Course Syllabus

Code - Course Title	**OGP217 - Game Physics**
Course Type	III. SEMESTER
Laboratory + Practice	2+1
ECTS	**5.0**
Language of Instruction	Türkçe
Course Type	Required Courses
Course Instructor(s)	ÖĞR. GÖR. GÜVENÇ USANMAZ

Mode of Delivery	This course is delivered through face-to-face instruction. Theoretical lectures, laboratory sessions and project work are integrated throughout the semester. The default environment for practical work is Unity 2D Physics/Box2D; the instructor may prefer an equivalent physics library/engine.
Prerequisites	There are no prerequisites or co-requisites for this course.
Courses Recomended	It is recommended to have completed OGP104 Programming II and OGP106 Computer Graphics before taking this course. Having completed XXX7965 Data Structures and Algorithms in Games may help reinforce collision and pathfinding concepts.
Recommended Resources	Shiffman, D. The Nature of Code: https://natureofcode.com/ (force, collision, particle sections)Unity. 2D Physics: https://docs.unity3d.com/Manual/Physics2D.html
Work Placement	This course has no internship or placement requirement.

Course Syllabus

Weeks	Learning Outcomes	Topics	Teaching Methods
Week - 1		Introduction to game physics; mass-force-acceleration, Newton's laws; game vs real physics.	
Week - 2		Vectors and kinematics; position, velocity, acceleration; Euler integration.	
Week - 3		Applying forces, friction, gravity; fixed timestep.	
Week - 4		Collision response: impulse, restitution (coefficient of elasticity).	
Week - 5		2D collision detection I: AABB (axis-aligned bounding box).	
Week - 6		2D collision detection II: circular collision, polygon intro.	
Week - 7		Ray casting; ground check, line of sight, platformer applications.	
Week - 8		Rigid body dynamics: center of mass, moment of inertia, torque, angular motion.	
Week - 9		Particle systems: gravity, wind, friction; explosion effects.	
Week - 10		Springs and joints: elasticity coefficient, constraints, simple ragdoll/joint idea.	
Week - 11		Physics engine architecture: Box2D/Unity 2D Physics overview.	

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Weeks	Learning Outcomes	Topics	Teaching Methods
Week - 12		Unity 2D: Rigidbody2D, Collider2D, PhysicsMaterial2D, collision layer/matrix.	
Week - 13		Simulation loop improvements; performance, determinism awareness.	
Week - 14		End-of-term physics-based mini game demo presentation; analysis and course wrap-up.	

Learning Outcomes

#	Learning Outcome
1	Explains Newton's laws of motion and simplifications in a game physics context.
2	Updates position, velocity and acceleration with vector and kinematic calculations.
3	Applies impulse-based collision response.
4	Performs 2D collision detection with AABB, circular collision and raycast.
5	Applies center of mass, torque and angular motion concepts in rigid body scenarios.
6	Designs particle system simulation with gravity, friction and wind forces.
7	Sets up simple physical connections with spring and joint constraints.
8	Develops and presents a physics-based mini game demo with Unity 2D Physics or equivalent.

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.