COURSE SYLLABUS						
Course Title	**Course Code**	**Semester**	**Course Hour/Week**		**Credit**	**ECTS**
Mathematics and Geometry for Design	DSGN 105	I	**Theory** 3	**Practice** 0	3	3
Course Type	Compulsory Courses	Department Elective	Faculty Elective	University Elective	CoHE (YÖK) Compulsory	Other
	X	-	-	-	-	-
Level of Course	Associate Degree (Short Cycle)		Undergraduate (First Cycle)		Graduate/ Doctoral (Second /Third Cycle)	
	-		X		-	

Language of Instruction	English

Course Instructor	Assoc.Prof.Dr. Salar Salah Muhy Al-Din	E-mail : salar.aldin@arucad.edu.tr Office : TI- OFF18	
Course Objectives	This course provides a foundational understanding of mathematical principles and geometric concepts tailored for aspiring architects. Through this course, students explore the mathematical underpinnings essential for architectural design, focusing on their practical applications within the creative process. Topics covered encompass fundamental algebraic concepts, geometric transformations, spatial reasoning, and principles of proportion and symmetry. By mastering these core mathematical and geometric principles, students gain invaluable tools for analyzing, conceptualizing, and communicating architectural ideas effectively.		
Course Learning Outcomes	Students will be able to:	Teaching Methods	Evaluation Methods
	Understand: Demonstrate knowledge and understanding of essential mathematical and geometric definitions.	Lectures, Direct instruction	Midterm Exam, Final Exam
	Understand: Describe relevant mathematical models applied to design.	Lectures, Direct instruction	Midterm Exam, Final Exam
	Apply: Apply appropriate mathematical and geometric solutions to design problems.	Class exercises, Problem-solving practice	Midterm Exam, Final Exam

	Analyze: Produce design solutions demonstrating underlying mathematical and geometric analysis.	Class exercises, Problem-solving practice	Midterm Exam, Final Exam
	Evaluate: Critically compare and contrast appropriate and inappropriate mathematical and geometric approaches to design issues.	Discussion, Class exercises	Final Exam
Course Content	• Numbers, numeric representation, operations, decimals, fractions and percentages • Measurement, approximation and ratios • Shapes, lengths, areas and volumes • Geometry and trigonometry • Algebra, formulae and equations • Vectors and matrices • Combinations, permutations and probability • Introduction to statistics • Introduction to (differential and integral) calculus • Introduction to graphs and graph theory		

COURSE OUTLINE/SCHEDULE			
Week	**Topic**	**Implementation (theory/practice)**	**Required Reading, Preliminary preparation**
1	Introduction: Course structure. Mathematics and geometry in art and design	T	See the required books.
2	Basic numbers and shapes	T	See the required books.
3	Operations, functions, decimals, fractions and percentages	T	See the required books.
4	Introduction to algebra	T	See the required books.
5	Geometry 1	T	See the required books.
6	Geometry 2	T	See the required books.
7	Trigonometry 1	T	See the required books.
8			See the required books.

	Trigonometry 2 and Midterm Exam	T	
9	Vectors (Transformations)	T	See the required books.
10	Matrices (Transformations)	T	See the required books.
11	Counting and probability	T	See the required books.
12	Statistics	T	See the required books.
13	Centre of Mass	T	See the required books.
14	Calculus 1	T	See the required books.
15	**FINAL EXAM**		

Required Course Material(s) / Reading(s)/ Text Book(s)	Stephen Ornes, 'Math Art: Truth, Beauty and Equations', 2019, ISBN: 9781454930440, ARUCAD Library **Call Number: N72.M3 O76 2019** Hugh Neill & Trevor Johnson, 'Mathematics: a complete introduction', JML, 2018, ISBN: 1473678374 9781473678378, ARUCAD **Library Call Number: QA39.3 .N44 2018**
Recommended Course Material(s)/ Reading(s) /Other	3rd level Maths - BBC Bitesize: https://www.bbc.co.uk/bitesize/subjects/zfcqn39 Wolfram MathWorld: The Web's Most Extensive Mathematics Resource: https://mathworld.wolfram.com/ Wolfram|Alpha Examples: Mathematics (wolframalpha.com): https://www.wolframalpha.com/examples/mathematics

ASSESSMENT		
Learning Activities	**NUMBER**	**WEIGHT in %**
Mid-Term	1	40
Quiz		
Assignment		

Project		
Field Study		
Presentation / Seminar		
Studio Practice		
Other		
Contribution of Final Examination/Final Project/ Dissertation to the Final Grade	1	60
TOTAL		100

CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAMME LEARNING OUTCOMES

No	**PROGRAMME LEARNING OUTCOMES**	Level of Contribution (1- lowest/ 5- highest)				
		1	2	3	4	5
1	Understand architectural history, theory, and cultural heritage, including the relationship between local/vernacular traditions and global architectural discourse.			X		
2	Understand the technical knowledge and the principles of structural systems, building technology, environmental performance, and construction processes as integrated components of architectural design.		X			
3	Comprehend sustainability, ecological sensitivity, and climate-responsive design principles and their application across different scales of the built environment.	X				
4	Recognize the legal, ethical, and professional frameworks governing architectural practice, including relevant codes, standards, universal ethical values, and the principles of project management and cost estimation.	X				
5	Apply creative and critical design thinking to develop holistic architectural solutions that respond to spatial, environmental, cultural, and social challenges at local, national, and global scales.			X		
6	Produce professional drawings, models, technical documentation, and digital/parametric visualizations that effectively communicate architectural proposals at all stages of design.	X				
7	Conduct systematic, evidence-based research and apply critical evaluation methods to inform and validate design decisions throughout the design process.				X	

8	Integrate interdisciplinary knowledge — spanning art, engineering, ecology, and social sciences — to produce innovative and contextually sensitive design outcomes.		X			
9	Demonstrate professional and ethical responsibility, with sensitivity to environmental sustainability, socio-cultural diversity, and the well-being of communities served by architectural practice.	X				
10	Collaborate effectively in interdisciplinary and intercultural teams, demonstrating leadership, communication, and project management competencies in design and professional contexts.	X				
11	Communicate architectural ideas persuasively and clearly in verbal, visual, and written form to professional, academic, client, and public audiences.		X			
12	Engage in continuous self-reflection, lifelong learning, and active contribution to the evolving architectural profession at local, regional, and international levels.			X		

ECTS / STUDENT WORKLOAD				
ACTIVITIES	**NUMBER**	**UNIT**	**HOUR**	**TOTAL (WORKLOAD)**
Course Teaching Hour (X weeks * total course hours)	14		3	42
Preliminary Preparation and self- study	14		1	14
Mid-Term	1		10	10
Quiz	-		-	-
Assignment	-		-	-
Project	-		-	-
Field Study	-		-	-
Presentation / Seminar	-		-	-
Studio Practice	-		-	-
Final Examination/ Final Project/ Dissertation	1		10	10
Other	-		-	-
TOTAL WORKLOAD				76
TOTAL WORKLOAD / 25				3.04
ECTS				**3**

RULES WITH REGARD TO THE COURSE
Plagiarism Disclaimer Detected and undetected plagiarism is a serious offense at any time and can have devastating effects on your degree results and future professional life. Plagiarism is easy to avoid if you ensure that you properly identify and acknowledge your sources and do not copy directly from visual examples, designs, or notes that have themselves been taken word-for-word from your sources.

	SDG 1: No Poverty	
	SDG 2: Zero Hunger	
	SDG 3: Good Health and Well-Being	X
	SDG 4: Quality Education	X
	SDG 5: Gender Equality	
	SDG 6: Clean Water and Sanitation	
	SDG 7: Affordable and Clean Energy	X
	SDG 8: Decent Work and Economic Growth	X
	SDG 9: Industry, Innovation and Infrastructure	X
	SDG 10: Reduced Inequalities	
	SDG 11: Sustainable Cities and Communities	X
	SDG 12: Responsible Consumption and Production	X
	SDG 13: Climate Action	
	SDG 14: Life Below Water	
	SDG 15: Life on Land	
	SDG 16:Peace, Justice and Strong Institutions	

	SDG 17:Partnership for the Goals	X

ASSESSMENT DETAILS AND EVALUATION CRITERIA: Final grades will be determined based on the course learning activities and the assessment details for the final examination or project, as outlined below, in accordance with the University's Education and Examination Regulations. Students are required to attend at least 70% of the classes. The maximum allowable absenteeism is 30%. **Mid-Term (40%)** **Final (60%)**	
PREPARED BY	Vic Grout
UPDATED	Assoc. Prof. Dr. Salar Salah MUHY AL-DIN, 21/09/2026
APPROVED	