

COURSE SYLLABUS

Course Title	Course Code	Semester	Course Hour/Week		Credit	ECTS
Discrete Mathematics	GAME103	1	Theory 3	Practice 0	3	5
Course Type	Compulsory Course	Department Elective	Faculty Elective	University Elective	CoHE (YÖK) Elective	Other
	X	-	-	-	-	-
Level of Course	Associate Degree (Short Cycle)		Undergraduate (First Cycle)		Graduate/ Doctoral (Second /Third Cycle)	
	-		X		-	
Language of Instruction		English				
Course Instructor(s)		Vic Grout	E-mail: vic.grout@arucad.edu.tr Office: TI OFF 18			
Course Objectives		Discrete Mathematics is the language of Computer Science, and consequentially of programming and game writing. One needs to be fluent in it to work in many fields including data science, machine learning, and software engineering. In this course, students will explore basic number theory and representation, propositional and symbolic logic, sets and relations, sequences, functions, algorithms, matrices, combinatorics, and probability theory in games.				
Course Learning Outcomes	Students will able to:			Teaching Methods	Evaluation Methods	
	Define and describe essential discrete mathematics principles			Class material and discussion	Midterm assignment	
	Interpret and apply mathematical notation and formulae			Class material and discussion	Midterm assignment	
	Select appropriate solutions for discrete mathematical problems			Class material and discussion	Final exam	

Course Content	Apply appropriate mathematical solutions in the field of video game design	Class material and discussion	Final exam
	• Numbers and numerical representation • Set theory • Relations • Functions and algorithms • Logic and propositional calculus • Permutations and combinations • Graph theory • Vectors and matrices • Geometry • Probability		

COURSE OUTLINE/SCHEDULE

Week	Topic	Implementation (theory/practice)	Required Reading, Preliminary preparation
1	Introduction: Course structure. Numbers and how to represent them	T	Class notes.
2	Number bases and representation. Mathematical relationships	T	Class notes. Hugh Neill & Trevor Johnson, 'Mathematics: a complete introduction'
3	Algebra and equations	T	Class notes
4	Mathematical functions	T	Class notes. Hugh Neill & Trevor Johnson, 'Mathematics: a complete introduction'
5	Introduction to algorithms	T	Class notes. Hugh Neill & Trevor Johnson, 'Mathematics: a complete introduction'
6	Set theory and practice	T	Class notes. Hugh Neill & Trevor Johnson, 'Mathematics: a complete introduction'
7	Propositional logic Midterm Exam	T	Class notes. Hugh Neill & Trevor Johnson, 'Mathematics: a complete introduction'
8	Boolean Algebra	T	Class notes. Hugh Neill & Trevor Johnson, 'Mathematics: a complete introduction'

9	Permutations and combinations	T	Class notes. Hugh Neill & Trevor Johnson, 'Mathematics: a complete introduction'
10	Probability for games	T	Class notes. Hugh Neill & Trevor Johnson, 'Mathematics: a complete introduction'
11	Graph theory and practice	T	Class notes. Hugh Neill & Trevor Johnson, 'Mathematics: a complete introduction'
12	Vectors	T	Class notes. Hugh Neill & Trevor Johnson, 'Mathematics: a complete introduction'
13	Matrices	T	Class notes. Hugh Neill & Trevor Johnson, 'Mathematics: a complete introduction'
14	Game geometry	T	Class notes.
15	Game algorithms	T	Class notes.
16	Maths workshop	T	Class notes.
17	Finals		

Required Course Material(s) / Reading(s)/ Text Book(s)	Hugh Neill & Trevor Johnson, 'Mathematics: a complete introduction', JML, 2018, ISBN: 1473678374 9781473678378, ARUCAD Library QA39.3 .N44 2018
Recommended Course Material(s)/ Reading(s) /Other	Stephen Ornes, 'Math Art: Truth, Beauty and Equations', 2019, ISBN: 9781454930440, ARUCAD Library N72.M3 O76 2019 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 assignment	1	40
Quiz		
Assignment		
Project		
Field Study		
Presentation / Seminar		
Studio Practice		
Other		
Contribution of Final Examination 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	Knows the historical development of the field of communication, basic concepts, theories.		X			
2	Knows the basic concepts and terminology related to the field of game design.				X	
3	Has knowledge about the history of computer and video games and developments in this field.			X		
4	Knows game design processes and related applications.		X			
5	Has the ability to utilize various disciplines such as communication, art, music, psychology, mythology, cinema, etc. in the game design process.		X			
6	Has the ability to analyse analog and digital game genres.		X			
7	Has the ability to use contemporary game engines and problem solving skills.	X				

8	Has the knowledge of questioning the game designs with an analytic and critical perspective.			X		
9	Has knowledge about media literacy.			X		
10	Has the competence to prepare projects based on ethical principles in game development processes.	X				
11	Has the competence to evaluate games as an art form.	X				
12	Has the competence to use game design concepts and methods in related fields such as design, software development and media.	X				
13	Has the competence to take part and responsibility in game development teams.		X			
14	Has the competence to collect, analyze and interpret analytical data about games and players.		X			
15	Has the competence to develop and present a digital game project by using game design practices effectively.	X				
16	Evaluates artificial intelligence applications in their studies with a critical approach in terms of aesthetics and originality, and uses them in accordance with ethical rules.	X				

ECTS / STUDENT WORKLOAD				
ACTIVITIES	NUMBER	UNIT	HOUR	TOTAL (WORKLOAD)
Course Teaching Hours (X weeks * total course hours)	15		3	45
Preliminary Preparation and self- study	15		2	30
Mid-Term Exam (including revision)	1		20	20
Quiz	-		-	-
Assignment	-		-	-
Project	-		-	-
Field Study	-		-	-
Presentation / Seminar	-		-	-
Studio Practice	-		-	-
Final Examination/ Final Project/ Dissertation	1		30	30
Other	-		-	-
TOTAL WORKLOAD				125

TOTAL WORKLOAD / 25				5
ECTS				5

ETHICAL RULES WITH REGARD TO THE COURSE

Detected and undetected plagiarism is a serious offence at any time and it could have devastating effects on your degree result and future professional lives. However, plagiarism is easy to avoid if you make sure you identify and acknowledge your sources thoroughly and do not copy directly from visual examples, designs, or notes that have in turn been taken word for word from your sources. The maximum similarity level is 20% in written assignments.

Important Note on Attendance: You must attend at least 70% of the sessions for this course or you will automatically fail. Students cannot be absent more than 30% of the time, *even if you have medical reports* or other forms of justification. Lecturers have no control over this rule: it will be rigorously applied by the system.

ASSESSMENT DETAILS AND EVALUATION CRITERIA:

You will be assessed by two components: midterm (40% of the overall course mark) and final (40% of the overall course mark).

The midterm assessment will be a written exam assessing fundamental mathematical and geometric concepts.

The final assessment will be an equal combination of a written exam assessing more advanced mathematical concepts and an exercise book to be completed in class.

Late work can only receive full credit in extreme circumstances and will be penalized otherwise as follows:

- Up to an hour late: 5% deducted
- Over an hour but less than a day late: 10% deducted
- Over a day but less than two days late: 15% deducted
- Over two days but less than a week late: 25% deducted
- A week or more late: Not accepted: 0%

Final Grades will be determined according to the Course Learning Activities and Final Examination Assessment Details as indicated below, and comply by the Education and Examination Regulation set forth by the University.

	SDG 1: No Poverty	
	SDG 2: Zero Hunger	

	SDG 3: Good Health and Well-Being	
	SDG 4: Quality Education	✓
	SDG 5: Gender Equality	
	SDG 6: Clean Water and Sanitation	
	SDG 7: Affordable and Clean Energy	
	SDG 8: Decent Work and Economic Growth	
	SDG 9: Industry, Innovation and Infrastructure	
	SDG 10: Reduced Inequalities	
	SDG 11: Sustainable Cities and Communities	
	SDG 12: Responsible Consumption and Production	
	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	

PREPARED BY	Vic Grout
UPDATED	07/10/2025
APPROVED	