

Identification	Subject	MATH 225, Linear algebra and mathematical analysis, 6 ECTS
	Department	Mathematics
	Program	Undergraduate
	Term	Fall, 2026
	Instructor	Osmanov Vüsal
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	Classroom/hours	Friday: 15:20-16:50; 17:00-18:30
	Office hours	
Prerequisites	Students should have a good understanding of high school algebra and trigonometry. While prior experience with calculus can be helpful, it is not required, as essential calculus concepts will be introduced during the course.	
Language	English	
Compulsory/Elective	Compulsory	
Description	Linear Algebra and Mathematical Analysis is a core course offered by the School of Economics and Management. This introductory course provides foundational knowledge in two key areas: Linear Algebra and Mathematical Analysis. Topics include matrix operations, determinants, systems of linear equations, as well as fundamental concepts of limits and differentiation.	
Required textbooks and course materials	1. George Thomas, et al, Thomas' Calculus: Early Transcendental, 12th edition, Addison-Wesley (2022), (http://libgen.org/) 2. V.V. Konev. Linear Algebra, Vector Algebra and Analytical Geometry, Textbook. Tomsk: TPU Press, 2019, 114 pp. 3. David C. Lay, Linear Algebra and its Applications. 4th edition, 2021 Supplementary book 1. Mathematics for Economists: An Introductory Textbook (5th Edition) Authors: Malcolm Pemberton, Nicholas Rau Publication Year: 2023 (Manchester University Press) 2. An introduction to Linear Algebra (6th Edition) Author: Gilbert Strang Publication Year: 2023 (Wellesley- Cambridge Press).	
Course outline	This course introduces undergraduate students to the fundamental concepts of Linear Algebra and Mathematical Analysis, with a focus on applications in economics and management sciences. Topics include matrix operations, determinants, solving systems of linear equations, and core calculus concepts such as limits, continuity, and differentiation.	
Course objectives	By the end of this course, students will be able to: • Understand and apply the fundamental principles of matrix algebra, including matrix operations and their role in solving systems of linear equations. • Calculate determinants and utilize them to analyze properties of matrices relevant to economic models. • Solve systems of linear equations effectively using methods such as Gaussian elimination. • Comprehend the concept of functions with a focus on trigonometric functions and their applications. • Develop a thorough understanding of limits and continuity as foundational concepts in mathematical analysis. • Apply differentiation techniques, including the chain rule, to analyze and interpret the behavior of functions.	

	Utilize derivatives to solve practical problems involving rates of change and tangents to curves, relevant to economic contexts.		
Learning outcomes	Upon successful completion of this course, students will be able to: - Perform matrix operations accurately and confidently. - Calculate determinants and interpret their significance in matrix algebra. - Solve systems of linear equations using methods such as Gaussian elimination. - Understand the concept of functions, including trigonometric functions. - Calculate limits of functions at specific points. - Determine derivatives of functions using differentiation rules, including the chain rule. - Apply mathematical theorems and techniques to solve real-world problems relevant to economics.		
Teaching methods	Lecture	x	
	Experiential exercise		
	Assisted work	x	
	Assisted lab work	x	
	Others		
Evaluation	Methods	Date/deadlines	Percentage (%)
	Midterm Exam		30
	Class Participation		5
	Quizzes		20 (4 quizzes)
	Activity		5
	Project (3 phases)		-
	Final Exam		40
	Total		100
Policy	Use of Generative AI Tools The use of generative artificial intelligence (GAI) tools is strictly prohibited in this course. The primary aim of the course is to develop students' independent mathematical reasoning, problem-solving skills, and creative thinking. Students are therefore expected to complete all assignments and assessments independently without the use of GAI tools. If it is determined that a student has used generative artificial intelligence (GenAI) tools while completing assignments, one of the following measures may be applied: - Issuing an oral or written warning; - Requiring the resubmission of the assignment; - Reducing the grade for the assignment or assigning a zero (0). - NO CELL PHONES are allowed during lecture and lab sessions. PLEASE turn them off before lecture! (Not silent or vibrating mode). This is a university policy and violators will be reprimanded accordingly. - No late assignments will be accepted without prior arrangement with the instructor for acceptable excuses. Medical and family emergency will be considered on case-by-case basis. - No late homework will be accepted. Homework is to be completed on an individual basis. Students may discuss homework with classmates, but students are responsible for your own work. If students have consulted classmates, please note the individuals name on the top of students' assignment.		

	• Quizzes may be given unannounced throughout the term and will count as one homework. There will be no make-up quizzes. • Students will be divided into groups of 3 individuals for study group sessions and will be assigned some problems to solve together in the class. • No make-up exams. If students miss an exam, a zero score will be assigned to the missed exam. • If students should miss class due to personal emergency or medical reasons, please notify the instructor by email immediately. A doctor's note will be required for make-up work. • Students are responsible for completing the reading assigned from the textbook related to the covered topics and for checking email regularly for important information and announcements related to the course. • University policy on academic honesty concerning exams and individual work will be strictly enforced.
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Week	Date/Day (Tentative)	Topics	Textbook/Assignments
1	18. 09. 2026	Systems of linear equations. Row reduction and Echelon forms.	[3], 1.1, 1.2
2	25. 09. 2026	Vector equations. The matrix equation $Ax = b$.	[3], 1.3, 1.4
3	02.10.2026	Solution sets of linear systems. Applications of linear systems.	[3], 1.5, 1.6 Quiz-1 (5 pts)
4	09.10.2026	Linear independence. Introduction to linear transformations.	[3], 1.7, 1.8
5	16.10.2026	The matrix of a linear transformation. Matrix operations.	[3], 1.9, 2.1
6	23.10.2026	The inverse of a matrix. Characterizations of invertible matrices	Quiz-2(5 pts) [3], 2.2, 2.3
7	30.10.2026	Partitioned matrices. Matrix factorizations.	2.4, 2.5
8	06.11.2026	Characterizations of invertible matrices Introduction to determinants. Dimension and rank.	[3], 2.8, 2.9
9	13.11.2026	Midterm Exam One-Sided Limits Limits Involving Infinity; Asymptotes of Graphs	[1] Ch. 2.4, 2.6
10	20.11.2026	Tangents and the Derivative at a Point Derivative as a function	[1] Ch. 3.1, 3.2, 3.3 Quiz-3(5 pts)
11	27.11.2026	The Derivative as a Rate of Change Derivatives of Trigonometric Functions	[1] Ch. 3.4, 3.5
12	04.12.2026	The Chain Rule Implicit Differentiation	[1] Ch. 3.6, 3.7
13	11.12.2026	Extreme values of functions Monotonic functions and the first derivative test Concavity and curve sketching	[1] Ch. 4.1, 4.2, 4.4
14	18.12.2026	Antiderivatives Integration by parts	[1] Ch. 4.8, 8.1 Quiz-4(5 pts)
15	25.12.2026	Trigonometric Integrals Integration of rational functions by partial fractions	[1] Ch.8.2, 8.4
	TBA	Final Exam	

This syllabus is a guide for the course and any modifications to it will be announced in advance.