

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Razvoj pogona za videoigre
Course title:	Game Engine Development

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Računalništvo in spletne tehnologije, visokošolski strokovni študijski program prve stopnje	-	Drugi ali tretji	Četrty ali šesti
Computer Science and Web Technologies, first cycle Professional Study Programme	-	Second or third	Fourth or sixth

Vrsta predmeta / Course type

Izbirni / Elective

Univerzitetna koda predmeta / University course code:

2-RST-VS-IP-RPV-2026-09-29

Predavanja a Lectures	Seminar Seminar	Vaje Tutorials	Klinične vaje Clinical tutorials	Druge oblike študija Other forms of study	Samost. delo Individ. work	ECTS
30	-	45	-	-	105	6

Nosilec predmeta / Lecturer:

Doc. dr. Kenny Bešter Štorgel

Jeziki / Languages:

Predavanja / Lectures:

Slovenščina, angleščina / Slovene, English

Vaje / Tutorial:

Slovenščina, angleščina / Slovene, English

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Pogoj za vključitev v delo je poznavanje vsebin predmeta Programiranje 2.

Prerequisites:

To enroll in the course, familiarity with the contents of Programming 2 is required.

Vsebina:

Content (Syllabus outline):

• Osnove grafične knjižnice SFML.Net (ustvarjanje okna, osnovni izrisi, teksture, zvok, obravnava uporabniškega vnosa in dogodkov). • Arhitektura igralnega pogona (igralna zanka, upravljanje časa in frekvenca posodabljanja, stanje igre, organizacija podsistemov). • ECS arhitektura (entitete, komponente, sistemi, kompozicijsko načrtovanje, upravljanje entitet in komponent). • Geometrija 2D prostora (vektorji, osnovne geometrijske operacije, razdalje, koti, premice, presečišča). • Fizika in gibanje (položaj, hitrost, pospešek, rotacija, gravitacija, masa, vztrajnostni moment). • Zaznavanje in reševanje trkov (omejevalni pravokotniki, AABB). • Osnove 2D grafike (liki, animacije, osnovni senčilniki). • Upravljanje sveta (nalaganje, ustvarjanje in odstranjevanje scen, prehajanje med scenami). • Metanje žarkov in kamere (pogledi, vidno okno, transformacije). • Umetna inteligenca (osnovno vedenje NPC-jev, krmiljenje, iskanje poti). • Shranjevanje in nalaganje stanja igre (serializacija, konfiguracijske datoteke). • Uporabniški vmesniki (osnovni sistemi za menije, povleci in spusti sistem). • Napredna igralna zanka • Napredni sistemi igralnega pogona (sistemi delcev, akcije in ponovitve).	• Fundamentals of the SFML.Net graphics library (window creation, basic rendering, textures, sounds, and handling user input and events). • Game engine architecture (game loop, time management and update rate, game states, and subsystem organization). • ECS architecture (entities, components, systems, composition-based design, and entity and component management). • 2D geometry (vectors, basic geometric operations, distances, angles, lines, and intersections). • Physics and motion (position, velocity, acceleration, rotation, gravity, mass, and moment of inertia). • Collision detection and resolution (bounding rectangles, AABBs – axis-aligned bounding boxes). • Fundamentals of 2D graphics (sprites, animations, and basic shaders). • World management (loading, creating, and removing scenes, changing between scenes). • Ray casting, and cameras (views, viewports, and transformations). • Artificial intelligence (basic NPC behavior, steering, and pathfinding). • Saving and loading game states (serialization and configuration files). • User interfaces (basic menu systems and drag-and-drop system). • Advanced game loop. • Advanced game engine systems (particle systems, actions, and replays).
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Temeljni literatura in viri / Readings:

- R. Papius. (2015). SFML Game Development By Example, 1. izdaja, Packt Publishing.
- R. Nystrom. (2014). Game Programming Patterns, Genever Benning.
- R. B. Whitaker. (2021). The C# Player's Guide, 5. izdaja, Starbound Software.

Cilji in kompetence:

Cilj učne enote je študente seznaniti z osnovnimi koncepti, načeli in tehnikami razvoja igralnih pogonov in jih usposobiti za njihovo uporabo pri razvoju računalniških iger.

Učna enota prispeva k razvoju naslednjih splošnih in predmetno-specifičnih kompetenc:

Splošne kompetence:

- Sposobnost načrtovanja in razvoja programskih rešitev.
- Poznavanje osnov računalništva in informacijskih tehnologij
- Sposobnost logičnega sklepanja, ocenjevanja velikostnega reda rezultata, natančnosti izražanja, pisanja in razmišljanja

Predmetno-specifične kompetence:

- Poznavanje osnovnih principov in arhitekture igralnih pogonov.
- Poznavanje osnovnih gradnikov in podsistemov igralnih pogonov.
- Poznavanje principov igralne zanke, obravnave dogodkov, upravljanja časa in izrisovanja.
- Razumevanje osnovnih principov objektno usmerjenega in podatkovno usmerjenega razvoja igralnih pogonov.
- Poznavanje osnovnih tehnik optimizacije in učinkovitega upravljanja podatkov.

Objectives and competences:

The aim of the instructional unit is to familiarize students with the basic concepts, principles, and techniques of game engine development and to equip them with the skills to apply them in the development of computer games.

The instructional unit contributes to the development of the following general and subject-specific competences:

General competences:

- Ability to design and develop software solutions.
- Familiarity with the basics of computer science and information technology
- Ability to make logical reasoning, to estimate the order of magnitude of the result as well as the ability to express oneself, write and think in an accurate manner

Subject-specific competencies:

- Knowledge of the basic principles and architecture of game engines.
- Knowledge of the basic building blocks and subsystems of game engines.
- Knowledge of the principles of the game loop, event handling, time management, and rendering.
- Understanding of the basic principles of object-oriented and data-oriented game engine development.
- Knowledge of basic optimization techniques and efficient data management.

Predvideni študijski rezultati:

Znanje in razumevanje:

Študent/študentka:

- Razume osnovne koncepte in arhitekturo igralnih pogonov.

Intended learning outcomes:

Knowledge and understanding:

The student:

- Understands the basic concepts and architecture of game engines.

• Pozna glavne gradnike in podsisteme igralnega pogona. • Razume principe upravljanja igralnih objektov, komponent, dogodkov in časa. • Razume osnovne principe izrisovanja in organizacije podatkov. • Pozna osnovne pristope k optimizaciji in učinkovitemu upravljanju podatkov. • Zna uporabiti ustrezne podatkovne strukture za učinkovito upravljanje igralnih objektov. • Zna uporabiti pristope objektno usmerjenega in podatkovno usmerjenega programiranja pri razvoju igralnih pogonov. • Zna analizirati in izboljšati učinkovitost implementiranih rešitev. • Zna razviti, testirati in dokumentirati manjši igralni pogon.	• Knows the main building blocks and subsystems of a game engine. • Understands the principles of managing game objects, components, events, and time. • Understands the basic principles of rendering and data organization. • Knows the basic approaches to optimization and efficient data management. • Can use appropriate data structures for the efficient management of game objects. • Can apply object-oriented and data-oriented programming approaches in game engine development. • Can analyze and improve the efficiency of implemented solutions. • Can develop, test, and document a small game engine.
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Metode poučevanja in učenja:

• predavanja z aktivno udeležbo študentov (razlaga, diskusija, vprašanja, primeri), • konzultacije, • vaje, • skupinsko delo na projektni nalogi.
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Learning and teaching methods:

• lectures with active student participation (explanation, discussion, questions, examples) • consultations, • tutorials, • group work on project assignment.
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Načini ocenjevanja:

Delež (v %) /

Weight (in %) /

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt) Študenti bodo ocenjeni na podlagi samostojnega ali skupinskega dela pri projektni nalogi. • Projektna naloga	100 %	Type (examination, oral, coursework, project): Students will be assessed on their individual or group work on project assignment. • Project assignment
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Reference nosilca / Lecturer's references:

- C. J. Dallard, M. Milanič, K. Štorgel, Treewidth versus clique number. II. Tree-independence number, *Journal of Combinatorial Theory. Series B.* 164 (2024), 404-442.
- C. J. Dallard, M. Milanič, K. Štorgel, Treewidth versus clique number. III. Tree-independence number of graphs with a forbidden structure, *Journal of Combinatorial Theory. Series B.*, 167 (2024), 338-391.
- C. J. Dallard, V. V. Lozin, M. Milanič, K. Štorgel, V. Zamaraev, Functionality of box intersection graphs, *Results in Mathematics*, 79 (2024), 1-17.
- B. Lužar, M. Maceková, S. Rindošová, R. Soták, K. Sroková, K. Štorgel, Locally irregular edge-coloring of subcubic graphs, *Discrete Applied Mathematics*, 339 (2023), 136–148.
- H. La, B. Lužar, K. Štorgel, Further extensions of the Grötzsch Theorem, *Discrete mathematics*, 345 (2022), 1-12.
- C. J. Dallard, M. Milanič, K. Štorgel, Treewidth versus Clique Number. I. Graph Classes with a Forbidden Structure, *SIAM Journal on Discrete Math.*, 35 (2021), 2618-2646.