

**OSTİM TECHNICAL UNIVERSITY
FACULTY OF ECONOMICS AND ADMINISTRATIVE SCIENCES**

**COURSE SYLLABUS FORM
2022-2023 SPRING**

MATH 104 Mathematics II							
Course Name	Course Code	Period	Hours	Application	Laboratory	Credit	ECTS
Mathematics II	MATH 104	1	3	0	0	3	6

Language of Instruction	English
Course Status	Compulsory
Course Level	Bachelor
Learning and Teaching Techniques of the Course	Lecture, Discussion, Question-Answer, Problem-Solving
Class Time/Classroom	Monday, 09:00, 441 (Online), (MIS Section) Wednesday, 09:00, 441 (Online) (ECON Section)
Instructor	Assist. Prof. Dr. Serkan BÜRKEN
Office	9th Floor, 907
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Office Hours	Tuesday 14:00-17:00
Teaching Assistants	Huzeyfe Erkam Candan (via e-mail) huzeyfe.candan@ostimteknik.edu.tr

Course Objective

This course covers advanced Calculus which is required to be used in economic analysis. The course includes differential equations, parametric equations and polar coordinates, infinite sequences and series, vectors, vector functions, partial derivatives, multiple integrals, and finally, second-order differential equations. The main aim of the course is to introduce students to several advanced methods and techniques of Calculus to make them useful in economic analysis. The course is designed to enhance student's 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 advanced concepts of Calculus in the literature,
- To introduce advanced methods and techniques of Calculus,
- To utilize methods and techniques of Calculus in economic analysis,
- To integrate analytical concepts into economic analysis,
- To learn critical thinking while using mathematics in several real-life and economic problems,
- To evaluate and enhance data to effectively produce economic analysis.

Course Outline

This course will begin with an introduction to differential equations. Then, parametric equations and polar coordinates will be taught in the second week. Before the mid-term exam which will have questions covering the topics in the first seven weeks, the other topics will be infinite sequences and series, vectors, and vector functions to further expand the calculus knowledge of the students. Partial derivatives and multiple integrals will be introduced between the ninth and twelfth weeks. The following weeks will be devoted to vector calculus and second-order differential equations. One week before the final examination, there will be a comprehensive problem-solving session to prepare students for the finals. Last week will be for the final examination in which students will be responsible for whole topics taught in the course. In addition, problem-solving sessions will be held once every 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	Why do we need this course? Introduction to the course Course Syllabus and requirements
2	Differential Equations	Modeling with Differential Equations Direction Fields and Euler's Method Separable Equations Models for Population Growth Linear Equations Problem-solving session
3	Parametric Equations and Polar Coordinates	Curves Defined by Parametric Equations Calculus with Parametric Curves Polar Coordinates Areas and Lengths in Polar Coordinates Conic Sections Conic Sections in Polar Coordinates
4	Infinite Sequences and Series	Sequences Series The Integral Test and Estimates of Sums The Comparison Tests Alternating Series Problem-solving session
5	Infinite Sequences and Series	Absolute Convergence and the Ratio and Root Tests Strategy for Testing Series Power Series Representations of Functions as Power Series Taylor and Maclaurin Series Applications of Taylor Polynomials
6	Vectors and the Geometry of Space	Three-Dimensional Coordinate Systems Vectors The Dot Product The Cross Product Equations of Lines and Planes Cylinders and Quadric Surfaces

7	Vector Functions	Vector Functions and Space Curves Derivatives and Integrals of Vector Functions Arc Length and Curvature Motion in Space: Velocity and Acceleration Problem-solving session
8	Mid-term Exam	Whole topics included between Week 2-7 4 or 5 questions
9	Partial Derivatives	Functions of Several Variables Limits and Continuity Partial Derivatives Tangent Planes and Linear Approximation Problem-solving session
10	Partial Derivatives	The Chain Rule Directional Derivatives and the Gradient Vector Maximum and Minimum Values Lagrange Multipliers
11	Multiple Integrals	Double Integrals over Rectangles Double Integrals over General Regions Double Integrals in Polar Coordinates Applications of Double Integrals Problem-solving session
12	Multiple Integrals	Surface Area Triple Integrals Triple Integrals in Cylindrical Coordinates Triple Integrals in Spherical Coordinates Change of Variables in Multiple Integrals
13	Vector Calculus	Vector Fields Line Integrals Curl and Divergence Parametric Surfaces and Their Areas Surface Integrals The Divergence Theorem
14	Second-Order Differential Equations	Second-Order Linear Equations Nonhomogeneous Linear Equations Applications of Second-Order Differential Equations Series Solutions Problem-solving session
15	Problem-Solving Session	Whole topics included
16	Final Exam	4 or 5 questions Whole topics included

Textbook(s)/References/Materials:

- James Stewart (2018). Calculus (Metric Version), 8th edition.
- 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>

Assessment

Studies	Number	Contribution margin (%)
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Continuity	1	10
Lab		
Application		
Field Study		
Course-Specific Internship (if any)		
Quizzes / Studio / Critical	5	10
Homework		
Presentation		
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

Relationship Between Course Learning Outcomes and Program Competencies						
Nu	Learning Outcomes	Contribution Level				
		1	2	3	4	5
1	To master the advanced concepts of Calculus in the literature					x
2	To introduce advanced methods and techniques of Calculus					x
3	To utilize methods and techniques of advanced Calculus in economic analysis					x
4	To integrate analytical concepts into economic analysis					x
5	To learn critical thinking while using mathematics in several real-life and economic problems					x
6	To evaluate and enhance data for effectively producing economic analysis					x
7	To have the knowledge and equipment to be able to execute and complete a project by taking part in national and international projects and project teams				x	
8	To have critical, creative, and innovative thinking skills to be able to carry out activities related to the field					x
9	To be individuals with improved social and intellectual capacity, visionary, high ethical values, and ability to adapt to group communication and teamwork.				x	
10	To be able to identify problems related to the field, to reach relevant sources, to be able to analyze and synthesize to produce scientific knowledge and to carry out research, and to have a command of the legislation related to the field.					x
11	To be aware of ethical behavior principles in all areas of science and act accordingly				x	

ECTS / Workload Table			
Activities	Number	Duration	Total

		(Hours)	Workload
Course hours (Including the exam week: 16 x total course hours)	16	3	48
Laboratory			
Application			
Course-Specific Internship			
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 Exam / Midterm Jury	1	30	30
Preparation Period for the Final Exam / General Jury	1	49	49
Total Workload	(180/30 = 6)		180

Policies and Procedures
Web page: https://www.ostimteknik.edu.tr/economics-752
<p>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.</p> <p>The written exams can be of two types, i.e. open-ended questions, which can also be in the form of problems or multiple-choice questions.</p> <p>Exams are composed of a final exam comprising 50% of the student's grade and a mid-term exam, with less weight. The rest of the grade comes from other assessment methods, shown in the assessment table included in this syllabus.</p> <p>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.</p>
<p>Assignments: The assignments could be in the form of Homework or paper writing. A paper must include 1- Abstract 2- Introduction, 3- Literature review 4- Research Method, 5- Findings and Discussion 6- Conclusion. 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.</p> <p>Plagiarism is unethical behavior and is subject to disciplinary action.</p>
<p>Missed exams: Any student missing an exam needs to bring an official medical report to be able to take a make-up exam.</p>
<p>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.</p>
<p>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.</p>