Course Syllabus

Code - Course Title	**OGP227 - Data Structures and Algorithms in Games**
Course Type	III. SEMESTER
Laboratory + Practice	2+1
ECTS	**3.0**
Language of Instruction	Türkçe
Course Type	Area Elective Courses
Course Instructor(s)	ÖĞR. GÖR. GÜVENÇ USANMAZ

Mode of Delivery	This course is delivered through face-to-face instruction. Theoretical lectures and laboratory sessions are integrated throughout the semester. Practical work is conducted by default with C#/Unity; the instructor may prefer an equivalent language/engine.
Prerequisites	There are no prerequisites or co-requisites for this course.
Courses Recomended	It is recommended to have completed OGP104 Programming II before taking this course. Having completed OGP106 Computer Graphics and XXX7960 Lightweight Game Frameworks may help situate algorithms in a game context.
Recommended Resources	Red Blob Games — Pathfinding for Games: https://www.redblobgames.com/pathfinding/a-star/introduction.htmlUnity. NavMesh and AI documentation: https://docs.unity3d.com/Manual/nav-BuildingNavMesh.html
Work Placement	This course has no internship or placement requirement.

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Weeks	Learning Outcomes	Topics	Teaching Methods
Week - 1		DS&A in games: frame budget, Big-O, hot path; map of most common industry structures.	
Week - 2		Object pool and command pattern; bullet/particle spawn, undo and command queue.	
Week - 3		Inventory systems: grid inventory, slot bag, stacking; loot table and weighted random selection.	
Week - 4		Event queue and ring buffer; input events, fixed timestep friendly structures.	
Week - 5		Spatial partitioning: uniform grid, spatial hash, quadtree; broad-phase collision and culling.	
Week - 6		Broad-phase / narrow-phase separation; which structure fits which game type.	
Week - 7		Graph-based game systems: waypoint network, quest chain, map connectivity; directed/undirected graph.	
Week - 8		MST and procedural map connectivity; dungeon/level connection graph.	
Week - 9		Pathfinding I: grid A*, heuristic tuning, path smoothing, intro to JPS concept.	
Week - 10		Pathfinding II: navmesh, flow field idea, steering behaviors (seek, flee, obstacle avoidance).	
Week - 11		Game AI structures: FSM, behavior tree; action/turn selection with priority queue.	

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Weeks	Learning Outcomes	Topics	Teaching Methods
Week - 12		Decision algorithms: minimax/alpha-beta or utility scoring; influence map concept.	
Week - 13		Unity NavMesh / profiling; choosing the right algorithm and performance measurement.	
Week - 14		End-of-term two-module presentation; systems + pathfinding/AI integration and rationale analysis.	

Learning Outcomes

#	Learning Outcome
1	Selects and justifies commonly used game data structures (pool, queue, grid, heap) for given scenarios.
2	Implements performant spawn/undo systems with object pool and command pattern.
3	Designs grid inventory, loot tables and weighted random selection algorithms.
4	Applies broad-phase collision/culling optimization with spatial hash, quadtree or uniform grid.
5	Models waypoint, quest and map systems with graph representation.
6	Applies character movement and pathfinding with A*, navmesh and steering behaviors.
7	Builds a game AI decision system with FSM, behavior tree or minimax/utility scoring.
8	Develops integrated systems + pathfinding/AI modules in a game prototype and analyzes them with profiling.

Sustainable Development Goals

No content has been provided.

Course Theme

No content has been provided.

AKTS Workload

Activity	Duration (Hour)	Count	Workload
Teorik Derse Katılım	0	0	0
Sınıf Dışı Çalışma (Ön Hazırlık & Pekiştirme Amaçlı)	0	0	0
Ödevler	0	0	0
Proje - Rapor - Sunum Hazırlama	0	0	0
Ara Sınav Hazırlığı (sınav süresi dahil)	0	0	0
Final Sınavı Hazırlığı (sınav süresi dahil)	0	0	0
Uygulama (Laboratuvar, Müzik/Enstrüman Uygulaması, Atölye/Saha Çalışması vb.)	0	0	0
Staj Uygulaması	0	0	0
		Calculated ECTS	**0**

Assessment Method and Passing Requirements

No content has been provided.