Załącznik Nr 5 do Zarz. Nr 33/11/12

(pieczęć wydziału)

COURSE DESCRIPTION

1. Course title: COMPUTER GRAPHICS	**2. Course code:** CG
3. Validity of course description: 2018/2019	
4. Level of studies: first degree	
5. Model of studies: stationary	
6. Field of study: INFORMATICS	
7. Profile of studies: general academic	
8. Programme: ALL	
9. Semester: 5, 6	
10. Faculty teaching the course: Faculty of Automatic Control, Electronics and Computer Science, Institute of Informatics	
11. Course instructor: Ph.D. Eng. Agnieszka Szczęsna	
12. Course classification: general	
13. Course status: obligatory	
14. Language: english	
15. Pre-requisite qualifications: Computer Programing (C, C++), Algebra and Analytic Geometry, Fundamentals of computer programming	
16. Course objectives: The course aims to provide the theoretical basis and the resulting 3D computer graphics algorithms, and selected topics of 2D computer graphics as well as providing the necessary practical experience acquired in result of the implementation of algorithms in the laboratory exercises. The lecture will enable students to get in touch with modern solutions in the field photo-realistic and interactive 3D graphics offered in world literature, create their own solutions to the projects as well as understanding fundamental conditions of modern computer animation.	

17. Description of learning outcomes:[1]

Nr	Lerning outocmes description	Method of assessment	Teaching methods	Reference code
1	Student is aware of basic computer graphics algorithms.	Test (sem. 5) Exam (sem. 6)	Lecture	K1A_W09, K1A_W15
2	Knowledge of basic methods used in solving computer science tasks in the field of computer graphics algorithms.	Test (sem. 5) Exam (sem. 6)	Lecture	K1A_W09, K1A_W15
3	Student understand graphical pipeline.	Test (sem. 5) Exam (sem. 6)	Lecture	K1A_W09, K1A_W15

[1] należy wskazać ok. 5 – 8 efektów kształcenia

4	Student can solve problem related to 2D and 3D computer graphics.	Solution of laboratory task	Laboratory	K1A_U08, K1A_U12, K1A_U21, K1A_U22
5	Student can implement basics 2D and 3D graphics algorithms.	Solution of laboratory task	Laboratory	K1A_U08, K1A_U12, K1A_U21, K1A_U22

18. Teaching modes and hours

Lecture / BA /MA Seminar / Class / Project / Laboratory:

30/0/0/0/0/30

19 Syllabus description:

Lecture:

Introduction to Introduction to programing in graphical API based on OpenGL, graphical pipeline, programing shaders in GLSL.

Basic math: vector space, Hilbert and affine. Frame, representation of the vector and the point. Representation in homogeneous coordinates. Transformations resulting from the choice of representation of the frame. The structure of the matrix transformation. Sample matrices for translation, rotation, scaling of the frame. Parameterization of the orientation, Euler angles, axis angle, quaternions. Equation of quaternions, interpolation between quaternions. The relationship between parameterizations. Geometric modelling of volume and surface. Parametric curves and surfaces. Analytical and geometric continuity. Bezier curves, B-spline, NURBS. Definitions, basic properties, determining the point on the curve, fold node, the weight of the control points. Parametric surfaces created from parametric curves. Parameterization of the surface and texture. Junction patches of surface. Projecting the 3D to 2D. Types of projection. Projection matrix perspective. Volume / pyramid of vision. Classic trim to the pyramid of view. Homogeneous coordinates. Shadowing algorithms. Rasterization algorithms. Texturing the basic concepts and application of textures, 2D texture and 3D texture procedure. Modelling of light using RGB representation. Components of the lighting heuristic approach. Techniques Gouraud'a and Phong, modelling of light including physics. Radiometry and its subsidiaries. BRDF and BSSRDF equation rendering versions of integrating the solid angle and the surface of the stage. Techniques solving the equation rendering. Monte Carlo method and its versions reduce variance estimate. Map a RGB colour to coordinate. Photon maps. Method energy balance.

Laboratory:

Introduction to OpenGL, Raster algorithms, Clipping and windowing, 3D Transformations, Hidden surface removal Illumination models, Raytracing, Object detection, Bone animation, Collision detection, Particle effects, Pixel and vertex shaders

20. Exam: yes (sem. 6)

21. Primary sources:

- James D. Foley, Andries van Dam, Steven K. Feiner, John F. Hughes, Richard L. Philips: Wprowadzenie do grafiki komputerowej (2011)
- Andries van Dam, Morgan McGuire , David F. Sklar , James D. Foley, Steven K. Feiner , Kurt Akeley Computer Graphics: Principles and Practice (3rd Edition), 2013.

22. Secondary sources:

- A series of books: Graphics Gems
- Francis S Hill Jr. , Stephen M Kelley: Computer Graphics Using OpenGL (3rd Edition).
- Sumanta Guha: Computer Graphics Through OpenGL: From Theory to Experiments,
- Richard S. Wright Jr., Benjamin Lipchak: OpenGL. Księga eksperta. Helion
- OpenGL Programming Guide

23. Total workload required to achieve learning outcomes

Lp.	Teaching mode	Contact hours / Student workload hours
1	Lecture	30/30
2	Classes	/
3	Laboratory	30/30
4	Project	/
5	Seminar	/
6	Other	10/20
	Total number of hours	70/80

24. Total hours: 150

25. Numbers of ECTS: 5 (2 – sem. 5, 3 – sem. 6)

26. Number of ECTS credits allocated for contact hours: 3

27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects): 2

26. Comments:

Approved:

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(date, Instructor's signature) (date, the Director of the Faculty Unit signature)