

OSTIM TECHNICAL UNIVERSITY FACULTY OF ECONOMICS AND ADMINISTRATIVE SCIENCES ECONOMICS DEPARTMENT COURSE SYLLABUS FORM 2022-2023 FALL

MATH 103 Mathematics I										
Course Name Course Code Period Hours Application Laboratory Credit ECTS										
Mathematics I	MATH 103	1	3	0	0	3	6			

Language of Instruction	English
Course Status	Compulsory
Course Level	Bachelor
Learning and Teaching Techniques of the Course	Lecture, Question-Answer, Problem Solving
Class Time/Classroom	Wednesdays 10:00-12:50 / Classroom 440 (Section 1) Fridays 11:00-13:50 / Classroom 440 Section 2)
Instructor	Asst. Prof. Dr. Serkan Bürken
Office	9 th Floor, 907
E-mail	serkan.burken@ostimteknik.edu.tr
Office Hours	09:00-12:00 on Tuesdays and 14:00-17:00 on Wednesday and by e-mail
Teaching Assistants	(If Applicable) Huzeyfe Erkam Candan (<u>huzeyfe.candan@ostimteknik.edu.tr</u>) Office Hours: By e-mail

Course Objective

This course covers the basics of Calculus which is required to be used in economic analysis. The course includes functions and models, limits and derivatives, differentiation rules, integral applications and techniques, and finally, further integration applications. The main aim of the course is to introduce several methods and techniques of Calculus to enable the students to use them in economic analysis. The course is designed to enhance students' ability to integrate mathematics into economic analysis to improve quantitative research skills and research.

Learning Outcomes

The students who succeeded in this course will be able;

- To master the basic concepts of Calculus in the literature,
- To comprehend basic methods and techniques of Calculus,
- To utilize methods and techniques of Calculus in economic analysis
- To integrate analytical concepts into economic analysis,
- To think critically while using mathematics in several real-life and economic problems
- To evaluate and enhance data for making effective economic analysis



Course Outline

This course will begin with a review of algebra, analytic geometry, functions, and trigonometry at an introductory level. This two-week part aims to understand whether the students are ready to take Calculus to expand their knowledge. This part is important for students to understand whether their high school studies are well enough to sustain this course. Then, the course will skip to the real part and the introduction of functions and models will be introduced to make a basis for limits and derivatives. Then, in the fifth week, limits and derivatives will be taught. In the sixth and seventh weeks, two major topics; namely, differentiation rules and applications, will be introduced to further expand the calculus knowledge of the students. The week of eight is for the midterm exam. By the ninth week, integral, its applications, and its techniques will be taught until the fifteenth week. Last week will be for problem-solving including whole topics and is expected to be a preparation for the final exam in which students will be responsible for whole topics taught in the course. In addition to this, problem-solving sessions will be held once per two weeks during the semester. Upon necessity, several quizzes could be organized to hold students' interests alive in the course.

	Weekly Topics and Related Preparation Studies								
Weeks	Topics	Preparation Studies							
1	Course Introduction (Diagnostic: Algebra, Analytic Geometry, Functions and Trigonometry)	 Why do we need Maths for Economics? What is Calculus? Introduction to the course Course Syllabus and requirements 							
2	Diagnostic: Algebra, Analytic Geometry	 Are we ready to begin Calculus? Review of Algebra Review of Analytic Geometry Problem Solving 							
3	Diagnostic: Functions, Trigonometry	Review of FunctionsReview of TrigonometryProblem Solving							
4	Functions and Models	 Four Ways to Represent a Function Mathematical Models: A Catalog of Essential Functions New Functions from Old Functions Exponential Functions Inverse Functions and Logarithms 							



5	Limits and Derivatives	 The Tangent and Velocity Problems The Limit of a Function Calculating Limits Using the Limit Laws The Precise Definition of a Limit Problem-solving session Continuity Limits at Infinity; Horizontal Asymptotes Derivatives and Rates of Change
6	Differentiation Rules	 The Derivative as a Function Derivatives of Polynomials and Exponential Functions The Product and Quotient Rules Derivatives of Trigonometric Functions The Chain Rule Implicit Differentiation Derivatives of Logarithmic Functions Rates of Change in the Natural and Social Sciences Exponential Growth and Decay Related Rates Linear Approximation and Differentials Hyperbolic Functions Problem-solving session
7	Applications of Differentiation	 Rates of Change in the Natural and Social Sciences Exponential Growth and Decay Related Rates Linear Approximation and Differentials Hyperbolic Functions Problem-solving session
8	MIDTERMI	EXAM
9	Applications of Differentiation	 Graphing with Calculus and Calculators Optimization Problems Newton's Method Antiderivatives Problem-solving session
10	Integrals	 Areas and Distances The Definite Integral The Fundamental Theorem of Calculus Indefinite Integrals and the Net Change Theorem The Substitution Rule



15	Problem Solving	 Problem-solving including all topics
		 Applications to Economics and Biology Probability
14	Further Applications of Integration	 Arc Length Area of a Surface of Revolution Applications to Physics and Engineering
12-13	Techniques of Integration	 Integration by Parts Trigonometric Integrals Trigonometric Substitution Integration of Rational Functions by Partial Fractions Strategy for Integration Integration Using Tables and Computer Algebra Systems Approximate Integration Improper Integrals Problem-solving session
11	Applications of Integration	 Areas Between Curves Volume Volumes by Cylindrical Shells Work Average Value of a Function Problem-solving session

Textbook(s)/References/Materials:

Textbook: James Stewart (2018). Calculus: Early Transcendentals, 8th edition **Supplementary References:** R. A. Barnett, M. R. Ziegler, K. E. Byleen (2015). Finite Mathematics for Business, Economics, Life Sciences, and Social Sciences, 13th ed., Prentice-Hall. Gilbert Strang (1991). Calculus, MIT. Available at: https://ocw.mit.edu/ans7870/resources/Strang/Edited/Calculus/Calculus.pdf **Other Materials:-**

Assessment								
Studies Number Contribution margin (%)								
Attendance								
Lab								
Class participation and performance	1	10						
Field Study								
Course-Specific Internship (if any)								
Quizzes / Studio / Critical	5	10						
Homework								



Presentation		A
Projects		
Report		
Seminar		
Midterm Exam/Midterm Jury	1	30
General Exam / Final Jury	1	50
Total		100
Success Grade Contribution of Semester Studies		50
Success Grade Contribution of End of Term		50
Total		100

ECTS / Workload Table							
Activities	Number	Duration (Hours)	Total Workload				
Course hours (Including the exam week): 16 x total course hours)	16	3	48				
Laboratory							
Application							
Course-Specific Internship (if any)							
Field Study							
Study Time Out of Class	16	3	48				
Presentation / Seminar Preparation							
Projects							
Reports							
Homework							
Quizzes / Studio Review	5	1	5				
Preparation Time for Midterm Exams / Midterm Jury	2	20	40				
Preparation Period for the Final Exam / General Jury	1	40	40				
Total Workload	(181/3	30 = 6,03)	181				

Course' Contribution Level to Learning Outcomes										
NI	Loorning Outcomos			Contribution Level						
nu					4	5				
L01	To master the basic concepts of Calculus in the literature					Х				
LO2	To comprehend basic methods and techniques of Calculus					Х				
LO3	To utilize methods and techniques of Calculus in economic analysis					Х				
L04	To integrate analytical concepts into economic analysis					Х				
LOF	To think critically while using mathematics in several real-life and economic					×				
L05	problems					^				
LO6	To evaluate and enhance data for making effective economic analysis					Х				



	Relationship Between Course Learning Outcomes and Program Competencies								
	(Departi			arning	Outcor	nes		Total	
Nu	Program Competencies	1.01		102			1.06	Effect	
		LOI	LUZ	LUS	L04	LUS	LUO	(1-5)	
1	Know the basic concepts used in economics, the relations between concepts, economic theories, the functioning mechanisms of the economy and the development processes of economies over time.	x			x	x		5	
2	Know how to obtain economic data and the research methods for processing and evaluating the obtained data by using various computer programs when necessary.			x	x			4	
3	Follow current developments in national and international macroeconomic conjuncture and world economic relations and can suggest economic policies to be used in case of economic problems.		x	x		x	x	5	
4	Acquire the capacity to conduct individual research on the field, interpret the results, and compare them with theoretical propositions.			x				4	
5	Scrutinize and interpret all kinds of knowledge in the field of economics, including theoretical and statistical information, through analysis within the framework of cause-effect relationships.		х	x		x		5	
6	Present solutions and opinions about the problems analyzed by supporting them with qualitative and quantitative data, use analytical language, and support the used approach with visual and graphical materials.	x			x		x	5	
7	Gain advanced skills in software and programming languages that assist analysis in the econometric field and can adapt to new software and programming languages								
8	Support the acquired theoretical knowledge of economics with econometric and statistical calculations, analyze and evaluate phenomena using software and programming languages within the framework of analytical thinking.								
9	Develop the ability to analyze unexpected and complex problems during professional practice, take responsibility as an individual or team member for solving the problem, and take initiative when necessary.			x		x	x	5	
10	Develop critical thinking and produce solutions to policy issues by adapting theoretical and analytical knowledge to different conceptual frameworks.					x	x	5	



		A N	K A	R A		
11	Exhibit approaches that will adapt to the speed of globalization, innovations, and technological developments.				x	5
12	Having an entrepreneurial spirit, developing original and innovative ideas, and solution proposals, and assuming responsibility.					
13	Pay maximum attention to social responsibilities, ethical sensitivities and legal framework in theoretical and practical studies.					
14	Communicate with peers, colleagues, co-workers, employees and managers with common sense, empathy and situational awareness.					
15	Communicate effectively with colleagues, senior managers, and the market, both in the mother tongue and in at least one foreign language (English).					
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Policies and Procedures

Web page: <u>https://www.ostimteknik.edu.tr/economics-752/425</u>

Exams: The exams aim at assessing various dimensions of learning: knowledge of concepts and theories and the ability to apply this knowledge to real-world phenomena, through analyzing the situation, distinguishing problems, and suggesting solutions. The written exams can be of two types, ie. open-ended questions, which can also be in the form of problems or multiple-choice questions. Exams are composed of a final exam comprising 50% of the student's grade and a mid-term exam, with less weight (30%). The rest of the grade comes from other assessment methods, shown in the assessment table included in this syllabus. The Department of Economics does not tolerate any act of academic dishonesty. Examinations are individual and must be completed without any outside assistance. Students who attempt to cheat during exams will receive a failing grade on that exam. The case could also be carried to the Dean's Office for additional disciplinary action.

Assignments: Quizzes and Homework (Assignments) might be applicable. Scientific Research Ethics Rules are very important while preparing assignments. The students should be careful about citing any material used from outside sources and reference them appropriately. The students must not adopt "cut copy paste" behavior from the sources on the internet or use the contents of any type of previous work in their assignments. Plagiarism is unethical behavior and is subject to disciplinary action.

Missed exams: Any student missing an exam needs to bring an official medical report to be able to take a make-up exam. The medical report must be from a state hospital.

Projects: Not applicable.

Attendance: Attendance requirements are announced at the beginning of the term. Students are usually expected to attend at least 70% of the classes during each term.



Objections: If the student observes a material error in his/her grade, he/she has the right to place an objection to the Faculty or the Department. The claim is examined and the student is notified about its outcome.