

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

2022 - 2023 Academic Year

CALCULUS I

Syllabus

Course Description					
Name	Code	Semester	T+A Hour	Credit	ECTS
CALCULUS I	IND1210745	Spring Semester	4+0	4	6
Prerequisites Courses					
Recommended Elective Courses					
Language of Instruction	English				
Course Level	First Cycle (Bachelor's Degree)				
Course Type	Required				
Course Coordinator	Assist.Prof. Özge BİÇER ÖDEMİŞ				
Name of Lecturer(s)	Prof.Dr. Afgan ASLAN				
Assistant(s)					
Aim	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.				
Course Content	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.				
Course Learning Outcomes			Teaching Methods	Assessment Methods	
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	
Teaching Methods	1: Lecture, 14: Self-Study, 15: Problem solving, 4: Exercise, Practice				
Assessment Methods	A: Written Exam, C: Homework				
Lecture Schedule					
Sequence	Topics	Preliminary Preparation			
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				
Evaluation Methods		Weight(%)			
Midterm Exam		30			
General Exam		70			

Resources

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