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MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution
Higher Education
"NORTH CAUCASUS FEDERAL UNIVERSITY"

APPROVED BY
Acting Director of the Institute
Advanced Engineering
Cand. Tech. Sci., Associate Professor
A.A. Porokhnya

DISCIPLINE ASSESSMENT TOOLS FUND
Digital Image Processing

Field of study	11.03.02 Infocommunication Technologies and Communication Systems
Profile	Intelligent Data Processing in Infocommunication Systems and Networks
Year of start of training	2026
Form of study	Full-time
Implemented in a semester	6

Introduction

1. Purpose

The Fund of Assessment Tools for the discipline "Digital Image Processing" is designed to objectively assess the level of competence formation.

2. FOS is an appendix to the program of the discipline "Digital Image Processing".

3. Developer N.Y. Bratchenko, Associate Professor of the Department of Digital, Robotic Systems and Electronics of the Institute of Advanced Engineering.

4. An examination of the FOC was carried out.

Members of the expert group:

Chairman: V.P. Mochalov, Professor of the Department of Digital, Robotic Systems and Electronics of the Institute of Advanced Engineering.

Members of the Commission:

V.P. Mochalov, Professor of the Department of Digital, Robotic Systems and Electronics of the Institute of Advanced Engineering.

S.V. Melnikov, Senior Researcher of the Interdisciplinary Training and Research Center for Agricultural Technologies, Associate Professor of the Department of Digital, Robotic Systems and Electronics of the Institute of Advanced Engineering.

Representative of the employer's organization:

Mironov V.A., General Director of Orintex LLC.

Expert opinion: The FAT for the discipline allows you to assess the level of competence formation. Start approbation.

5. The validity period of the FAT is determined by the period of implementation of the educational program.

1. Description of indicators and assessment criteria at various stages of their formation, description of assessment scales

Competency(s), indicator(s)	Levels of competence formation(s),			
	The minimum level has not been reached (Unsatisfactory) 2 points	Minimum level (satisfactory) 3 points	Intermediate level (good) 4 points	High level (excellent) 5 points
<i>Competence: PC-1</i> Capable of operating radio-electronic systems				
Learning outcomes in the discipline (module): <i>Indicator:</i> ID-1PK-1	Does not know and does not understand the principles of building software architecture and types of software architecture; does not know the basic methods and means of software design; does not understand the methods and means of designing computer vision systems; does not understand the methods and techniques for formalizing digital image processing tasks; does not understand the capabilities of modern and future tools for the development of software products, technical means.	Insufficiently knows and understands the principles of software architecture and types of software architecture; partially knows the basic methods and tools of software design; partially understands the methods and means of designing computer vision systems; partially understands the methods and techniques of formalizing digital image processing tasks; partially understands the capabilities of modern and future tools for the development of software products, hardware.	Knows and understands the principles of building software architecture and types of software architecture; knows the basic methods and tools of software design; understands the methods and means of designing computer vision systems; understands the methods and techniques of formalizing digital image processing tasks; understands the capabilities of modern and promising tools for the development of software products and hardware.	Fully knows and understands the principles of building software architecture and types of software architecture; knows the basic methods and tools of software design; understands the methods and means of designing computer vision systems; understands the methods and techniques of formalizing digital image processing tasks; understands the capabilities of modern and promising tools for the development of software products and hardware.

Learning outcomes in the discipline (module): <i>Indicator:</i> ID-2PK-1	Insufficiently understands and does not analyze the subject area, does not develop options for the development of a computer vision system and does not evaluate and substantiate the developed solutions. Insufficiently selects hardware and software, does not use existing standard solutions and design templates in the process of developing computer vision systems	Partially analyzes the subject area and develops options for the development of a computer vision system and evaluates and substantiates the developed solutions. Partially selects hardware and software, uses existing standard solutions and design templates in the process of developing computer vision systems	Analyzes the subject area, develops options for the development of a computer vision system and evaluates and substantiates the developed solutions. Selects hardware and software, uses existing standard solutions and design templates in the process of developing computer vision systems	Carries out a full analysis of the subject area, develops options for the development of a computer vision system and evaluates and substantiates the developed solutions. Selects hardware and software, uses existing standard solutions and design templates in the process of developing computer vision systems
Learning outcomes in the discipline (module): <i>Indicator:</i> ID-3PK-1	Does not assess the time and labor intensity of implementing the requirements for the developed software. Poorly applies methods and tools for designing the computer vision system.	Evaluates the time and labor intensity of implementing the requirements for the developed software. Partially applies the methods and means of designing the computer vision system.	Evaluates the time and labor intensity of the implementation of requirements for the developed software. Applies methods and means of designing the computer vision system.	Fully assesses the time and labor intensity of implementing the requirements for the developed software. Consciously and competently applies the methods and means of designing the computer vision system.
Competence: PC-3 Capable of conducting research work on the development of innovative radio-electronic devices for various purposes				
Learning outcomes in the discipline (module): <i>Indicator:</i> ID-1PK-3	Does not assess the time and labor intensity of implementing the requirements for the developed software.	With errors and shortcomings, he applies the methods of planning project work, the basics	Applies methods of planning project work, the basics of development	Independently competently applies the methods of planning project work,

	Poorly applies methods and tools for designing the computer vision system.	of development and management of business processes.	and management of business processes.	the basics of development and management of business processes.
Learning outcomes in the discipline (module): <i>Indicator:</i> ID-2PK-3	He is not able to apply methods of theoretical and experimental research using computer modeling, performing technical calculations using computer technology	Partially develops vision system components. Partially develops vision systems and the necessary requirements for them.	Develops models of vision system components. Develops vision systems and the necessary requirements for them.	Independently develops models of vision system components. Develops vision systems and the necessary requirements for them.
Learning outcomes in the discipline (module): <i>Indicator:</i> ID-3PK3	Does not use the basic logical methods and techniques of scientific research and scientific creativity	Partially determines the business requirements for the system during the design process, determines some of the limitations of the system.	Identifies the business requirements for the system during the design process, and defines the appropriate system constraints.	Independently determines the business requirements for the system in the design process, fully determines the
Learning outcomes in the discipline (module): <i>Indicator:</i> ID-4PK-3	Unable to perform technical calculations using computer technology	Partially analyzes requests for changes to the properties and requirements of the system being developed and analyzes their impact	analyzes requests for changes to the properties and requirements of the system being developed and analyzes their impact	Independently and actively analyzes requests for changes in the properties and requirements of the system being developed and analyzes their impact
Learning outcomes in the discipline (module): <i>Indicator:</i> ID-6PK-3	Is unable to collect and analyze scientific and technical information, summarizes domestic and foreign experience	Partially applies methods and algorithms for optimizing executable code	Applies methods and algorithms for optimizing executable code	Competently applies methods and algorithms for optimizing executable code

	in the field of radio engineering, conducts patent searches scientific creativity research and development in the form of presentations, patents, articles, reports			
<i>Indicator:</i> ID-8PK-3	Analyzes the results of scientific research	Partially defines software implementation options	Defines software implementation options	Competently determines software implementation options

ASSESSMENT TOOLS TO CHECK THE LEVEL OF FORMATION OF COMPETENCIES

Full-time, Semester 7			
Job Number	Correct answer	Content of the question	Competence
2.	a	What is Image Sampling? (a) The process of converting an analogue image to a digital image by pixelation b) Increasing the brightness of the image c) Lossless image compression d) Image Noise Removal	PC-1
3.	a	What parameter determines the quality of image sampling? a) Sample rate b) Image File Size (c) Colour scheme (d) Noise level	PC-1
4.	a	What happens if the sample rate is too low? a) An aliasing effect will appear b) The clarity of the image will increase c) File size will be reduced d) All noises will disappear	PC-1
5.	d	Which theorem sets the conditions for correct signal sampling? a) Kotelnikov's theorem b) Pythagorean Theorem (c) Fourier's theorem (d) Nyquist's theorem	PC-1
6.	a	What is image quantization? (a) The process of assigning discrete brightness values to pixels b) Image blur c) Increasing the resolution of the image d) Color space conversion	PC-1
7.	a	What is the name of the quantization error? a) Quantization noise (b) Moiré effect	PC-1

		c) Compression artifacts (d) Color dispersion	
8.	a	The more levels of quantization, the more ... a) Higher image quality b) Smaller file size c) Stronger aliasing effect d) Lower contrast	PC-1
9.	a	What does the image histogram show? a) Pixel brightness distribution (b) Geometric distortions (c) Colour temperature (d) Noise level	PC-1
10.	a	What tool is used to analyze the change in brightness along a line in an image? a) Luminance profile b) Histogram (c) Projection (d) Spectrum	PC-1
11.	a	What are image projections used for? a) To analyze the distribution of pixels in the X and Y axes b) To increase resolution c) To change the color balance d) To compress the image	PC-1
12.	a	If the histogram is shifted to the left, it means that the image... a) Too dark b) Too light c) Has a high contrast ratio d) Contains a lot of noise	PC-1
13.		Define the process of image sampling. What physical parameters are sampled?	PC-1
14.		Formulate the Kotelnikov (Nyquist) theorem in relation to image sampling. What is its practical meaning?	PC-1
15.		What factors affect the sample rate selection when converting an analog image to a digital image?	PC-1

16.		Describe the phenomenon of aliasing (superposition of spectra) in image sampling. How can this effect be prevented?	PC-1
17.		Define the process of image quantization. What is the difference between level quantization and time quantization?	PC-1
18.		What types of brightness quantization do you know? Describe the features of uniform and non-uniform quantization.	PC-1
19.		How is the depth of quantization (bit depth) related to the quality of a digital image?	PC-1
20.		Describe the phenomenon of the contour effect (posterization). Under what conditions does it occur?	PC-1
21.		What quantization noise reduction methods exist? How do they affect image quality?	PC-1
22.		Define the histogram of an image. What characteristics of an image can be determined from its histogram?	PC-1
23.		Describe the algorithm for constructing a histogram for a halftone image. How is a histogram constructed for a color image?	PC-1
24.		What is an image brightness profile? What image processing tasks are it used in?	PC-1
25.		Define horizontal and vertical image projections. What are their practical applications?	PC-1
26.		How can I use a histogram to analyze the quality of image quantization?	PC-1
27.		Describe the method of histogram alignment. When is it most effective?	PC-1
28.		How can image projection analysis help with segmentation problems?	PC-1
29.		How does the histogram of an image change when the depth of its quantization changes?	PC-1
30.		Compare the processes of discretization and quantization of images. What are the similarities and differences?	PC-1
31.		What are the current trends in image sampling and quantization techniques?	PC-1
32.	a	What is element-by-element image transformation? a) Change each pixel independently of the others b) Group processing of image areas c) Filtering the image in the frequency domain d) Lossy image compression	PC-1
33.	c	Which type of transformation is NOT element-by-element? a) Linear Stretch of Histogram (b) Gamma correction	PC-1

		(c) Median filtration (d) Binarization	
34.	a	How Does Linear Image Contrast Work? a) Increases the difference between the minimum and maximum brightness values b) Adds random noise to the image c) Blurs the boundaries of objects d) Reduces the number of colors	PC-1
35.	b	Which transformation is described by the formula: $I_{out} = a * I_{in} + b$? (a) Nonlinear transformation (b) Linear transformation (c) Logarithmic conversion (d) Power transformation	PC-1
36.	a	What is gamma correction used for? a) To correct the nonlinearity of the human eye's perception of brightness b) To increase the resolution of the image c) To rotate the image d) To change the color space	PC-1
37.	b	At $\gamma > 1$ in gamma correction, the following occurs: a) Image lightening b) Image Darkening c) Increase contrast in dark areas d) Reducing contrast in light areas	PC-1
38.	a	What is histogram EQ? a) Alignment of pixel brightness distribution b) Increasing the size of the image c) Image Noise Removal d) Dynamic range compression	PC-1
39.	d	What is the effect of applying histogram EQ to a narrow dynamic range image? a) Increase in contrast b) Decrease in detail c) Emergence of artifacts d) All of the above	PC-1

40.	b	How is the threshold selected for Otsu binarization? a) Intra-class variance is minimized b) Maximizes cross-class variance c) User-defined (d) A fixed value of 128 is used	PC-1
41.	a	What transformation allows you to distinguish objects from the background according to a given range of brightness? (a) Threshold treatment (b) Gamma correction c) Linear Tension d) Histogram Equalization	PC-1
42.	b	What is the best conversion to use to enhance an image with uneven lighting? (a) Global threshold processing (b) Adaptive threshold treatment (c) Linear contrast d) Gamma correction from $\gamma = 1$	PC-1
43.	b	Which method allows you to emphasize details in dark areas without overexposing light areas? a) Linear Tension (b) Logarithmic conversion (c) Power conversion from $\gamma > 1$ (d) Binarization	PC-1
44.	a	Which transformation sequence will give the best result for a dark, noisy image? a) Noise Reduction → Linear Stretching → Gamma Correction b) Gamma Correction → Binarization → Equalization c) Equalization → Threshold Machining → Linear Stretching d) Linear Tension → Noise Reduction → Binarization	PC-1
45.	b	What parameter do I need to change to increase detail in the highlights during gamma correction? a) Increase γ (b) Reduce γ c) Increase parameter a in linear transformation (d) Reduce the threshold for binarization	PC-1

46.		Define element-by-element image transformation. How does it differ from spatial (mask) processing methods?	PC-1
47.		What are the main classes of elemental transformations? Give examples of each class.	PC-1
48.		Describe a mathematical model of element-by-element transformation. What parameters are it characterized by?	PC-1
49.		What are the advantages and limitations of element-by-element transformations compared to other image enhancement techniques?	PC-1
50.		Describe the principle of linear contrast of an image. What parameters determine its result?	PC-1
51.		How is the dynamic range of an image normalized? Please provide a mathematical description.	PC-1
52.		What problems can arise when applying linear stretching of a histogram to images with luminance spikes?	PC-1
53.		Compare the performance of global and local linear contrast for different types of images.	PC-1
54.		Define gamma correction. How is the optimal value of the γ parameter chosen?	PC-1
55.		Describe the principle of a logarithmic transformation. When is it most effective?	PC-1
56.		What are the methods of power transformations? How do they affect the visual perception of an image?	PC-1
57.		Compare the effects of applying different nonlinear transformations (gamma correction, logarithmic, power) to dark and light images.	PC-1
58.		Formulate the problem of equalizing the histogram. What mathematical apparatus is used to solve it?	PC-1
59.		Describe the algorithm for adaptive local equalization of the histogram. What parameters should be taken into account when implementing it?	PC-1
60.		What are the limitations of the histogram equalization method? In what cases can it degrade the image quality?	PC-1
61.		How is partial histogram EQ performed? What are its advantages over full EQ?	PC-1
62.		Define image binarization. What are the methods for choosing a threshold?	PC-1
63.		Describe the binarization algorithm according to the Otsu method. What statistical characteristics of the image does it use?	PC-1

64.		What are the advantages of adaptive threshold processing compared to global processing?	PC-1
65.		What threshold processing modifications allow you to take into account local features of the image?	PC-1
66.		How to evaluate the effectiveness of the applied element-by-element transformation? What quantitative metrics can be used?	PC-1
67.		Describe current trends in the development of element-by-element image conversion algorithms.	PC-1
68.		How are human visual perceptions taken into account in the development of image enhancement techniques?	PC-1
69.		How can I adapt the conversion parameters to the content of the image?	PC-1
70.		How are machine learning methods used to select the optimal parameters of element-by-element transformations?	PC-1
71.		What hardware accelerators can be used to implement element-by-element transformations in real time?	PC-1
72.	b	The Wiener filter is designed for: a) Sharpening the image b) Minimization of RMS between the original and the reconstructed image c) Removal of only impulse noise d) Image segmentation	PC-1
73.	b	The Wiener-Hopf equation connects: (a) Image and noise spectra (b) Correlation functions of signal and noise (c) Spatial filter masks (d) Median filter parameters	PC-1
74.	c	Which operator is NOT a linear filtration mask? a) Sobel Operator (b) Gaussian filter (c) Median filter (d) Laplace filter	PC-1
75.	a	When increasing the size of the washout filter mask: a) Reduces noise but increases blur	PC-1

		(b) Sharpening of boundaries c) The effect of aliasing disappears (d) Improved colour rendering	
76.	a	A causal filter processes pixels: a) Based on previous values only b) Using future values c) Considering all pixels of the image d) Diagonal only	PC-1
77.	a	Recurrent filtering allows: a) Reduce computational complexity b) Increase the size of the mask c) Eliminate the influence of noise d) Change the color model	PC-1
78.	a	To implement a non-causal Wiener filter, the following is used: (a) Discrete Fourier transform (FFT) (b) Wave conversion c) Histogram quantization (d) Linear interpolation	PC-1
79.	a	Cyclic convolution is used for: a) Acceleration of computations in the frequency domain b) Increase in resolution c) Image compression (d) Removal of artifacts	PC1
80.	a	The Bayesian approach is based on: a) Statistical signal and noise model b) Analysis of histograms (c) Geometric transformations d) Graph theories	PC-1
81.	b	Markov filtration takes into account: a) Current system status only (b) Dependence on previous states c) All pixels of the image (d) Spectral characteristics only	PC-1

82.	b	The median filter is effective against: a) Additive Gaussian noise (b) Impulse noise ("salt and pepper") (c) Intermittent interference (d) Color distortion	PC-1
83.	a	When you increase the size of the median filter window: a) Anti-aliasing is enhanced, but details are lost b) Improved colour rendering c) All types of noise are reduced d) Blur effect is excluded	PC-1
84.	a	What does the Point Scattering Function (FRT) in the distortion model describe? a) Brightness distribution of a point source after distortion b) Image histogram (c) Frequency spectrum of noise (d) Geometric transformations	PC-1
85.	a	Motion blur (blur) can be described: a) Linear FRT in the direction of travel (b) The Gaussian FRT (c) Pulse function (d) Periodic function	PC-1
86.	a	The algebraic approach to recovery is based on: a) Solution of a system of linear equations (b) Frequency filtering c) Iterative correction (d) Neural networks	PC-1
87.	a	The main problem of algebraic methods: a) Computational Complexity for Large Images b) Inability to work with color images (c) High-frequency noise amplification (d) Requirement of accurate knowledge of the FRT	PC-1
88.	a	The main disadvantage of the inverse filter: (a) Excessive noise amplification b) Inability to work with defocus	PC-1

		(c) Requirement for an iterative approach (d) Limiting to circular distortions only	
89.	a	The Wiener filter differs from the inverse filter: (a) Consideration of noise statistics (b) Use of non-linear operations (c) Work only in the spatial field (d) Applying only to binary images	PC-1
90.	a	To compensate for edge effects, the following are used: (a) Overlapping Periodic Continuation (b) Image cropping (c) Increase in the size of the FRT (d) Ignoring boundary pixels	PC-1
91.	a	The Lucy-Richardson method is based on: (a) Poisson statistics and iterative refinement (b) Linear algebra (c) Frequency decomposition (d) Geometric transformations	PC-1
92.	a	Number of iterations in recovery methods: a) Selectable between speed and quality b) Always fixed c) Determined by image size only d) Depends on the color model	PC-1
93.	a	Segmentation during recovery helps: a) Separate objects for local recovery b) Increase resolution c) Remove all types of noise d) Change the color scheme	PC-1
94.	a	Threshold segmentation is used to: a) Highlighting objects by brightness (b) Frequency filtering (c) Correction of geometric distortions (d) Elimination of lubrication	PC-1

95.		Explain the principle of duality between points and lines in projective geometry. How is this property used in image processing?	PC-1
96.		What equations describe a straight line on a plane in different coordinate systems? Compare their advantages.	PC-1
97.		Define homogeneous coordinates. Why are they necessary for projective transformations?	PC-1
98.		How is the transition from Cartesian coordinates to homogeneous coordinates and vice versa performed? Give examples.	PC-1
99.		Which transformations are Euclidean transformations? Write down their matrix form.	PC-1
100.		How are the properties of figures preserved during Euclidean transformations? Give examples of application.	PC-1
101.			
102.		How do affine transformations differ from Euclidean transformations? What properties do they preserve?	PC-1
103.		Define homography. In what image processing tasks is it used?	PC-3
104.		How do projective transformations affect the parallelism of lines and the ratio of distances?	PC-3
105.		What types of polynomial transformations are used to correct complex distortions?	PC-3
106.		How is the degree of a polynomial selected for geometric correction? What problems can arise?	PC-3
107.		What interpolation methods are used in inverse geometric transformation? Compare their accuracy and computational complexity.	PC-3
108.		How are the effects of spectral superposition taken into account in geometric image transformations?	PC-3
109.		Describe the problem of artifacts when rotating and scaling images. How can they be minimized?	PC-3
110.		Describe the normalized cross-correlation algorithm. In what cases is it most effective?	PC-3
111.		What are the limitations of the correlation approach for large geometric distortions?	PC-3
112.		How does the pyramidal (multi-level) image matching algorithm work?	PC-3
113.		What methods are used to refine local shifts between images?	PC-3
114.		What is the advantage of phase correlation over spatial methods?	PC-3
115.		How do spectral methods help with large rotations and scales?	PC-3

116.		Which features of the image are the most stable for comparison during geometric transformations?	PC-3
117.		Compare the performance of SIFT, SURF, and ORB handles for binding tasks.	
118.	b	What does a computer simulation system include? a) Software Only b) Hardware, software, mathematical models, users c) Mathematical models only d) Users and Software Only	PC-1
119.	b	Which of the following is a key component of computer modeling? a) Graphical interface (b) Mathematical model c) Computer monitor (d) Keyboard	PC-1
120.	c	What level of modeling is responsible for detailing physical processes? (a) System level (b) Functional level (c) Detailed (physical) layer (d) Logical level	PC-3
121.	b	What level of modeling is used to analyze the interaction of subsystems? a) Algorithmic layer (b) System level (c) Component level (d) Physical layer	PC-1
122.	b	What is the main task of computer vision systems? a) Random image generation b) Processing and analysis of visual information (c) Mechanical drive control (d) Storage of large amounts of data	PC-3
123.	b	What is the most common method used to recognize objects in vision systems? (a) Monte Carlo method b) Neural networks (c) Linear programming (d) Queue theory	PC-3

124.	b	What criterion evaluates the compliance of the product with the terms of reference? a) Ergonomics (b) Functionality c) Aesthetics (d) Cost	PC-1
125.	c	Which of the quality criteria is NOT technical? (a) Reliability (b) Maintainability c) Exterior design (d) Accuracy	PC-3
126.	a	What stage of modeling follows after building a mathematical model? a) Verification of the model (b) Interface design (c) Conducting experiments (d) Documentation	PC-3
127.	b	What is the final step in the computer simulation process? a) Build a 3D model (b) Analysis of results and decision-making c) Launch of production (d) Publication of the report	PC-1
128.	b	What is the main purpose of modeling technical devices? (a) Reduction of development costs b) Predicting the behavior of a system without creating a physical prototype (c) Speeding up proceedings (d) Simplification of documentation	PC-1
129.	b	Which stage is NOT included in the process of modeling technical systems? a) Construction of a mathematical model (b) Full-scale testing without simulation c) Verification and validation of the model (d) Analysis of modelling results	PC-3
130.	b	Which model describes the system using equations and algorithms? (a) Physical model (b) Mathematical model	PC-1

		(c) Graphical model (d) Analogue model	
131.	b	What type of model is used to visualize the device design? (a) Simulation model (b) 3D geometric model (c) Analytical model (d) Statistical model	PC-1
132.	b	Which model describes the system with differential equations? (a) Statistical model (b) Deterministic model (c) Simulation model (d) Stochastic model	PC-1
133.	b	What kind of model takes into account random factors and probabilities? (a) Analytical model (b) Stochastic model (c) Graphical model (d) Physical model	PC-1
134.	c	What approach is used to improve the accuracy of object recognition in difficult environments? a) Simplification of algorithms b) Use of a single processing algorithm (c) Algorithmic ensembles and multimodal systems d) Reducing the resolution of images	PC-3
135.	c	What is the advantage of cloud technology for vision systems? a) Complete Autonomy from the Internet (b) Limited computing resources (c) Scalability and distributed processing (d) Reduced recognition accuracy	PC-3
136.	c	What is the trend associated with the introduction of computer vision systems in consumer devices? a) Increase in the cost of devices b) Reduced recognition accuracy	PC-3

		c) Ubiquity (smartphones, household appliances) d) Refusal of color vision	
137.	c	What area of research in computer vision systems is related to medical diagnostics? (a) Traffic sign recognition (b) Analysis of industrial defects (c) Computed tomography and X-ray analysis (d) Vehicle speed control	PC-3
138.	c	What factor is accelerating the development of vision systems in industry? a) Reduced safety requirements (b) Increased demand for manual labour (c) Implementation of Industry 4.0 and automation (d) Reduction in the number of surveillance cameras	PC-3
139.	a	What object detection method does the sliding window use to analyze an image? (a) Viola-Jones method (b) k-nearest neighbors method (c) Principal Component Method (PCA) (d) Support Vector Method (SVM)	PC-3
140.	b	Which method is NOT traditional object detection methods? (a) Kanny boundary detector (b) Convolutional neural networks (CNNs) (c) Harris Angle Detector (d) Algorithm for contour selection	PC-3
141.	b	What statistical method does the Bayesian approach use to classify objects? (a) Linear regression (b) Naïve Bayesian classifier (c) K-means method (d) Principal component method	PC-3
142.	b	Which method allows you to reduce the dimensionality of the feature space? a) Support Vector Method (SVM) (b) Principal Component Method (PCA) (c) Viola-Jones method (d) Hough's algorithm	PC-1

143.	b	What criterion is used to assess the quality of classification in statistical methods? a) RMS error b) Confusion Matrix (c) Correlation coefficient (d) Euclidean distance	PC-1
144.	b	What indicator estimates the share of correctly detected objects among all real objects? a) Precision (b) Recall (c) F1 measure (d) Accuracy	PC-1
145.	b	What metric measures the overall quality of the model, which takes into account both accuracy and completeness? a) ROC curve (b) F1 measure (c) Standard deviation (d) Coefficient of determination	PC-3
146.	b	What criterion is used to evaluate false positives of the detector? a) True Positive Rate b) False Positive Rate c) Intersection over Union (IoU) d) Mean Average Precision (mAP)	PC-3
147.	c	Which metric estimates the area of intersection of the predicted and true bounding box? a) Precision b) Recall c) Intersection over Union (IoU) d) F1-Measure	PC-3

2. Description of the rating scale

Rating assessment of knowledge is not provided.

3. Criteria for assessing competencies

The grade "excellent" is given to the student if the theoretical content of the topic is mastered completely, without gaps; exhaustively, consistently, clearly and logically harmoniously presents the material; freely copes with tasks, questions and other types of application of knowledge; uses additional material in the answer all the tasks provided for by the program are completed, the quality of their performance is evaluated by the number of points close to the maximum; analyzes the results obtained; shows independence in the performance of tasks.

A grade of "good" is given to a student if the theoretical content of the topic is fully mastered, the necessary practical competencies are basically formed, all the educational tasks provided for by the training program are completed, the quality of their performance is quite high. The student knows the material firmly, presents it competently and to the point, without making significant inaccuracies in answering the question.

The grade "satisfactory" is given to a student if the theoretical content of the topic is partially mastered, but the gaps are not significant, most of the tasks provided for by the program are completed, but there are errors in them, when answering the question, the student makes inaccuracies, insufficiently correct wording, there are violations of the logical sequence in the presentation of the program material.

An "unsatisfactory" grade is given to a student if he does not know a significant part of the program material, makes significant mistakes, performs practical work unconfidently, with great difficulty, the necessary practical competencies are not formed, most of the educational tasks are not completed, the quality of their performance is evaluated by the number of points close to the minimum.