

FACULTY OF ENGINEERING STUDY COURSE DESCRIPTION

Course Title:	Augmented reality and computer vision algorithms				
Course code (VAIS):	The course code will be specified after receiving the license				
Study programme:	Virtual reality and mobile 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:	Kristaps Brigmanis-Brīģis				
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	Consultation: according to the schedule for each semester				
Course Form:	Full time				
Study year, semester:	1 st year, 2 nd semester				
Language:	Latvian, English				
Prerequisites for the Course:	C++ programming				
Course Summary:	<p>The aim of this course is to give practical and theoretical knowledge in nowadays computer vision algorithms, its structure and functioning principles and their usage in augmented reality systems and applications using OpenCV4 libraries. During practical workshops, students will develop and improve their skills in developing augmented reality systems applying computer vision algorithms.</p>				
Course Methods:	Lectures, practical activities, individual assignment, final assessment etc.				
Assessment:	Examination				
Requirements for Credits:	<ol style="list-style-type: none"> 1. Passed each lecture's practical activity 2. Passed online tests for each chapter 3. Passed group assignment and its presentation <p>Final examination consists of oral questions and practical activity. If all requirements are not met on time, student is not allowed to pass the exam. For delayed exam requirements, max score is decreased. Final valuation is formed by individual assignment and final examination.</p>				
Course Contents:	<p>Image structure. OpenCV4 libraries, structure and main elements. Basic image processing and analysis. Interest points and natural features in image. Interest point and natural feature detection, descriptor extraction and matching. Motion in image and object tracking. Object detection and classification. Text detection and recognition.</p>				

	Vuforia Unity plugin for augmented reality review. Microsoft Azure cloud service review, image analysis and text recognition.	
Learning Outcomes; the evaluation methods and criteria	Learning Outcomes	
	The evaluation methods and criteria	
	Knowledge	
	Knowledge and extensive understanding of image structure, OpenCV4 library structure and provided image manipulation functionality.	Accomplished practical activities. Individual assignment.
	Extensive knowledge and understanding of image interest point and natural features detection, description and matching.	Accomplished practical activities. Individual assignment.
	Knowledge and extensive understanding of motion detection and object tracking in image.	Accomplished practical activities. Individual assignment.
	Knowledge and understanding of object detection and classification in image.	Accomplished practical activities. Individual assignment.
	Skills	
	Able to use independently OpenCV4 libraries for image processing and analysis to solve various augmented reality problems.	Accomplished practical activities. Individual assignment.
	Able to provide arguments when explaining and discuss latest computer vision algorithms and its appliance in scope of augmented reality.	Group assignment and presentation.
	Competency	
	Able to independently analyse computer vision algorithm problems and substantiate potential professional solutions.	Individual exam with oral questions and practical assessment.
	Able to show extensive understanding of computer vision algorithm provided solutions and it integration in scope of augmented reality.	Individual exam with oral questions and practical assessment. Individual assignment.
Able to combine variety of computer vision algorithm approaches and methods for augmented reality problem solving.	Individual exam with oral questions and practical assessment. Individual assignment.	
Course Compulsory literature:	1. Robert Laganier. OpenCV 3 Computer Vision Application Programming Cookbook (3 rd Edition). 446 pages. 2017	
Course additional literature:	1. Daniel L. Baggio, Shervin Emami, David M. Escriva, Khvedchenia Ievgen, Jason Saragih, Roy Shilkrot. Mastering OpenCV 3 (2 nd Edition). 244 pages. 2017 2. Tobias Hollerer, Dieter Schmalstieg. Augmented reality : principles and practice. 496 pages. 2016 3. https://docs.opencv.org/3.3.1/	
Course confirmation date:	30.10.2017.	
Date of course description update:	30.10.2017.	

Study Course Plan:

Date	Theme	Academic hours		Study Form
		Contact hours	Independent work hours	
	Image structure. OpenCV4 libraries, structure and main elements. Basic image processing and analysis, part one.	4	10	Theoretical lecture. Practical activity. Online test.
	Basic image processing and analysis, part two.	4	10	Theoretical lecture. Practical activity. Online test.
	Interest points and natural features in image. Interest point and natural feature detection, extraction and matching.	4	12	Theoretical lecture. Practical activity. Online test.
	Motion in image, optical flow and object tracking.	4	12	Theoretical lecture. Practical activity. Online test. Skills challenging workshop.
	Object detection and classification in image. Text detection and recognition. Vuforia+Unity. Microsoft Azure cognitive service.	4	12	Theoretical lecture. Practical activity. Online test. Individual assignment presentation.
	Final examination	4	-	Group assignment presentation.