COURSE SYLLABUS						
Course Title	**Course Code**	**Semester**	**Course Hour/Week**		**Credit**	**ECTS**
Game Optimization Techniques	GAME 309	5	**Theory** 2	**Practice** 2	3	5
Course Type	Compulsory Course	Department Elective	Faculty Elective	University Elective	CoHE (YÖK) Elective	Other
	-	YES	-	-	-	-
Level of Course	Associate Degree (Short Cycle)		Undergraduate (First Cycle)		Graduate/ Doctoral (Second /Third Cycle)	
	-		Yes		-	

Language of Instruction	English

Course Instructor(s)	Dr. Masoud Moradi	E-mail : masoud.moradi@arucad.edu.tr Office : TI-OFF18
Course Objectives	This course aims to equip students with the necessary skills and knowledge to optimize games for performance and efficiency. Students will learn to identify performance issues using profiling tools and implement coding and asset management strategies to reduce overhead. The course will cover various optimization techniques, including physics, rendering, memory management, and UI performance improvements, focusing on practical applications in game engines like Unity. By the end of the course, students will be able to optimize game projects effectively to enhance player experience.	
Course Learning Outcomes	**Students will able to:**	**Teaching Methods** / **Evaluation Methods**

	Explain why optimization matters and outline core performance metrics (CPU, GPU, memory, draw calls, GC).	- Lectures - Practical labs - Project-based learning	- Midterm Exam
	Use profiling tools (e.g., Unity Profiler) to locate bottlenecks.	Live tool walkthroughs, hands-on labs	- Midterm Exam - Final Exam
	Implement efficient code patterns (loops, data structures, job systems).	- Lectures	Mid-term, final exam
	Optimise rendering (batching, LODs, shaders, camera settings).	Engine practice, case studies	Assignment, final exam
Course Content	Throughout the semester you apply each block to a running Unity scene: 1. Profile – capture baseline metrics. 2. Diagnose – identify the worst offenders. 3. Optimise – implement techniques from the current block. 4. Document – record before/after data in an optimisation log. By the end you hand in a fully profiled, optimised mini-project together with a concise report that explains the changes and quantifies the performance gain.		

COURSE OUTLINE/SCHEDULE			
Week	**Topic**	**Implementation (theory/practice)**	**Required Reading, Preliminary preparation**
1		T	*Instructor course notes.*
2	Introduction to Game Optimization What is optimization and why it matters.	T	Instructor course notes.
3	Basic Profiling and Performance Issues Concepts: Identifying performance problems using Unity Profiler	T	Instructor course notes.
4	Optimization Principles Efficient coding practices (loops, data structures).	T/P	Unity game development cookbook : essentials for every game / Paris

			Buttfield-Addison, Jon Manning and Tim Nugent. Call number: QA76.76.C672 B88 2018
5	Optimization Principles Efficient coding practices (loops, data structures).	T/P	Unity game development cookbook : essentials for every game / Paris Buttfield-Addison, Jon Manning and Tim Nugent. Call number: QA76.76.C672 B88 2018.
6	Understanding Unity Basics Concepts: Unity interface, game objects, components.	T/P	Unity game development cookbook : essentials for every game / Paris Buttfield-Addison, Jon Manning and Tim Nugent. Call number: QA76.76.C672 B88 2018.
7	Batching and Draw Calls Concepts: Understanding batching and reducing draw calls	T/P	Instructor course notes.
8	**Mid-Term Exam** **Review**		
9	Managing Assets in Unity Concepts: Texture, audio, and model optimization	T/P	Instructor course notes.
10	Physics Optimizations Concepts: Simplifying physics calculations for performance.	T	Instructor course notes.
11	Memory Management Concepts (General) Concepts: Memory management principles, garbage collection.	T	Unity game development cookbook : essentials for every game / Paris Buttfield-Addison, Jon Manning and Tim Nugent. Call number: QA76.76.C672 B88 2018
12	Introduction to Shaders Concepts: Basics of shaders and their impact on performance.	T	Instructor course notes.
13	Rendering Optimizations Concepts: Reducing draw calls, adjusting resolution, camera settings.	T	Instructor course notes.
14	UI Optimization Basics Concepts: Reducing UI performance overhead (Canvases, draw calls).	T	Unity game development cookbook : essentials for every game / Paris Buttfield-Addison, Jon Manning and Tim Nugent. Call number: QA76.76.C672 B88 2018
15	Review		Instructor course notes.

16	Review		
1	**Final Exam**	T	*Instructor course notes.*

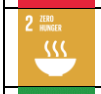
Required Course Material(s) / Reading(s)/ Text Book(s)	Unity game development cookbook : essentials for every game / Paris Buttfield-Addison, Jon Manning and Tim Nugent. Call number: QA76.76.C672 B88 2018.
Recommended Course Material(s)/ Reading(s) /Other	**Nystrom, R.** *Game Programming Patterns.* Genever Benning, 2014. **Unity Documentation** – Unity official documentation on optimization techniques for game performanc

ASSESSMENT		
Learning Activities	**NUMBER**	**WEIGHT in %**
Mid-Term	1	40
Quiz		
Assignment	1	20
Project		
Field Study		
Presentation / Seminar		
Studio Practice		
Other		
Contribution of Final Examination/Final Project/ Dissertation to the Final Grade	1	40
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.	✓				
2	Knows the basic concepts and terminology related to the field of game design.				✓	
3	Has knowledge about the history of computer and video games and developments in this field.				✓	
4	Knows game design processes and related applications.					✓
5	Has the ability to utilize various disciplines such as communication, art, music, psychology, mythology, cinema, etc. in the game design process.	✓				
6	Has the ability to analyze analog and digital game genres.			✓		
7	Has the ability to use contemporary game engines and problem solving skills.				✓	
8	Has the knowledge of questioning the game designs with an analytic and critical perspective.			✓		
9	Has knowledge about media literacy.	✓				
10	Has the competence to prepare projects based on ethical principles in game development processes.		✓			
11	Has the competence to evaluate games as an art form.		✓			
12	Has the competence to use game design concepts and methods in related fields such as design, software development and media.					✓
13	Has the competence to take part and responsibility in game development teams.					✓
14	Has the competence to collect, analyze and interpret analytical data about games and players.				✓	
15	Has the competence to develop and present a digital game project by using game design practices effectively.					✓

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.			✓		

ECTS / STUDENT WORKLOAD				
ACTIVITIES	**NUMBER**	**UNIT**	**HOUR**	**TOTAL (WORKLOAD)**
Course Teaching Hour (X weeks * total course hours)	15		3	45
Preliminary Preparation and self- study	15		3	45
Mid-Term	1		10	10
Quiz				
Assignment	2		10	10
Project				
Field Study				
Presentation / Seminar				
Studio Practice				
Final Examination/ Final Project/ Dissertation	1		15	15
Other				
TOTAL WORKLOAD				125
TOTAL WORKLOAD / 25				5
ECTS				5

	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	×

ETHICAL RULES WITH REGARD TO THE COURSE
Plagiarism Disclaimer Detected and undetected plagiarism is a serious offence at any time and it could have devastating effects on your degree result and future professional life. Plagiarism is easy to avoid if you make sure you thoroughly identify and recognize your sources and do not copy from visual examples, designs or notes taken directly from your sources word for word. The maximum citation limit cannot exceed 20%. Artificial intelligence citations are also considered within this scope. If proven otherwise, the student will fail the course.

ASSESSMENT DETAILS AND EVALUATION CRITERIA:	
Final Grades will be determined according to the Course Learning Activities and Final Examination/ Project/ Dissertation Assessment Details as below, and comply with the Education and Examination Regulation set forth by the University. During the class sessions, participation is a very important input for the learning process for the students.. 70% attendance to courses is compulsory. Health reports belong to 30% absenteeism right.	
PREPARED BY	Dr.Masoud Moradi
UPDATED	14.04.2025
APPROVED	