

**School of Engineering and Natural Sciences / Industrial Engineering (English)**

**2022 - 2023 Academic Year**

**CALCULUS I**

**Syllabus**

<b>Course Description</b>					
<b>Name</b>	<b>Code</b>	<b>Semester</b>	<b>T+A Hour</b>	<b>Credit</b>	<b>ECTS</b>
CALCULUS I	IND1110745	Fall Semester	4+0	4	6
<b>Prerequisites Courses</b>					
<b>Recommended Elective Courses</b>					
<b>Language of Instruction</b>	English				
<b>Course Level</b>	First Cycle (Bachelor's Degree)				
<b>Course Type</b>	Required				
<b>Course Coordinator</b>	Assist.Prof. Özge BİÇER ÖDEMİŞ				
<b>Name of Lecturer(s)</b>	Prof.Dr. Gülçin Mihriye MUSLU				
<b>Assistant(s)</b>					
<b>Aim</b>	To teach fundamental math contents, methods and techniques, and its applications for the study of engineering. To provide supports on studies and researches in the area of engineering.				
<b>Course Content</b>	This course contains; Functions: Lines, Functions and Graphs, Exponential Functions, Functions: Inverse Functions and Logarithms, Trigonometric Functions and Their Inverses, Parametric Equations, Limits and Continuity: Rates of Change and Limits, Finding Limits and One-Sided Limits, Limits and Continuity: Limits Involving Infinity, Continuity, Tangent Lines, Derivatives: The Derivative as a Function, The Derivatives as a Rate of Change, Derivatives of Products, Quotients and Negative Powers, Derivatives: Derivatives of Trigonometric Functions, The Chain Rule and Parametric Equations, Implicit Differentiation, Applications of Derivatives: Extreme Values of Functions, The Mean Value Theorem and Differential Equations, Applications of Derivatives: The Shape of a Graph, Linearization and Differentials, Integration: Indefinite Integrals, Integral Rules, Integration by Substitution, Integration: Riemann Sums and Definite Integrals, The Mean Value and Fundamental Theorems, Substitution in Definite Integrals, Applications of Definite Integrals: Volumes by Slicing and Rotation About an Axis, Applications of Definite Integrals: Modelling Volume Using Cylindrical Shells, Lengths of Plane Curves, Transcendental Functions: Logarithms, Exponential Functions, Transcendental Functions: Derivatives of Inverse Trigonometric Functions Integrals.				
<b>Course Learning Outcomes</b>				<b>Teaching Methods</b>	<b>Assessment Methods</b>
1. Explain and recognize one-variable functions, compute the limit of functions of one-variable, use the concepts of the continuity and understand the relation between continuity and limit. Use the rules of differentiation to differentiate functions.				1, 14, 15, 4	A, C
2. Solve application problems of the derivative; maximum and minimum problems and sketching the graph of functions of one-variable.				1, 14, 15, 4	A, C
3. Define and explain integrals; evaluate definite integrals by using the Fundamental Theorem of Calculus, indefinite integrals.				1, 14, 15, 4	A, C
4. Define and explain Transcendental functions, their graphs and their properties. Calculate integrals using integration technique; substitution technique, integration by parts, partial fraction method and trigonometric substitution.				1, 14, 15, 4	A, C
5. Determine the convergence of improper integral. Solve application problems of integral; apply integration to compute areas, volumes by slicing, volumes of revolution and arclength.				1, 14, 15, 4	A, C
<b>Teaching Methods</b>	1: Lecture, 14: Self-Study, 15: Problem solving, 4: Exercise, Practice				
<b>Assessment Methods</b>	A: Written Exam, C: Homework				
<b>Lecture Schedule</b>					
<b>Sequence</b>	<b>Topics</b>	<b>Preliminary Preparation</b>			
1	Functions: Lines, Functions and Graphs, Exponential Functions				
2	Functions: Inverse Functions and Logarithms, Trigonometric Functions and Their Inverses, Parametric Equations				
3	Limits and Continuity: Rates of Change and Limits, Finding Limits and One-Sided Limits				
4	Limits and Continuity: Limits Involving Infinity, Continuity, Tangent Lines				
5	Derivatives: The Derivative as a Function, The Derivatives as a Rate of Change, Derivatives of Products, Quotients and Negative Powers				
6	Derivatives: Derivatives of Trigonometric Functions, The Chain Rule and Parametric Equations, Implicit Differentiation				
7	Applications of Derivatives: Extreme Values of Functions, The Mean Value Theorem and Differential Equations				
8	Applications of Derivatives: The Shape of a Graph, Linearization and Differentials				
9	Integration: Indefinite Integrals, Integral Rules, Integration by Substitution				
10	Integration: Riemann Sums and Definite Integrals, The Mean Value and Fundamental Theorems, Substitution in Definite Integrals				
11	Applications of Definite Integrals: Volumes by Slicing and Rotation About an Axis				
12	Applications of Definite Integrals: Modelling Volume Using Cylindrical Shells, Lengths of Plane Curves				
13	Transcendental Functions: Logarithms, Exponential Functions				
14	Transcendental Functions: Derivatives of Inverse Trigonometric Functions Integrals				
<b>Evaluation Methods</b>		<b>Weight(%)</b>			
Midterm Exam		30			
General Exam		70			

**Resources**

Thomas' Calculus, 12th ed., G. B. Thomas, Jr. and M. D. Weir and J. Hass, Addison-Wesley