br><i>0.3 Graphs of Quadratic Equations</i><br><i>0.5 Combining Functions to Make New functions</i><br><i>0.7 The Trigonometric Functions</i> | <i>0.2 Cartesian Coordinates in the Plane</i><br><i>0.4 Functions and Their Graphs</i><br><i>0.6 Polynomials and Rational Functions</i>   |
|      |   | <b>Ch 1: Limits and Continuity</b><br>1.2 Limits of Functions<br>1.3 Limits at Infinity and Infinite Limits   | <b>1.2</b> : 2, 3, 4, 5, 6, 11, 13, 18, 22, 24, 32, 56, 58, 61, 62, 63, 64<br><b>1.3</b> : 3, 6, 10, 14, 20, 25, 29, 33, 34, 50, 51   |
| 2    | Feb.24-28   | 1.4 Continuity<br>1.5 The Formal Definition of Limit  | <b>1.4</b> : 1, 2, 3, 4, 5, 6, 9, 13, 16, 18, 22, 30, 32<br><b>1.5</b> : 4, 6, 8, 10, 12, 16, 20, 27, 30, 31, 37, 38  |
| 3    | Mar.03-07   | <b>Ch 2: Differentiation</b><br>2.1 Tangent Lines and Their Slopes<br>2.2 The Derivative<br>2.3 Differentiation Rules<br>2.4 The Chain Rule   | <b>2.1</b> : 3, 5, 9, 13, 15, 17, 19, 21, 23<br><b>2.2</b> : 1, 3, 11, 17, 23, 25, 27, 31, 35, 37, 41, 43, 45, 47, 49<br><b>2.3</b> : 7, 9, 11, 13, 15, 17, 23, 25, 29, 33, 37, 39, 43, 49, 51, 53<br><b>2.4</b> : 3, 5, 11, 13, 15, 19, 23, 25, 31, 37, 45   |
| 4    | Mar.10-14   | 2.5 Derivatives of Trigonometric Functions<br>2.6 Higher-Order Derivatives<br>2.9 Implicit Differentiation<br>2.8 The Mean-Value Theorem  | <b>2.5</b> : 3, 5, 11, 17, 21, 27, 29, 35, 37, 41, 43, 45, 49, 53, 55, 57, 62<br><b>2.6</b> : 1, 7, 11, 13, 21, 25, 26<br><b>2.9</b> : 3, 7, 9, 11, 13, 17, 21, 27<br><b>2.8</b> : 1, 3, 5, 7, 9, 11, 15  |
| 5    | Mar.17-21   | <b>Ch 3: Transcendental Functions</b><br>3.1 Inverse Functions<br>3.2 Exponential and Logarithmic Functions<br>3.3 The Natural Logarithm and Exponential<br>3.5 The Inverse Trigonometric Functions                   | <b>3.1</b> : 3, 9, 12, 17, 19, 23, 26, 29, 34<br><b>3.2</b> : 7, 17, 26, 31, 32, 35<br><b>3.3</b> : 5, 8, 13, 17, 33, 35, 41, 44, 48, 52, 57, 59, 63, 65<br><b>3.5</b> : 7, 9, 11, 15, 24, 31, 35, 39, 47   |
| 6    | Mar.24-28   | <b>Ch 4: More Applications of Differentiation</b><br>4.1 Related Rates<br>4.3 Indeterminate Forms   | <b>4.1</b> : 1, 2, 3, 4, 5, 6, 7, 13, 14, 22, 26<br><b>4.3</b> : 1, 3, 5, 7, 9, 13, 15, 17, 19, 24, 26, 28  |
| 7    | Apr.02-04<br><small>30 MARCH - 01 APRIL<br/>2025 Religious<br/>holiday (Holiday eve<br/>Saturday)Monday-Tuesday</small>                 | 4.4 Extreme Values<br><b>Midterm-I April 05<sup>th</sup> 2025 at 13:30</b>  | <b>4.4</b> : 1, 3, 5, 7, 8, 11, 13, 17, 19, 21, 25, 29, 31, 35, 39  |
| 8    | Apr.04-11   | 4.5 Concavity and Inflections<br>4.6 Sketching the Graph of a Function  | <b>4.5</b> : 1, 3, 5, 7, 9, 11, 13, 14, 16, 17, 19, 25, 27, 29, 31, 35, 39<br><b>4.6</b> : 1, 2, 3, 4, 5, 6, 15, 16, 17, 18, 29, 31   |
| 9    | Apr.14-18   | 4.6 Sketching the Graph of a Function<br>4.8 Extreme-Value Problems<br>4.9 Linear Approximations  | <b>4.6</b> : 1, 2, 3, 4, 5, 6, 15, 16, 17, 18, 29, 31<br><b>4.8</b> : 1, 3, 7, 9, 11, 13, 17, 18, 21, 31, 32, 42<br><b>4.9</b> : 1, 3, 5, 7, 9, 11, 15, 17, 21  |
| 10   | Apr.21-25<br><small>23 APRIL 2025 National<br/>Holiday (National<br/>Sovereignty and Children's<br/>Day, Wednesday)</small>             | <b>Ch 5: Integration</b><br>5.1 Sums and Sigma Notation<br>5.2 Areas as Limits of Sums<br>5.3 The Definite Integral   | <b>5.1</b> : 3, 5, 11, 13, 17, 21, 31, 33<br><b>5.2</b> : 3, 7, 13, 17, 19<br><b>5.3</b> : 2, 3, 5, 7, 11, 13, 15, 17   |
| 11   | Apr.28-<br>May 02<br><small>01 MAY 2025 Labor and<br/>Solidarity Day (Thursday)</small>   | 5.4 Properties of the Definite Integral<br>2.10 Antiderivatives and the Indefinite Integral<br>5.5 The Fundamental Theorem of Calculus<br>5.6 The Method of Substitution  | <b>5.4</b> : 1, 2, 7, 9, 11, 13, 15, 17, 19, 21, 25, 29, 31, 35, 36, 37, 39<br><b>5.5</b> : 3, 7, 11, 13, 15, 17, 19, 23, 27, 29, 31, 33, 37, 39, 41, 43, 45, 46, 47, 49, 51, 52, 53, 54<br><b>5.6</b> : 1, 3, 5, 7, 8, 9, 10, 11, 12, 13, 15, 17, 18, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 40, 41, 43, 44, 45, 47, 48, 49, 50, 51 |
| 12   | May 05-09   | <b>Ch 6: Techniques of Integration</b><br>6.1 Integration by Parts<br>6.2 Integrals of Rational Functions<br>6.3 Inverse Substitutions  | <b>6.1</b> : 5, 7, 10, 11, 13, 15, 17, 19, 21, 23, 25, 27, 28, 29, 33, 37<br><b>6.2</b> : 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31<br><b>6.3</b> : 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 44, 45, 47, 49, 51   |
| 13   | May 12-16   | 6.5 Improper Integrals (including Limit Comparison Test and Absolute Convergence)<br><b>Midterm-II May 10<sup>th</sup> 2025 at 13:30</b>  | <b>6.5</b> : 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 24, 25, 31, 33, 35, 37, 39, 41, 42  |
| 14   | May 20-23<br><small>19 MAY 2025 National<br/>Holiday (Commemoration of<br/>Atatürk &amp; Youth and Sports<br/>Festival, Monday)</small> | <b>Ch 7: Applications of Integration</b><br>5.7 Areas of Plane Regions<br>7.1 Volumes by Slicing-Solids of Revolution   | <b>5.7</b> : 3, 5, 9, 11, 15, 17, 19, 21, 23, 29<br><b>7.1</b> : 1, 3, 7, 11, 13, 15, 19  |
| 15   | May 26-30   | 7.3 Arc Length and Surface Area<br><b>8.5 Polar Coordinates and Polar Curves</b><br>Catch up<br><b>Final Exam June 14<sup>th</sup> 2025 at 13:30</b>  | <b>7.3</b> : 3, 5, 7, 9, 11, 13, 14, 21, 24, 25, 27, 28, 29<br><b>8.5</b> : 3, 4, 5, 7, 9, 11, 13, 16, 18, 22, 26   |

## **MATH 119 Course Policy (2024-2)**

This document/announcement contains all the necessary information that you need to know about the structure of the *MATH 119: Calculus with Analytic Geometry* course. More information will be announced on the official website of the course and the ODTUCLASS page. All students enrolled in this course are supposed to follow these websites regularly.

*MATH119 Coordination reserves the right to make necessary changes in this policy depending on the situations which are out of our control. So it is your responsibility to follow the announcements in the webpage of the course regularly.*

### **Lectures and Recitations**

Lectures and Recitations are delivered as announced in **Schedule of Lectures** on the official website of the course. Keep in mind that this course is **6 (=4+2) hours per week**.

The first 2+2=4 hours are for **lectures** and the last 2 hours are for **recitations**. See "the schedule of lectures"- tab on the MATH119 web page when available.

### **Class Attendance**

You are **expected** to attend all lectures and recitations. However no attendance will be taken.

### **Make up for Exams and Assignments**

You can have at most one make-up exam. In order to be able to take the make-up exam, you must present a reasonable excuse (such as a medical report or an academic leave).

**After the final exam**, there will be a form on ODTUClass and via that form, you will apply the make-up exam instead of one missed exam and will send your reasonable excuse to **wwwma119@metu.edu.tr**.

### **Eligibility to take the Final Exam and NA Grade**

If your two midterm scores (each one out of 100 points) add up to less than 20 points (out of 200 points in total), then you cannot take the Final Exam and will receive an **NA** grade from the course.

If you did not attend the Final Exam and if you do not have the right to take make-up exam for Final, you will receive an **NA** grade.

### **Who gets NA grade?**

(A) Before the final exam, students will be categorized in the following way:

1)  $M1 + M2 \geq 20$

2)  $M1 + M2 < 20$ ,

for which M1 is the Midterm 1 score out of 100, and M2 is the Midterm 2 score out of 100.

- Students in group **1** will be able to take the final exam.
- Students in group **2** will **NOT** be able to take the final exam. They will get an automatic **NA** grade.

### **Examples:**

**a)** Student A attends to Midterm 1 and his score is 20. He/she does not take Midterm 2 being on leave for academic/medical reasons. Since  $M1+M2 = 20 \geq 20$ , He/she is eligible for the final exam. If he/she submits relevant documents, it is also possible to take make-up exam which is given after the final. *No problem at all.*

**b)** Student B does not attend to Midterm 1 because of their illness. He/she attends to Midterm 2 and get 18 points. Since  $M1+M2 = 18 < 20$ , he/she won't be able to take final exam and get NA grade. **It should be in mind that in this example, taking make-up for Midterm is not possible even if he/she has an appropriate official document (academic/medical report etc.).**

**(B)** According to the university's rules and regulations governing undergraduate studies (Article 24),

*"...The grade NA is designated due to one of the conditions below. The grade NA is processed as FF in the calculation of the Grade Point Average.*

*1) Not fulfilling the attendance requirements for the theoretical and practical course hours as indicated in the course schedule.*

*2) Not qualifying to take the final exam due to failure in fulfilling the provisions regarding course practices.*

*3) Having taken none of the mid-term and final examinations.*

*..."*

**Note that each instructor/the coordination of the course reserves the right to determine whether the attendance requirements indicated in the above policy (B-1) applies to the students of their section or not.**

### **Information for Students with Disabilities**

Students who experience difficulties due to their disabilities and wish to obtain academic adjustments and/or auxiliary aids must contact ODTU Disability Support Office and/or course instructor and the advisor of students with disabilities at academic departments (for the list:

<http://engelsiz.metu.edu.tr/en/advisor-students-disabilities>) as soon as possible. For detailed information, please visit the website of Disability Support Office: <https://engelsiz.metu.edu.tr/en/>

### **Academic Honesty**

The METU Honour Code is as follows: "Every member of METU community adopts the following honour code as one of the core principles of academic life and strives to develop an academic environment where continuous adherence to this code is promoted. The members of the METU community are reliable, responsible and honourable people who embrace only the success and recognition they deserve, and act with integrity in their use, evaluation and presentation of facts, data and documents."