VIDZEMES AUGSTSKOLA

FACULTY OF ENGINEERING
STUDY COURSE DESCRIPTION

Course Title:	**Development of advanced 3D interactive environments (Unity)**				
Course code (LAIS):	**DatZM020**				
Study programme:	**Virtual reality and smart technologies**				
Level of Study programme:	☐	Short-cycle professional higher education			
	☐	Professional Bachelor			
	☐	Professional Master			
	☒	Academic Master			
	☐	PhD level			
Type of Study programme:	☒	Compulsory course (Part A)			
	☐	Professional specialization courses (Part B, compulsory)			
	☐	Professional specialization optional courses (Part B, optional)			
	☐	Elective courses (Part C)			
Course Workload:	**Credits/ ECTS**		**Academic hours**	**Contact hours**	**Independent work hours**
	6		150	48	102
Course Author/ Tutor:	**Ģirts Ķesteris**				
	Guest lecturer, Mg. sc.comp.				
	girts.kesteris@va.lv				
	Consultation: according to the schedule for each semester				
Course Form:	Full time				
Study year, semester:	1st year, 1st semester				
Language:	Latvian, English				
Prerequisites for the Course:	Grounding knowledge in programming				
Course Summary:	Course's objective is to give a general view into a three-dimentional environment development cycle and its basic principles and theoretical and practical knowledge in development of virtual and augmented reality systems.				
Assessment:	Exam				
Requirements for Credits:	Final grade consists of oral and practical exam task grades.				
Abiding by the Academic Ethics	Students must abide by the academic and research ethics, Vidzeme University of Applied Sciences Ethics Regulations, incl.: - study papers must be independently developed; - the study work should reference all statements, ideas and data used that have been authored by someone else; - appropriate data acquisition methods should be used in the acquisition of data, the research ethics must be respected, empirical data must be collected independently and cannot be distorted or falsified; - the examination must be carried out by the student independently, without the use of supporting materials and/or consultations with other students, unless the lecturer states otherwise. In the event of non-compliance with the academic and research ethics, punishment is imposed in accordance with the ViA Ethics Regulations and the study course must be re-taken, unless the punishment is extramarital.				
Learning Outcomes; the evaluation methods and criteria	**Learning Outcomes**			**The evaluation methods and criteria**	
	Knowledge				

	Theoretical knowledge of how Unity engine operates.	Individual oral exam
	Theoretical knowledge of basic principles of development of virtual and augmented reality systems.	Individual oral exam
	Theoretical knowledge of creation of different interactive content.	Individual oral exam
	Skills	
	Use and manage Unity 3D engine.	Individual oral and practical exam
	Develop interactive 3D experiences.	Individual oral and practical exam
	Create different virtual and augmented reality environments.	Individual oral and practical exam
	Competency	
	Use correct 3D development terminology	Individual oral exam
	Independently plan different 3D experience arhitectures, develop and support them, predict possible problemsituations.	Individual oral and practical exam
	Evaluate and analyse different possible approaches in creation of interactive 3D content.	Individual oral and practical exam
Course Compulsory literature:		
Course additional literature:	1. Jeremy Gibson. *Introduction to Game Design, Prototyping, and Development: From Concept to Playable Game with Unity and C#*. - Boston : Addison-Wesley Professional, 2014. 2. Steve Aukstakalnis. *Practical Augmented Reality: A Guide to the Technologies, Applications, and human factors for AR and VR*. - Boston? : Addison-Wesley Professional, 2016.	
Course confirmation date:	*22.05.2024*	
Date of course description update:	01.10.2024	

Study Course Plan:

Date	Theme	Academic hours		Study Form
		Contact hours	**Independent work hours**	
	Intro in Unity and 3D engines. Unity hierarchy entities and their components. Visualisation. Topical research on Unity Engine.	**4**	**2**	*Theory, practical lession.*
	Perspective and orthographic camera projections. Physics.	**4**	**4**	*Theory, practical lession.*

	Keyframe animations. Animation controllers. Inverse kinematics. Motion capture.	**4**	**8**	*Theory, practical lession.*
	Unity application programming interface (API). Transformation mathematics.	**4**	**8**	*Theory, practical lession.*
	Unity user inferface system. Optimisation. Coroutines. Interpolations and extrapolations.	**4**	**8**	*Theory, practical lession.*
	Surface shaders. Vert/Frag shaders.	**4**	**8**	*Theory, practical lession.*
	Virtual reality. Linear and gamma color spaces.	**4**	**15**	*Theory, practical lession.*
	Rendering techniques. Postprocessing effects.	**4**	**10**	*Theory, practical lession.*
	Augmented reality. Computer vision.	**4**	**15**	*Theory, practical lession.*
	Object recognision and tracking. Motion tracking. Image recognision and tracking. Facial recognision	**4**	**10**	*Theory, practical lession.*
	Environmental understanding. Environmental light estimation.	**4**	**14**	*Theory, practical lession.*
	Exam.	**4**	**-**	*Individual exam with oral questions and practical assignment.*
	Hours total	***48***	***102***	