



SCHOOL OF BUSINESS
AND MANAGEMENT OF
TECHNOLOGY OF BSU



Innovative ICT Education for Social-Economic Development (IESED)
574283-EPP-1-2016-1-LT-EPPKA2-CBHE-JP

SYSTEMS OF COMPUTER GRAPHICS

Minsk 2017

1. COURSE PLAN

Year of study	Semester	Academic hours					Hours of course work	Credits	Number of hours
		Total	Lecture	Lab	Practice/ seminar	Independent work			
3	5,6	108	26	68	2	12		4	Full-time
3	5,6	108	6	30		72		4	Part-time

2. COURSE GOALS

To solve practical problems of visualization by means of computer graphics (two-dimensional: raster and vector).

3. COURSE OUTCOMES

After completing this course, students will be able to:

- explain the basic concepts that form the logic of working with different kinds of two-dimensional graphics (raster and vector);
- apply technologies for creating, editing raster and vector images;
- use the technique of working with the toolkit editors raster and vector graphics, ways of creating and editing images to solve practical problems;
- generate ideas for solving practical problems of visualization;
- work independently and in a team.

4. COURSE CONTENT (FULL TIME)

Number of topic	Name of the topic	Number of academic hours			Independent work, hours	Form of student's knowledge control
		Lecture	Practical tasks (seminar)	Laboratory tasks		
1	2	3	4	5	6	7
1	Introduction to computer graphics	2	2			Task for group work "Fundamentals of work with vector and raster graphics"
2	Raster graphics	16		48	8	Final Assignment
2.1	Basics of working with a raster editor.	6		16		Round table means Forum "Working with image layers"
2.2	Creation of raster images.	4		16	4	Creative task 1
2.3	Editing of raster images	6		16	4	Creative task 2
3	Vector graphics	8		20	4	Final Assignment
3.1	Basics of working with a vector editor	2		2		
3.2	Creation and editing of vector objects	4		22	4	Test work 1 Creative task 1 Creative task 2
3.3	Optimization of work in a vector editor	2				
	Total	26	2	68	12	

5. COURSE CONTENT (PART TIME)

Number of topic	Name of the topic	Number of academic hours			Independent work, hours	Form of student's knowledge control
		Lecture	Practical tasks (seminar)	Laboratory tasks		
1	2	3	4	5	6	7
1	Introduction to computer graphics	2			2	Task for group work "Fundamentals of work with vector and raster graphics"
2	Raster graphics	2		18	52	Final Assignment
2.1	Basics of working with a raster editor	2		4	16	Round table means Forum "Working with image layers"
2.2	Creation of raster images			6	18	Creative task 1
2.3	Editing of raster images			8	18	Creative task 2
3	Vector graphics	2		12	18	Final Assignment
3.1	Basics of working with a vector editor	2			2	
3.2	Creation and editing of vector objects			10	16	Creative task 1 Creative task 2
3.3	Optimization of work in a vector editor			2		
	Total	6		30	72	

6. THEORETICAL CONTENT

№	Topic number	Content
1	Introduction to computer graphics	Basic concepts of vector and raster graphics, their comparison: disadvantages and advantages, work methods. Image resolution. Formats of graphic files. Color Models and Modes. The editor of computer graphics. Review editors of vector and raster graphics.
2	Basics of working with a raster editor	The interface of a raster editor. Assigning a raster editor. The interface of a raster editor. Setting up the workspace of a raster editor. Work with documents: opening, closing, creating a new one, saving. Changing the viewing scale of the image, navigation. Use of auxiliary elements: rulers, guides, grids. Ways to cancel the performed actions. Settings of a raster editor. Technique for selecting areas of the image. The concept of selection in a raster image. Selection of objects of the correct geometric shape. Selection of objects of complex shape, logical operations with selections. Selection by color. Actions with the selected area: modification, transformation, inverting, setting of the edges of objects.
3	Creation of raster images	Work with color. Color Background, Foreground. Dialog Color Picker. The Swatches palette. Technique of drawing. Tools for drawing and fills. Brush tool: drawing techniques, palette brushes, setting up and creating brushes. The Point Buked tool. The Gradient tool: a gradient palette, creating a new gradient. The filler layers. Delete fragments and restore

		images - tools Eraser, Magic Eraser, History Brush. Work with text. Vector tools of a raster editor.
4	Editing of raster images	Drawing up of montage and collage. Problems in separating the object from the background. Automatic edge removal. Correction layers. Technology of compiling collages and erections. Concept and work with the layer mask. Concept and work with a quick mask. Their use in creating collages and montages. Color and tone correction of images. The concept of image correction. Corrective tools. Corrective filters. Types of images. Color Models. Translation of an image from one color model to another. The concept of an image channel. Using alpha channels to work with highlighting. The concept of color and tone correction of an image. Commands and techniques for tone correction of images. Commands and techniques for color correction of images.
10	Basics of working with a vector editor	The main elements of the interface and their purpose. Adding and removing elements of the interface. Zoom the image. Zoom and Hand tools. Zoom the image with the computer mouse. Adjust the page settings. Adding and removing pages. Navigate through the pages. Creating new illustrations. Opening of previously created illustrations. Preservation of illustrations. Import and export files. Work with multiple documents at the same time. Printing of documents.
11	Creation and editing of vector objects	The concept of a vector object and the way of its representation in the computer. The main elements of a vector object. Overview of tools for creating basic vector objects: rectangles, polygons, ellipses Methods for adjusting the parameters of vector objects. Adjusting the fill parameters and the contour parameters of vector objects.
12	Creation and editing of vector objects	Curves. Overview of tools for creating and editing curves. Converting standard objects to curves. Logical operations.
13	Optimization of work in a vector editor	Document view modes. Creation and use of color styles. Creation and use of graphic and text styles. Creation of a custom palette. Overview of dockers for optimizing work in a vector editor.

7. PRACTICAL CONTENT

№	Topic number	Content
1	Introduction to computer graphics.	Basic concepts of vector and raster graphics, their comparison: disadvantages and advantages, work methods. Image resolution. Formats of graphic files. Color Models and Modes. The editor of computer graphics. Review editors of vector and raster graphics.

8. LABORATORY PRACTICE

№	Topic number	Content
2.1	Basics of working with a raster editor.	The interface of a raster editor. Assigning a raster editor. The interface of a raster editor. Customize the workspace. Work with documents: opening, closing, creating a new one, saving. Changing the viewing scale of the image. Use of auxiliary elements: rulers, guides, grids. Ways to cancel the performed actions. Setting up a raster editor. Work with layers. The concept of an image layer. Types of layers and their features. Operations with layers. Manage layers using the

		<p>Layers palette. Opacity of the layer. Blending modes for layers. Lock the layer. Transformation of the contents of the layer. Layer effects.</p> <p>Technique for selecting areas of the image. The concept of selection in a raster image. Select objects of the correct geometric shape. Selection of objects of complex shape, logical operations with selections. Selection by color. Actions with the selected area: modification, transformation, inverting, setting of the edges of objects. Practical use of selections: for the subsequent work with the selected area, for masking the unseparated part of the image, for drawing.</p>
2.2	Creation of raster images.	<p>Work with color. Color Background, Foreground. Dialog Color Picker. The Swatches palette.</p> <p>Technique of drawing. Tools for drawing and fills. Brush tool: drawing techniques, palette brushes, setting up and creating brushes. The Point Buked tool. The Gradient tool: a gradient palette, creating a new gradient. The filler layers.</p> <p>Delete fragments and restore images - tools Eraser, Magic Eraser, History Brush.</p> <p>Work with text. Entering and editing text. Transformation of the text block. Formatting symbols and paragraphs. Work with text layers. Rasterization of the text layer. Change the orientation of the text. Antialiasig of the text. Curvature of the text. The notion of “filter” and methods of working with them.</p> <p>Vector tools of the raster editor. The concept of vector contour. Modes of work of vector tools of a raster editor. Using contours in practice: drawing, storing selections, creating a vector layer mask.</p>
2.3	Editing of raster images	<p>Drawing up of montage and collage. Problems in separating the object from the background. Automatic edge removal. Correction layers. Technology of compiling collages and erections. Concept and work with the layer mask. Concept and work with a quick mask. Their use in creating collages and montages.</p> <p>Color and tone correction of images. The concept of image correction. Corrective tools. Correction filters. Types of images. Color Models. Translation of an image from one color model to another. The concept of an image channel. Using alpha channels to work with highlighting. The concept of color and tone correction of the image. Commands and techniques for tone correction of images. Commands and techniques for color correction of images.</p>
3.1	Basics of working with a vector editor	<p>Introduction to a vector editor. The main elements of the interface and their purpose. Adding and removing elements of the interface. Zoom the image. Zoom and Hand tools. Zoom the image with the computer mouse. Docker View Manager. Adjust the page settings. Adding and removing pages. Navigate through the pages. Creation of new illustrations. Opening of previously created illustrations. Preservation of illustrations. Import and export files. Work with multiple documents at the same time. Printing of documents.</p> <p>The concept of a vector object. The concept of a vector object and the way it is represented in the computer.</p>
3.2	Creation and editing of vector objects	<p>Tools for creating standard vector objects. Creation of rectangles and squares. Creation of a rectangle about the size of the page. Creation of a rectangle by three points. Adjustment of the parameters of the rectangle. Creation of ellipses and circles. Creation of sectors and arcs. Adjustment of the parameters of ellipses, sectors and arcs. Creation of cells. Adjustment of the number of columns and rows of the cell. Creation of polygons. Types of polygons. Creation of polygons of different types. Configuration of polygon parameters. Creation of spirals. Types of spirals. Adjustment of parameters of spirals. Tools for drawing lines. Additional tools for creating vector forms. Methods of moving, rotating and scaling objects. Deleting objects. Copy objects using the clipboard. Copy objects with the</p>

		<p>mouse. Duplicating objects. Cloning of objects.</p> <p>Work with Curves.</p> <p>Work with curves. Types of nodes. Adding and removing nodes. Breaks on the curve. Union of independent curves. Splitting a curve into independent curves. Logical operations on curves. Converting standard objects to curves.</p> <p>Adjustment of the fill and path. Homogeneous filling. Gradient fill. Patterned fill. Texture filling. PostScript fill. Interactive filling. Tarpitting by the grid. "Clever" fill. Contour settings.</p> <p>Work with text. Types of text objects. Creation of text objects. Editing of text objects. Formatting of text objects. Converting text objects from one view to another. Text effects (text wrapping around the text, fitting the text under the path and under the form).</p> <p>Ordering of objects. Ordering with the help of transformations. Alignment and distribution. The order of the objects. Grouping. Blocking. Ordering using bindings. Object Manager. Docker Step and Repeat.</p> <p>Special effects. Interactive extrusion. Interactive contour. Interactive distortion. Interactive shadow. Interactive shell. Interactive extrusion. Interactive transparency. Lenses. The effect of perspective. Figured pruning. Beveled edges. Border effect.</p>
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9. ASSIGNMENT FOR INDEPENDENT WORK

№	Name of task	Task
1	Task for group work "Fundamentals of work with vector and raster graphics"	Based on the analysis of the principles of raster and vector graphics, highlight the shortcomings and advantages of each of these types of graphics. For the identified shortcomings, choose the ways to neutralize them.
2.1	Round table means Forum "Working with image layers"	Discuss through the forum means the practical application of layer operations when creating and editing raster images.
2.2	Creative task №1 "Drawing in a raster editor"	<p>Draw a drawing using the following raster editor tools for drawing:</p> <ul style="list-style-type: none"> – Learned drawing tools and fills, corrective tools. – Created brush. – Created gradient. – Created pattern. – Created palette. – One of the drawing objects must be difficult to draw with the object. It can be, for example: bubbles, hair, rain, fog, mountains, etc. – Drawing technology should be applied. Bonding of layers during this task is not allowed.
2.3	Creative task №2 "Creating a collage / editing in a raster editor"	<p>Make a montage of any images you have. For this:</p> <ol style="list-style-type: none"> 1. Select the images for the assembly. They must satisfy the following condition: several mounted objects must be complex to separate them from the background. For example, to have needles, hair, hair, whiskers, etc. 2. Analyze all the selected initial photos for compliance with technical (size, resolution, etc.) and artistic (angle, lighting, lighting sources, etc.) requirements. 3. Select the selected objects in the most effective ways. 4. Collect all the separated objects in a single document. The document should be layered. Bonding of layers during this task is not allowed. 5. The layer mask must be used in the installation. If desired and necessary, it can be used several times. 6. The installation should be provided with objects drawn or cut using selections corrected by a quick mask. 7. One of the mounted objects should be provided with a realistic shadow.

		8. Use Smart Object 9. Analyze the resulting image for compliance with artistic requirements (sources of illumination, illumination, realism, etc.). to the received installation / collage.
2	The final task for the section "Raster graphics"	Prepare an advertising booklet, or a flyer or a web page layout by means of a raster graphics editor (at the teacher's choice).
3.2	Test work №1 «Work with curves».	Imagine graphically step-by-step construction of an object by turning a geometric primitive into a curve and using the curve editing capabilities (adding / removing vertices, breaking and closing curves, combining curves, etc.). The result of the work is presented on the page of the vector editor document
3.2	Creative task №1 «Executing Fills»	Create 4 pictures according to the following descriptions: 1. each picture has a size of 10x10 cm; 2. for the picture elements, use a uniform, gradient and mesh fill; 3. The theme of the 1st picture is a book; the theme of the 2nd picture is a vase; the theme of the 3rd picture is vegetables or fruits; the theme of the 4th picture is an airplane.
3.2	Creative task №2 «Performing special effects and using the master layer»	Create 4 pictures according to the following descriptions: 1. create each picture on a separate page; rename the page accordingly; 2. use layers to organize objects; layers must be given the appropriate names; 3. each picture should have a size of 10x10 cm; 4. for image elements use a uniform, gradient or mesh fill; 5. use a variety of special effects, at least 3 different; 6. all images must be combined with a common element, which is placed on the master layer.
3	Final task for the section "Vector Graphics"	Prepare an advertising booklet, or a flyer or a web page layout using the vector graphics editor (the teacher's choice).

10. SYSTEM OF ASSESSMENT OF KNOWLEDGE AND SKILLS (ACCORDING TO THE NATIONAL REQUIREMENTS)

A ten-point scale, depending on the grade and the mark, includes the following criteria:

10 (ten) points, passed:

- systematized, deep and full knowledge on all sections of the curriculum of the institution of higher education in the academic discipline, as well as on major issues that go beyond its limits;
- accurate use of scientific terminology (including in a foreign language), competent, logically correct statement of the answer to questions;
- perfect mastering of the tools of the academic discipline, the ability to use it effectively in formulation and solution of scientific and professional problems;
- the expressed ability independently and creatively to solve complex problems in non-standard situations;
- complete and profound studying of basic, additional literature on the subject of the discipline;
- the ability to freely navigate in theories, concepts and directions on the discipline and give them an analytical assessment, use the scientific achievements of other disciplines;
- creative independent work on practical, laboratory classes, active creative participation in-group discussions, high level of the culture of performance of tasks.
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9 (nine) points, passed:

- systematized, deep and full knowledge on all sections of the curriculum of the institution of higher education on the academic discipline;
- accurate use of scientific terminology (including in a foreign language), competent, logically correct statement of the answer to questions;
- mastering of the tools of the academic discipline, the ability to use it effectively in formulation and solution of scientific and professional problems;
- ability independently and creatively to solve complex problems in non-standard situations within the curriculum of the institution of higher education on the academic discipline;
- complete studying of basic, additional literature on the subject of the discipline, recommended by the curriculum of the institution of higher education on the discipline;
- the ability to navigate in theories, concepts and directions on the discipline and give them an analytical assessment;
- Systematic, active independent work on practical, laboratory classes, active creative participation in-group discussions, high level of the culture of performance of tasks.

8 (eight) points, passed:

- systematized, deep and full knowledge on all sections of the curriculum of the institution of higher education in the academic discipline in the volume of the curriculum of the institution of higher education on the discipline;
- use of scientific terminology (including in a foreign language), competent, logically correct statement of the answer to questions, the ability to make sound conclusions and generalizations;
- mastering of the tools of the academic discipline (methods of complex analysis, information technology), the ability to use it effectively in formulation and solution of scientific and professional problems;
- ability independently to solve complex problems within the curriculum of the institution of higher education on the academic discipline;
- studying of basic, additional literature, recommended by the curriculum of the institution of higher education on the discipline;
- the ability to navigate in theories, concepts and directions on the discipline and give them an analytical assessment;
- active independent work on practical, laboratory classes, systematic participation in-group discussions, high level of the culture of performance of tasks.

7 (seven) points, passed:

- systematized, deep and full knowledge on all sections of the curriculum of the institution of higher education on the academic discipline;
- use of scientific terminology (including in a foreign language), competent, logically correct statement of the answer to questions, the ability to make sound conclusions and generalizations;
- mastering of the tools of the academic discipline, the ability to use it effectively in formulation and solution of scientific and professional problems;
- free possession of generic solutions within the curriculum of the institution of higher education on the academic discipline;
- studying of basic, additional literature, recommended by the curriculum of the institution of higher education on the discipline;

- the ability to navigate in basic theories, concepts and directions on the discipline and give them an analytical assessment;
- independent work on practical, laboratory classes, participation in- group discussions, high level of the culture of performance of tasks.

6 (six) points, passed:

- sufficiently full and systematized knowledge in the volume of the curriculum of the institution of higher education on the discipline;
- use of the necessary scientific terminology, competent, logically correct statement of the answer to questions, the ability to make sound conclusions and generalizations;
- mastering of the tools of the academic discipline, the ability to use it effectively in solution of scientific and professional problems;
- ability independently to apply generic solutions within the curriculum of the institution of higher education on the academic discipline;
- studying of basic literature, recommended by the curriculum of the institution of higher education on the discipline;
- the ability to navigate in basic theories, concepts and directions on the discipline and give them a comparative assessment;
- active independent work on practical, laboratory classes, periodic participation in group discussions, high level of the culture of performance of tasks.

5 (five) points, passed:

- sufficient knowledge in the volume of the curriculum of the institution of higher education on the discipline;
- use of scientific terminology, competent, logically correct statement of the answer to questions, the ability to make sound conclusions;
- mastering of the tools of the academic discipline, the ability to use it in solution of scientific and professional problems;
- ability independently to apply generic solutions within the curriculum of the institution of higher education on the academic discipline;
- studying of basic literature, recommended by the curriculum of the institution of higher education on the discipline;
- the ability to navigate in basic theories, concepts and directions on the discipline and give them a comparative assessment;
- active independent work on practical, laboratory classes, periodic participation in group discussions, high level of the culture of performance of tasks;
- independent work on practical, laboratory classes, periodic participation in group discussions, sufficient level of the culture of performance of tasks.

4 (four) points, passed:

- sufficient knowledge within the educational standard of higher education;
- studying of basic literature, recommended by the curriculum of the institution of higher education on the discipline;
- use of scientific terminology, logical statement of the answer to questions, the ability to make sound conclusions;
- ability to draw conclusions without essential errors;
- mastering of the tools of the academic discipline, the ability to use it in solution of standard (typical) tasks;

- ability to solve standard (typical) tasks under the guidance of a teacher;
- ability to navigate in basic theories, concepts and directions on the discipline and give them an assessment;
- work under the guidance of a teacher on practical, laboratory classes, the permissible level of the culture of performance of tasks.

3 (three) points, failed:

- insufficient knowledge within the educational standard of higher education;
- studying of basic literature, recommended by the curriculum of the institution of higher education on the discipline;
- knowledge of a part of the basic literature, recommended by the curriculum of the institution of higher education on the discipline;
- use of scientific terminology, presentation of answers to questions with significant, logical errors;
- weak possession of the tools of the academic discipline, incompetence in solving standard (typical) tasks;
- inability to navigate in basic theories, concepts and directions on the discipline;
- work under the guidance of a teacher on practical, laboratory classes, the permissible level of the culture of performance of tasks.
- passivity on practical, laboratory classes, low level of the culture of performance of tasks.

2 (two) points, failed:

- fragmented knowledge within the educational standard of higher education;
- knowledge of individual literary sources, recommended by the curriculum of the institution of higher education on the discipline;
- inability to use scientific terminology of the academic discipline, the presence in the answer rude, logical errors;
- passivity on practical, laboratory classes, low level of the culture of performance of tasks.

1 (one) point, failed:

- lack of knowledge and (competences) within the educational standard of higher education, failure to answer, failure to appear for attestation without good cause.

11. TOOLS – MINIMUM REQUIREMENTS, WHICH SHOULD BE FIXED

The training will be conducted using interactive methods (round tables, project method) and distance learning technologies, implemented by means of the training portal (eLearning Server). The students will be provided with electronic presentations of lectures, electronic and printed versions of handouts for practical classes.

On full-time laboratory and practical classes, students will learn the discipline directly in the computer lab. The following software (SW) will be used during the training:

The following tools and technologies were used in the preparation of training, teaching and methodological materials:

- MS Office;
- iSpring;

- Internet services (LearningApps, etc.);
- Programs for recording and editing video;
- Programs for data visualization (Infogr.am, etc.);
- Specialized software.

12. RESOURCES

Basic literature

1. Adobe Photoshop CC 2017: офиц. учеб. курс / [пер. с англ. Горлач А., Тимакова А.] — М.: Изд-во ТРИУМФ, 2017 – 480 с.: ил.
2. Обучение и техническая поддержка для Adobe Photoshop [Электронный ресурс] / Режим доступа: / <https://helpx.adobe.com/ru/support/photoshop.html?promoid=5NHJ8FD2&mv=other>
3. Photoshop tutorials [Электронный ресурс] / Режим доступа: <https://helpx.adobe.com/photoshop/tutorials.html>
4. Руководство пользователя Photoshop / <https://helpx.adobe.com/ru/photoshop/user-guide.html>
5. Комолова Н.В., Тайц А.М., Тайц А.А. Самоучитель CorelDRAW X8 – СПб.: БХВ-Петербург, 2017
6. Руководство по CorelDRAW® X8 [Электронный ресурс] / Режим доступа: <http://product.corel.com/help/CorelDRAW/540238885/Main/RU/User-Guide/CorelDRAW-X8.pdf> \ Дата доступа: 28.02.2018
7. Баутон Г.Д. CorelDRAW X5. Официальное руководство СПб.: БХВ-Петербург, 2012. – 816 с.

Additional literature

1. Andrew Faulkner, Brie Gyncild. Adobe Photoshop CC Classroom in a Book (2014 release). The official training workbook from Adobe. / Режим доступа: <https://books.google.by/books?id=Yt-cKiK5CbwC&printsec=frontcover&dq=adobe+photoshop+cc+book&hl=ru&sa=X&ved=0ahUKEwi44Ne0hcjZAhXOzaQKHcTLD-Q6AEIKDAA#v=onepage&q=adobe%20photoshop%20cc%20book&f=false> Дата доступа: 28.02.2018
2. Scott Kelby The Adobe Photoshop CC Book for Digital Photographers (2014 release) / Режим доступа : <https://books.google.by/books?id=KEtVBOAAQBAJ&printsec=frontcover&dq=adobe+photoshop+cc+2017+book&hl=ru&sa=X&ved=0ahUKEwjzgcyPhsjZAhWQ66QKHVAMDCMQ6AEIMTAB#v=onepage&q&f=false> Дата доступа: 28.02.2018
3. Bouton G.D. CorelDRAW X8: The Official Guide/ McGraw-Hill Education, 2017 <https://www.amazon.com/CorelDRAW-X8-Gary-David-Bouton/dp/1259860205>