

Discipline	Graphic Systems code: 23 summer semester	
Specialty	SOFTWARE AND INTERNET TECHNOLOGIES	
ECTS credits: 6	Form of assessment: Progressive Assessment	
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Department	SOFTWARE AND INTERNET TECHNOLOGIES	
Faculty	Faculty of Computer Sciences and Automation	
<p>Annotation: The aim of the course is to introduce students to the basic methods of computer graphics and visualization necessary for the construction of different types of graphic systems (GC). Different aspects of graphical applications are discussed as a set of software, hardware, data, manipulation, storage, analysis and visual representation of data in systems with different application areas. The course includes lectures on topics such as the mathematical foundations of computer vision, models, types and specifics of graphical systems. Mathematical tools needed to represent the geometric aspects of graphical objects, especially for modeling of smooth shapes and surfaces, have been specially studied. The themes of computer modeling of light, colors, exposure, reproduction, and composition of the frame, as well as the ways of storing graphic data are discussed. Attention is paid to the methods and means of storing graphic data. Algorithms for visualization of two-dimensional and three-dimensional graphic objects, business, technological and management, geographic and other graphic systems are also explored. The content includes questions about the synthesis of realistic images, the movement of graphics objects, animation systems, and the creation of virtual reality. The course also envisages the development of different types of graphics systems in the OpenGL graphics environment.</p> <p>Learning objectives:</p> <ul style="list-style-type: none"> • Graphic program libraries • Raster graphics. Two-dimensional graphics • Business graphics • Algorithms for plotting graphic primitives (segment, circle, etc.) • Algorithms for two-dimensional cutting and filling closed areas • Transformations of graphic objects • Three-dimensional graphics. Design transformation • Algorithms to remove hidden lines • Coloring 3D objects with realistic color 		

CONTENTS:		
Training Area	Hours lectures	Hours seminar exercises
Introduction to Computer Graphics, Specific Devices, Graphics Application Development Environments.	2	
Mathematical tools needed to represent the geometric aspects of graphical objects.	2	
Means for realization of computer graphics algorithms.	2	
Creating graphical applications with OpenGL, basic syntax, libraries.	2	
Two-dimensional graphics. Models and types of graphics systems (SGs).	2	
Algorithms for business, technology, and management information.	3	
Algorithms for graphical representation of graphic primitives, point, curves and polygons.	2	
Composition of transformations, movement and animation.	1	
Approximation and interpolation methods for forming curves.	2	
Color images synthesis.	2	
Algorithms for filling closed areas and cutting out graphic windows.	3	
Algorithms for visualization of 3D objects.	2	
Algorithms for removing invisible lines and surfaces.	2	
Lighting patterns. Generate Realistic Images. Three dimensional image systems.	1	
Image databases (BDIs), types and applications.	2	
Methods and means of creating a SG. Introduction to the use of OpenGL and Visual C ++ environments to create graphical applications. Types of devices. Raster - scanning system. Graphical file formats. Types of coordinate systems.		2
Create graphical applications in the DevC ++ environment. Static two-dimensional graphic object.		2
Development of sub-systems for graphical representation of two-dimensional data.		2
Development of business graphic subsystems using circular diagrams.		2
Development of business graphic subsystems using histograms.		2
OpenGL Structure of Programming Modules. Graphic Mode Settings Parameters Settings.		2

OpenGL Working with graphic primitive dots, lines, curves, standard graphic objects.		2
OpenGL Basic techniques and algorithms for synthesis of 2D images. Color applications.		2
Use different attributes of graphic primitives (colors, textures, columns, masks, fog, translucency, etc.) in the OpenGL environment. Filling with texture, blurry and translucency.		2
Implementation of systems with B-splines and Beius curves.		2
Two-dimensional and three-dimensional graphical transformations. Motion of graphic objects. Animation systems and creation of virtual reality.		2
Implementation of algorithms for visualization of 3D objects. Parallel projections.		2
Implementation of algorithms for visualization of 3D objects. Central projections.		2
Implementation of algorithms for separating the visible surfaces of 3D objects.		2
Achieving image realism. Realistic color, shadows, transparency		2
TOTAL: 60 h	30	30