OSTIM TECHNICAL UNIVERSITY
FACULTY OF ECONOMICS AND ADMINISTRATIVE SCIENCES

COURSE SYLLABUS FORM
2021-2022 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

Course Objective

This course covers the 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 several advanced methods and techniques of Calculus in order to make them use 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 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 for effectively produce economic analysis.

Course Outline

This course will begin by the introduction of differential equations. Then, in the second week, parametric equations and polar coordinates will be taught. Before the mid-term exam which will have questions covering the topics in 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. Between ninth week and twelfth week, partial derivatives and multiple integrals will be introduced. 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 in order to prepare students for the finals. Last week will be for final examination 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 on the course.

Weekly Topics and Related Preparation Studies		
Weeks	**Topics**	**Preparation Studies**
1	Course Introduction	Why 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 (%)**
Attendance	1	10
Lab		
Classroom application and performance		
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 produce 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, 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 a 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 (Hours)**	**Total 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**