

**FACULTY OF ENGINEERING
STUDY COURSE DESCRIPTION**

Course Title:	Development of Advanced 3D Interactive Environments				
Course code (LAIS):	DatZ1022				
Study programme:	Virtual Reality and Smart Technologies				
Level of Study programme:	<input type="checkbox"/>	1st level professional higher education			
	<input type="checkbox"/>	Professional Bachelor			
	<input checked="" type="checkbox"/>	Professional Master			
	<input type="checkbox"/>	PhD level			
Type of Study programme:	<input checked="" type="checkbox"/>	Compulsory course (Part A)			
	<input type="checkbox"/>	Professional specialization courses (Part B, compulsory)			
	<input type="checkbox"/>	Professional specialization optional courses (Part B, optional)			
	<input type="checkbox"/>	Elective courses (Part C)			
Course Workload:	Credits	ECTS	Academic hours	Contact hours	Independent work hours
	2	3	80	24	56
Course Author/ Tutor:	Arnis Ćirulis				
	Assoc.prof., Dr.sc.ing.				
	e-mail: arnis.cirulis@va.lv				
	Consultation: according to the schedule for each semester				
Course Form:	Full time studies				
Study year, semester:	1., 1. 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-dimensional environment development cycle and its basic principles and theoretical and practical knowledge in development of virtual and augmented reality systems.				
Course Methods:	Lectures, practical lessons, exam				
Assessment:	Exam				
Requirements for Credits:	Final grade consists of oral and practical exam task grades.				
Course Contents:	<p>Intro in Unity and 3D engines. Unity hierarchy entities and their components. Visualisation. Perspective and orthographic camera projections. Physics. Keyframe animations. Animation controllers. Inverse kinematics. Motion capture. Unity application programming interface (API). Transformation mathematics. Coroutines. Interpolations and extrapolations. Unity user interface system. Optimisation. Surface shaders. Vert/Frag shaders. Virtual reality. Linear and gamma color spaces. Rendering techniques. Postprocessing effects. Augmented reality. Computer vision. Image recognition and tracking.</p>				

	Facial recognition. Object recognition and tracking. Motion tracking. Environmental understanding. Environmental light estimation.	
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 architectures, 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. <i>Introduction to Game Design, Prototyping, and Development: From Concept to Playable Game with Unity and C#</i> . - Boston : Addison-Wesley Professional, 2014. 2. Steve Aukstakalnis. <i>Practical Augmented Reality: A Guide to the Technologies, Applications, and human factors for AR and VR</i> . - Boston? : Addison-Wesley Professional, 2016.	
Course confirmation date:	08.12.2017.	
Date of course description update:		

Study Course Plan:

Date	Theme	Academic hours		Study Form
		Contact hours	Independent work hours	
<i>The date is specified before the implementation of the course</i>	Intro in Unity and 3D engines. Unity hierarchy entities and their components. Visualisation. Perspective and orthographic camera projections. Physics.	3	2	Theory, practical lesson.
	Keyframe animations. Animation controllers. Inverse kinematics. Motion capture.	3	6	Theory, practical lesson.
	Unity application programming interface (API). Transformation mathematics. Coroutines. Interpolations and extrapolations.	3	8	Theory, practical lesson.
	Unity user interface system. Optimisation. Surface shaders. Vert/Frag shaders.	3	6	Theory, practical lesson.
	Virtual reality. Linear and gamma color spaces. Rendering techniques. Postprocessing effects.	3	10	Theory, practical lesson.
	Augmented reality. Computer vision. Image recognition and tracking. Facial recognition.	3	14	Theory, practical lesson.
	Object recognition and tracking. Motion tracking. Environmental understanding. Environmental light estimation.	3	10	Theory, practical lesson.
	Exam.	3	-	Individual exam with oral questions and practical assignment.
Hours total:		24	56	