ESOGU CIVIL ENGINEERING DEPARTMENT

COURSE INFORMATION FORM

Course Name	Course Code
CALCULUS II	**151412209**

Semester	Number of Course Hours per Week		ECTS
	Theory	Practice	
2	4	0	5

Course Category (Credit)				
Basic Sciences	**Engineering Sciences**	**Design**	**General Education**	**Social**
3	2	0	0	0

Course Language	Course Level	Course Type
Turkish	Undergraduate	Compulsory

Prerequisite(s) if any	-
Objectives of the Course	The Mathematics II course aims to teach students advanced integral calculus techniques, to help them grasp the theoretical foundations of these techniques, and to enable them to apply this knowledge to practical applications in the field of Civil Engineering. The course aims to develop students' analytical thinking and problem-solving abilities and to enhance their skills in applying mathematical concepts to engineering problems. Additionally, it seeks to improve students' mathematical modeling and analysis capabilities, enabling them to solve complex engineering problems.
Short Course Content	This course covers topics ranging from the basic concepts of integral calculus to advanced applications. The content includes indefinite and definite integrals, advanced integral computation methods, integrals of special functions, and engineering applications of definite integrals. The course aims to develop students' ability to apply mathematical concepts to Civil Engineering problems by combining theoretical knowledge with practical applications.

	Learning Outcomes of the Course	Contributed PO(s)	Teaching Methods *	Measuring Methods **
1	Gains the ability to understand and apply advanced integral calculus techniques.	1, 2	1, 5, 6, 10	A, D
2	Develops the ability to compute and interpret definite and indefinite integrals.	1, 2	1, 5, 6, 10	A, D
3	Acquires the skill to model and solve engineering problems using integral calculus.	1, 2, 3	1, 2, 6, 10	A, D
4	Gains the ability to compute the integrals of special functions (hyperbolic, inverse hyperbolic, exponential).	1, 2	1, 5, 6, 10	A, D
5	Acquires the ability to perform engineering applications of definite integrals (volume, area, length calculations).	1, 2, 3, 4	1, 2, 6, 10	A, D
6	Develops the ability to understand and apply numerical integration techniques.	1, 2, 4	1, 6, 10	A, D
7	Enhances mathematical thinking and analytical problem-solving skills.	1, 2, 8	2, 5, 6, 10, 11	A, D
8	Gains the ability to apply integrals and derivatives to problems in Civil Engineering.	1, 2, 3, 4	1, 2, 6, 8, 10	A, D
9	Acquires the skill to analyze complex engineering problems using mathematical modeling techniques.	1, 2, 3, 4	1, 2, 6, 10	A, D

***Teaching Methods** **1:**Expression, **2:**Discussion, **3:**Experiment, **4:**Simulation, **5:**Question-Answer, **6:**Tutorial, **7:**Observation, **8:**Case Study, **9:**Technical Visit, **10:**Trouble/Problem Solving, **11:**Induvidual Work, **12:**Team/Group Work, **13:**Brain Storm, **14:**Project Design / Management, **15:**Report Preparation and/or Presentation

****Measuring Methods** **A:**Exam, **B:**Quiz, **C:**Oral Exam, **D:**Homework, **E:**Report, **F:**Article Examination, **G:**Presentation, **I:**Experimental Skill, **J:**Project Observation, **K:**Class Attendance; **L:**Jury Exam

Main Textbook	Thomas G.B., Weir M.D., Hass J.R., 2018, Thomas Kalkülüs, Cilt 1-2, Pearson Publications
Supporting References	Lecture Notes. Calculus Online Textbook, 2023, MIT OpenCourseWare. Strang G., 2016, Introduction to Linear Algebra. 5th edition, Wellesley-Cambridge Press.
Necessary Course Material	Laptop or desktop computer, presentation/projection device, fixed/movable projection screen, whiteboard.

Course Schedule	
1	Introduction to the course and basic calculus review
2	Integral I: Antiderivative, the definition of a differential equation, initial value problem, indefinite integral
3	Integral II: Finite sums, lower-middle-upper sum rules, mean value estimation
4	Integral III: Limits of finite sums, Riemann sums, definite integral
5	Integral IV: Mean value theorem, area under the curve, power rule
6	Integral V: Variable transformation, area between curves, integral of transcendental functions
7	Integral VI: Integral of hyperbolic and inverse hyperbolic functions, exponential change, relative growth rates
8	Mid-Term Exam
9	Examples of Applications of derivatives and integrals in civil engineering
10	Applications of definite integrals I: Volume calculations using cross-sections and cylindrical shells
11	Applications of definite integrals II: Lengths of plane curves, surface areas of solids of revolution, work, pressure-depth
12	Applications of definite integrals III: Moments and centers of mass
13	Integration techniques I: Integration by parts
14	Integration techniques II: Trigonometric integrals, integration of rational functions
15	Integration techniques III: Integral table, improper integrals, numerical integration
16,17	Final Exam

Calculation of Course Workload			
Activities	**Number**	**Time (Hour)**	**Total Workload (Hour)**
Course Time (number of course hours per week)	14	4	56
Classroom Studying Time (review, reinforcing, prestudy,….)	14	4	56
Homework	4	2	8
Quiz Exam	0	0	0
Studying for Quiz Exam	0	0	0
Oral exam	0	0	0
Studying for Oral Exam	0	0	0
Report (Preparation and presentation time included)	0	0	0
Project (Preparation and presentation time included)	0	0	0
Presentation (Preparation time included)	0	0	0
Mid-Term Exam	1	2	2
Studying for Mid-Term Exam	1	10	10
Final Exam	1	2	2
Studying for Final Exam	1	15	15
		Total workload	**149**
		Total workload / 30	**4.97**
		Course ECTS Credit	**5**

Evaluation	
Activity Type	**%**
Mid-term	30
Homework	20
Final Exam	50
Total	100

RELATIONSHIP BETWEEN THE COURSE LEARNING OUTCOMES AND THE PROGRAM OUTCOMES (PO) (5: Very high, 4: High, 3: Middle, 2: Low, 1: Very low)		
NO	**PROGRAM OUTCOME**	**Contribution**
1	Sufficient knowledge in mathematics, science, and fundamental engineering; ability to apply theoretical and practical knowledge in these fields to model and solve Engineering problems.	5
2	Skills to identify, define, formulate complex engineering problems in civil engineering and related fields, and to select and apply appropriate analysis and modeling methods to solve them.	4
3	Ability to design a complex system, device, or product under realistic constraints and conditions, applying modern design methods towards a specified goal.	4
4	Ability to develop, select, and use modern techniques and tools necessary for Civil Engineering applications, and to effectively utilize information technologies.	2
5	Ability to design experiments, conduct experiments, collect data, analyze and interpret results for the investigation of Civil Engineering problems.	1
6	Ability to work effectively in intra-disciplinary and inter-disciplinary teams.	1
7	Effective communication skills in Turkish, both oral and written, and ability to use/improve knowledge of a foreign language.	1
8	Recognition of the need for lifelong learning; ability to access information, follow developments in science and technology, and continuously renew oneself.	3
9	Consciousness of professional and ethical responsibility.	1
10	Knowledge about business life practices such as project management, risk management, and change management; awareness about entrepreneurship, innovation, and sustainable development.	1
11	Knowledge about the effects of engineering practices on health, environment, and safety in universal and societal dimensions; awareness about national and international legal regulations and standards, and the legal consequences of engineering solutions.	5

LECTUTER(S)				
Prepared by	Dr. Kadir Berkhan AKALIN	Dr. Ömer KARAGÖZ		
Signature(s)				

Date:23.07.2024