

Lecturer

Name: Rajmund Kożuszek

Name for daily/classes use: Rajmund

Background: Master of Science, Eng.

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Course Description

Title: VR the Graphics Champions

Fields of activity: Aerospace/Aeronautical Engineering , Agronomics/Forestry , Applied Sciences , Architectural Engineering , Architecture , Automotive Engineering , Biological/Biotechnical/Gene Engineering , Biology , Biomedical Engineering , Chemical Engineering , Chemistry/Chemical Technology , Civil Engineering , Computational Sciences , Computer Engineering , Computer Science/Automatic Control/Informatics , Conservation-Restoration , Control Engineering/Systems engineering , Economics/Business Administration/Marketing , Electrical/Electromechanical Engineering , Electronic/Electrotechnical Engineering , Environmental Engineering , Food Engineering , Geodesy , Geology , Industrial Engineering , Industrial Management , Logistics , Machine & Instrument engineering/Design , Maritime Management , Materials Engineering , Mathematics , Mechanical Engineering , Mechatronics , Medicine/Dental Medicine , Mining/Mineral Resources Engineering , Multimedia and Communication Design , Naval Architecture & Engineering , Optics/Optomety , Petroleum Engineering , Pharmacy , Physics/Physics Engineering , Power Engineering , Production Engineering/Management , Rural and Surveying Engineering , Telecommunications/Electronics , Territory Engineering , Textile Engineering & Technology , Transport Engineering , Veterinary Medicine

Examination type: Case Study with presentation

Number of ECTS credits issued: 1 ECTS

Learning Goals and Objectives: To increase the participants' knowledge in computer graphics in particular: image analysis, animation, creating of CGI and physically based movements control. To show how to use programming skills in the creative way.

Syllabus

Name of activity	Crash course in Computer Graphics
Number of working hours	3 h
Type of activity	Lecture
Lecturer	Rajmund Kożuszek, M.Sc., Eng.
Short summary of content	Raster vs. vector graphics. Basic raster operations. Coordinate systems. Geometric transformations in 2D and 3D. Modelling of objects. Shading models: surface properties and lights. Texture mapping and filtering. Rendering pipeline. Ray tracing and global illumination. Computer animation: keyframes, inverse kinematics and dynamics.
Bibliography	Not needed
Expected effect	Students are going to gain basic knowledge about computer graphics. Furthermore, they will most likely experience problems characteristic to this field of science and will learn how to find solutions.

Name of activity	Crash course in Virtual Reality Technology
Number of working hours	3 h
Type of activity	Lecture
Lecturer	Marcin Witkowski, Ph.D., Eng.
Short summary of content	A short history of VR/AR. Description of VR system architecture and key components: input devices: haptic interface, face and gesture recognition, gaze tracking), output devices

	(stereoscopic displays, force feedback, simulation of movement). Building VR worlds.
Bibliography	<p>Warwick, K., Gray, J. and Roberts, D. eds. (1993). Virtual Reality in Engineering, Peter Peregrinus. London.</p> <p>Stanney, K. M. ed. (2002). Handbook of Virtual Environments: Design, Implementation, and Applications. Lawrence Erlbaum Associates, Inc., Mahwah, New Jersey</p>
Expected effect	Students will be familiar with basic concepts of virtual and augmented reality. They will know the VR and AR system structure and novel hardware used to provide the highest level of immersion.

Name of activity	Modelling and shading basics in Blender
Number of working hours	4 h
Type of activity	Workshop
Lecturer	Rajmund Kożuszek, M.Sc., Eng.
Short summary of content	Blender user interface. Creating and modifying mesh objects. Applying transformations in different coordinate systems. Using modifiers. Editing meshes. Using Cycles renderer. Composition of surface properties. Using area lights and controlling rendering process. Using particle systems.
Bibliography	Not needed
Expected effect	At the end of the session, students will be familiar with the problems of creating and modifying 3D objects. They will learn the basic terminology and mechanisms applied in the area of using Blender. People with programming background will be prepared to create models on their own.

Name of activity	Animation and Game Engine basics in Blender
Number of working hours	4 h
Type of activity	Workshop
Lecturer	Rajmund Kozuszek, M.Sc., Eng.
Short summary of content	<p>Skinning and armature. Operating on bones and vertex groups. Keyframe animation; interpolation parameters. Rendering animation. Game Engine basics: sensors, controllers and actuators. Using keyboard and mouse sensors. Collision detection. Scene switching.</p>
Bibliography	Not needed
Expected effect	<p>Students will be familiar with basic technology and mechanisms applied in the area of animation and game engine basics. They will also gain some theoretical knowledge necessary to perform an exercise during the workshop.</p>

Name of activity	UX/UI Workshop - from an idea to a prototype
Number of working hours	6 h
Type of activity	Workshop
Lecturer	Maciej Szafraniec, FollowUp.cc
Short summary of content	<p>Intro to UX. Theory and fundamentals of UX. Lean UX Process: Discovery, Strategy, Modeling, Sketching, Wireframing, Prototyping, UXPin software.</p> <p>The main goal of the workshop is to present and apply the entire process of creating digital products: from an idea to prototype.</p>

Bibliography	Not needed
Expected effect	Participants will be able to generate ideas, define and model them, as well as create first sketches of the product. The final task will be creating a prototype in UXPIn.

Name of activity	Introduction to Computer Vision
Number of working hours	2 h
Type of activity	Lecture
Lecturer	Filip Dorociński, B.Sc., Eng.
Short summary of content	This course provides an introduction to computer vision including fundamentals of image formation, camera imaging geometry, feature detection and matching, multiview geometry including stereo, motion estimation and tracking, and classification.
Bibliography	Not needed
Expected effect	Participants will learn basic methods for applications that include finding known models in images, depth recovery from stereo, camera calibration, image stabilization.

Name of activity	Exam
Number of working hours	7 h
Type of activity	Project or practical work
Lecturer	Mateusz Rumowski, B.Sc., Eng.

Short summary of content	Projecting VR/AR application in groups of 4-5 people.
Bibliography	Not needed
Expected effect	Students project the application with given set of properties, use the knowledge gained during the course. Students will present the results of Case Study, show up their ideas and plans for given application development.

Pre-materials

The course will move quickly from the basics of understanding VR and Computer Graphics production and workflow, and will encourage participants to go as far as possible during the academical hours.

Useful links:

Name	https://en.wikipedia.org/wiki/Computer_graphics
Topic/field	Computer Science
Short description	Some basic information about computer graphics

Name	http://whatis.techtarget.com/definition/virtual-reality
Topic/field	Computer Science
Short description	Some basic information about Virtual Reality

Name	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-837-computer-graphics-fall-2012/lecture-notes/
Topic/field	Computer Science
Short description	MIT open course of Computer Graphics
References	Lectures: 3, 5, 6, 10, 11, 13

Name	http://www.blenderhd.com/wp-content/uploads/2015/08/BeginnersGuideToBlender.pdf
Topic/field	Computer Science
Short description	The beginner's guide to Blender
References	Chapters: "What is 3D?", "Modeling", "Animation: Keyframes"