OSTIM TECHNICAL UNIVERSITY
FACULTY OF ECONOMICS AND ADMINISTRATIVE SCIENCES

COURSE SYLLABUS FORM
2021-2022 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, Discussion, Question Answer, Problem Solving

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, integral applications and techniques and finally, further applications of integration. The main aim of the course is to introduce students several 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 basic concepts of Calculus in the literature,
- To introduce basic 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 functions and models to make a basis for limits and derivatives. Then, in the second and third week, limits and derivatives will be taught before the first mid-term exam which will have questions covering the topics in first five weeks. Between sixth and ninth week, two major topics; namely, differentiation rules and techniques, will be introduced to further expand the calculus knowledge of the students. The tenth week is the time for second mid-term which have questions measuring to what extent those topics have been learnt by the students. By eleventh week, integral, its applications and its techniques will be taught until fifteenth week. 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 Maths for Economics? What is Calculus? Introduction to the course Course Syllabus and requirements
2	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
3	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
4	Limits and Derivatives	Continuity Limits at Infinity; Horizontal Asymptotes Derivatives and Rates of Change The Derivative as a Function
5	**Mid-Term Exam-1**	4 or 5 questions Whole topics included until week 5
6	Differentiation Rules	Derivatives of Polynomials and Exponential Functions The Product and Quotient Rules Derivatives of Trigonometric Functions The Chain Rule Implicit Differentiation Derivatives of Logarithmic Functions
7	Differentiation Rules	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	Applications of Differentiation	Maximum and Minimum Values The Mean Value Theorem How Derivatives Affect the Shape of a Graph Indeterminate Forms and l'Hospital's Rule Summary of Curve Sketching
9	Applications of Differentiation	Graphing with Calculus and Calculators Optimization Problems Newton's Method Antiderivatives Problem solving session

10	**Mid-Term 2**	4 or 5 questions Whole topics included between week 6-9	
11	Integrals	Areas and Distances The Definite Integral The Fundamental Theorem of Calculus Indefinite Integrals and the Net Change Theorem The Substitution Rule	
12	Applications of Integration	Areas between Curves Volume Volumes by Cylindrical Shells Work Average Value of a Function Problem solving session	
13	Techniques of Integration	Integration by Parts Trigonometric Integrals Trigonometric Substitution Integration of Rational Functions by Partial Fractions	
14	Techniques of Integration	Strategy for Integration Integration Using Tables and Computer Algebra Systems Approximate Integration Improper Integrals Problem solving session	
15	Further Applications of Integration	Arc Length Area of a Surface of Revolution Applications to Physics and Engineering Applications to Economics and Biology Probability	
16	**Final Exam**	4 or 5 questions Whole topics included	

Textbook(s)/References/Materials:

- James Stewart (2018). Calculus : Early Transcendentals, 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 Exams / 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 basic concepts of Calculus in the literature					x
2	To introduce basic methods and techniques of Calculus					x
3	To utilize methods and techniques of 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 Exams / Midterm Jury	2	20	40
Preparation Period for the Final Exam / General Jury	1	39	39
Total Workload	**(180/30 = 6)**		**180**