

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

**2022 - 2023 Academic Year**

**CALCULUS II**

**Syllabus**

Course Description					
Name	Code	Semester	T+A Hour	Credit	ECTS
CALCULUS II	IND1210751	Spring Semester	4+0	4	6
<b>Prerequisites Courses</b>	MATEMATİK I; GENEL MATEMATİK I				
<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.				
<b>Course Content</b>	This course contains; Techniques of Integration: Basic Integration Formulas, Integration by Parts, Partial Fractions, Techniques of Integration: Trigonometric Substitutions, L'Hopital's Rule, Techniques of Integration: Improper Integrals, Infinite Sequences and Series: Limits of Sequences of Numbers, Subsequences, Infinite Sequences and Series: Bounded Sequences, Infinite Series, Infinite Sequences and Series: Series of Nonnegative Terms, Alternating Series, Infinite Sequences and Series: Absolute and Conditional Convergence, Power Series, Taylor and Maclaurin Series, Polar Coordinates: Polar coordinates and graphs, Calculus of Polar Curves, Vectors and Geometry of Space: Cartesian (Rectangular) Coordinates and Vectors in Space, Dot and Cross Products, Lines and Planes in Space, Cylinders and Quadric Surfaces, Vectors and Geometry of Space: Vector-Valued Functions and Space Curves, Arc Length and the Unit Tangent Vector, Partial Derivatives: Functions of Several Variables, Limits and Continuity in Higher Dimensions, Partial Derivatives, The Chain Rule, Partial Derivatives: Directional Derivatives, Gradient Vectors and Tangent Planes, Extreme Values and Saddle Points, Lagrange Multipliers, Multiple Integrals: Double Integrals, Areas, Double Integrals in Polar Form, Triple Integrals in Rectangular Coordinates, Multiple Integrals: Triple Integrals in Cylindrical and Spherical Coordinates, Substitutions in Multiple Integrals.				
<b>Course Learning Outcomes</b>			<b>Teaching Methods</b>	<b>Assessment Methods</b>	
1. Define polar coordinates and the polar curves and explain the relationship between polar and cartesian coordinates. Explain area, slope, equations of tangent-normal line and (arc)length in polar curves.			1, 14, 15	A, C	
2. Define the concepts of three-dimensional coordinate systems. Identify vectors. Define and apply dot product and cross product and explain their features. Define lines and planes in space and explain their relationship. Explain and define cylindrical and quadratic surfaces.			1, 14, 15	A, C	
3. Understand the multivariable functions, analyze limits, determine continuity, and compute partial derivatives of them; find tangent planes, directional derivatives, gradients; apply the second partials test, and Lagrange multipliers to approximate and solve optimization problems.			1, 14, 15	A, C	
4. Compute multiple integrals and use multiple integrals when calculating area and volume.			1, 14, 15	A, C	
5. Determine the convergence of sequences and series, compute the radius of convergence of power series, represent a known function as a Taylor series; approximate a known function with a Taylor polynomial and determine the error involved.			1, 14, 15	A, C	
<b>Teaching Methods</b>	1: Lecture, 14: Self-Study, 15: Problem solving				
<b>Assessment Methods</b>	A: Written Exam, C: Homework				
<b>Lecture Schedule</b>					
<b>Sequence</b>	<b>Topics</b>	<b>Preliminary Preparation</b>			
1	Techniques of Integration: Basic Integration Formulas, Integration by Parts, Partial Fractions				
2	Techniques of Integration: Trigonometric Substitutions, L'Hopital's Rule				
3	Techniques of Integration: Improper Integrals				
4	Infinite Sequences and Series: Limits of Sequences of Numbers, Subsequences				
5	Infinite Sequences and Series: Bounded Sequences, Infinite Series				
6	Infinite Sequences and Series: Series of Nonnegative Terms, Alternating Series				
7	Infinite Sequences and Series: Absolute and Conditional Convergence, Power Series, Taylor and Maclaurin Series				
8	Polar Coordinates: Polar coordinates and graphs, Calculus of Polar Curves				
9	Vectors and Geometry of Space: Cartesian (Rectangular) Coordinates and Vectors in Space, Dot and Cross Products, Lines and Planes in Space, Cylinders and Quadric Surfaces				
10	Vectors and Geometry of Space: Vector-Valued Functions and Space Curves, Arc Length and the Unit Tangent Vector				
11	Partial Derivatives: Functions of Several Variables, Limits and Continuity in Higher Dimensions, Partial Derivatives, The Chain Rule				
12	Partial Derivatives: Directional Derivatives, Gradient Vectors and Tangent Planes, Extreme Values and Saddle Points, Lagrange Multipliers				
13	Multiple Integrals: Double Integrals, Areas, Double Integrals in Polar Form, Triple Integrals in Rectangular Coordinates				
14	Multiple Integrals: Triple Integrals in Cylindrical and Spherical Coordinates, Substitutions in Multiple 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