

# **MATH 120 Calculus of Functions of Several Variables**

**Course Number and Title:** MATH 120 Calculus of Functions of Several Variables

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

**Catalogue Description:** Sequences and infinite series. Power series. Taylor series. Vectors and analytic geometry in 3-space. Functions of several variables: limits, continuity, partial derivatives. Chain rule. Directional derivatives. Tangent planes and linear approximations. Extreme values. Lagrange multipliers. Double integrals. Double integrals in polar coordinates. General change of variables in double integrals. Surface parametrization and surface area in double integrals. Triple integrals in Cartesian, cylindrical and spherical coordinates. Parametrization of space curves. Line integrals. Path independence. Green's theorem in the plane.

**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.

**Prerequisites:** Math 119

**Course Coordinator:** Asst. Prof. Dilber KOÇAK

**Office Hours:**

**Dilber KOÇAK:** Tuesday 09:30-10:30

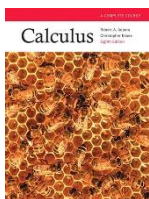
**Ahmet BEYAZ:** Tuesday 10:40-12:30

**Melike ÇAKMAK:** Thursday 9:40-11:30

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|---|-----|
| <b>Midterm I (November 16, 2024, at 17:00)</b>  | 30% |
| <b>Midterm II (December 21, 2024, at 17:00)</b> | 30% |
| <b>Final Exam (TBA)</b>                         | 40% |

For more details about exams and grading, see the announcements on the Course Home page.

## **Suggested textbook:**



Robert A. Adams, Christopher Essex

CALCULUS

A Complete Course Calculus. Eight (or any newer) Edition.

ISBN 978 0-321-78107-9

QA303.2.A33 2013

**Reference Books:** Calculus

James Stewart, Fifth Edition

**Current Semester Course Home Page:** <http://www.ma120.math.metu.edu.tr/>

**Contact:** [wwwma120@metu.edu.tr](mailto:wwwma120@metu.edu.tr)

| Week | Dates                   | Syllabus (Math 120) 2024-1   | Suggested Problem List  |
|------|-------------------------|--|---|
| 1    | September 30-October 04 | <b>Ch. 9: Sequences, Series, and Power Series</b><br>9.1 Sequences and Convergence   | <a href="#">Worksheet on Sequences and Series</a><br>9.1: 6,8,10,17,18,19,24,26,29,31,35                            |
| 2    | October 07-11           | 9.2 Infinite Series<br>9.3 Convergence Tests for Positive Series   | 9.2: 4,6,8,10,12,14,26,27,28,29,30,31<br>9.3: 4,6,12,16,18,20,24,26,38,42   |
| 3    | October 14-18           | 9.4 Absolute and Conditional Convergence<br>9.5 Power Series   | 9.4: 2,4,8,10,16,20,24,27<br>9.5: 4,8,10,13,14,17,18,22,26,28,30  |
| 4    | October 21-25           | 9.6 Taylor and Maclaurin Series<br>9.7 Applications of Taylor and Maclaurin Series<br><b>Ch. 10: Vectors and Coordinate Geometry in 3-Space</b><br>10.1 Analytic Geometry in Three Dimensions<br>10.2 Vectors                            | 9.6: 6,8,12,18,22,26,34,35,40<br>9.7: 6,7,12,16,18,24<br><br>10.1: 6,19,22,27,32,36,40<br>10.2: 4,13,16,18,22,26,31 |
| 5    | October 28-November 01  | 10.3 The Cross Product in 3-Space<br>10.4 Planes and Lines<br>10.5 Quadric Surfaces  | 10.3: 3,5,14,15,17,20,23<br>10.4: 3,6,9,18,23,26,28,29<br>10.5: 3,5,8,10,12,15,17,20,21                             |
| 6    | November 04-08          | <b>Ch. 12: Partial Differentiation</b><br>12.1 Functions of Several Variables<br>12.2 Limits and Continuity  | 12.1: 4,5,8,12,13,14,20,24<br>12.2: 2,6,8,10,12,14,18   |
| 7    | November 11-15          | 12.3 Partial Derivatives<br>12.4 Higher-Order Derivatives<br>12.5 The Chain Rule<br>12.6 Linear Approximations<br><b>Midterm I (November 16, 2024, at 17:00)</b>   | 12.3: 4,5,6,11,12,16,17,21,24,28,31,36,39<br>12.4: 4,10,16<br>12.5: 4,8,16,18,29,30<br>12.6: 4,6,10,16              |
| 8    | November 18-22          | 12.7 Gradients and Directional Derivatives<br>12.8 Implicit Functions ( <i>"Systems of Equations" is not included</i> )<br><b>Ch. 13: Applications of Partial Derivatives</b><br>13.1 Extreme Values                                     | 12.7: 4,8,10,17,18,19,22,26,36<br>12.8: 2,5,6,11<br>13.1: 1,3,6,7,9,11,17,19,24,26                                  |
| 9    | November 25-29          | 13.2 Extreme Values of Functions Defined on Restricted Domains<br>13.3 Lagrange Multipliers<br><b>Ch. 14: Multiple Integration</b><br>14.1 Double Integrals  | 13.2: 3,5,7,8,9,11,17<br>13.3: 1,3,5,7,9,11,19,21,22<br>14.1: 5,13,15,18,19   |
| 10   | December 02-06          | 14.2 Iteration of Double Integrals in Cartesian Coordinates<br>14.4 Double Integrals in Polar Coordinates<br>14.5 Triple Integrals   | 14.2: 1-27 odd<br>14.4: 1-25 odd<br>14.5: 2,4,6,7,9,10,14,15  |
| 11   | December 09-13          | 14.6 Change of Variables in Triple Integrals<br><b>Ch. 11: Vector Functions and Curves</b><br>11.1 Vector Functions of One Variable<br>11.3 Curves and Parametrizations<br><b>Ch. 15: Vector Fields</b><br>15.1 Vector and Scalar Fields | 14.6: 2,3,4,6,10,12,16<br><br>11.1: 8,10,16,18<br>11.3: 1,2,3,4,6,8,17,18,24<br><br>15.1: 2,3,6                     |
| 12   | December 16-20          | 16.1 Gradient, Divergence, and Curl<br>15.2 Conservative Fields<br>15.3 Line Integrals<br><b>Midterm II (December 21, 2024, at 17:00)</b>  | 16.1: 3,4<br>15.2: 2,6,9<br>15.3: 2,6,8,13,14   |
| 13   | December 23-27          | 15.3 Line Integrals<br>15.4 Line Integrals of Vector Fields<br><b>Ch. 16: Vector Calculus</b><br>16.3 Green's Theorem in the Plane   | 15.3: 2,6,8,13,14<br>15.4: 4,6,8,9,13,22<br><br>16.3: 1,2,3,4,5,6,7,9   |
| 14   | December 30-January 03  | 16.3 Green's Theorem in the Plane<br><b>Final Exam (TBA)</b>   | 16.3: 1,2,3,4,5,6,7,9   |
|      |                         |  |   |

## **MATH 120 Course Policy (2024-1)**

This document/announcement contains all the necessary information that you need to know about the structure of the *MATH 120: Calculus of Functions of Several Variables* 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.

*MATH 120 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 MATH120 web page when available.

### **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 ODTÜClass and via that form, you will apply the make-up exam instead of one missed exam and will send your reasonable excuse to **wwwma120@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."