VIDZEMES AUGSTSKOLA

FACULTY OF ENGINEERING
STUDY COURSE DESCRIPTION

Course Title:	**AUGMENTED REALITY AND COMPUTER VISION ALGORITHMS**					
Course code (LAIS):	**DatZ6003**					
Study programme:	**Virtual Reality and Mobile Technologies**					
Level of Study programme:	☐	1st level professional higher education				
	☐	Professional Bachelor				
	☒	Professional 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**	
	2	3	80	24	56	
Course Author/ Tutor:	**Kristaps Brigmanis-Briģis**					
	Mg. sc. comp.					
	Kristaps.brigmanis@va.lv					
	Consultation: according to the schedule for each semester					
Course Form:	Full time					
Study year, semester:	1st year, 2nd semester					
Language:	Latvian, English					
Prerequisites for the Course:	C++ programming					
Course Summary:	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 OpenCV3 libraries. During practical workshops, students will develop and improve their skills in developing augmented reality systems applying computer vision algorithms.					
Course Methods:	Lectures, practical activities, individual assignment, final assessment etc.					
Assessment:	Examination					
Requirements for Credits:	1. Passed each lecture's practical activity 2. Passed online tests for each chapter 3. Passed individual assignment and its presentation 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.					
Course Contents:	Image types and structure. OpenCV3 libraries, structure and main elements. Basic image processing and analysis. Image segmentation. 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. Performance optimization (CUDA, OpenCL). Image data sets, image credits.	
Learning Outcomes; the evaluation methods and criteria	**Learning Outcomes**	**The evaluation methods and criteria**
	Knowledge	
	Knowledge and extensive understanding of image types and structure, OpenCV3 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 OpenCV3 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.	Individual 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:	Robert Laganiere. OpenCV 3 Computer Vision Application Programming Cookbook (3rd 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 (2nd 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:	08.12.2017.	
Date of course description update:		

Study Course Plan:

Date	Theme	Academic hours		Study Form
		Contact hours	Independent work hours	
	Image types and structure. OpenCV3 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. Image segmentation.	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. Performance optimization using CUDA and OpenCL. Image datasets and image credits. Individual assignment presentation.	4	12	Theoretical lecture. Practical activity. Online test. Individual assignment presentation.
	Final examination	4	-	Final examination with oral questions and practical activity.
	Total:	***24***	***56***	