

**EDUCATIONAL-PROFESSIONAL PROGRAM**  
**System analysis and management**  
**The first (bachelor's) level**

<b>specialty</b>	<b>124 System analysis</b>
<b>field of knowledge</b>	<b>12 Information Technology</b>
<b>qualification</b>	<b>Bachelor of Systems Analysis</b>

APPROVED by Academic Council  
Chairman of the Academic Council  
NTU "KhPI"

\_\_\_\_\_ L.L. Tovaznansky

«\_\_\_» \_\_\_\_\_ 20\_\_ .  
protocol №\_\_ from «\_\_» \_\_\_\_\_ 2019.

The educational program is put into action  
from \_\_\_\_\_ 2019 y.

Rector \_\_\_\_\_ E.I. Sokol  
(order № \_\_ from «\_\_» \_\_\_\_\_ 2019.)

## **PREAMBLE**

### **Developed by a working group**

Chairman of the working group

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# 1. EDUCATIONAL PROFESSIONAL PROGRAM PROFILE

## System analysis and control from the specialty 124 System Analysis

<b>1 – General information</b>	
Full name of university and institute / faculty	National Technical University "Kharkiv Polytechnic Institute" Computer Science and Software Engineering Faculty
Higher education and the name of the qualification in the language of the original	Degree – бакалавр (Bachelor) Qualification – бакалавр з системного аналізу (Bachelor of systems analysis)
Level of NQF (National Qualifications Framework)	Ukrainian NQF– 7 <sup>th</sup> level, FQ-EHEA – first cycle, EQF-LLL – 6 level
Educational program official name	Educational and professional program of the bachelor of system analysis preparation (practical direction)
Type of diploma and volume of educational program	Bachelor's degree, unitary, 240 credits, The term of training is 3 years 10 months
Accreditation	Certificate of Accreditation: Serie PD - IV № 2158945 from 12 august 2013 year.
Prerequisites	Full general education
Language (s) of teaching	Ukrainean/English
The duration of the educational program	Until next accreditation
Internet address of the permanent placement of the educational program	<a href="http://web.kpi.kharkov.ua/say">http://web.kpi.kharkov.ua/say</a>
<b>2 – The purpose of the educational program</b>	
Training of a specialist able to apply methods of system analysis to solve complex interdisciplinary problems of analysis and synthesis of complex systems.	
<b>3 – Characteristics of the educational program</b>	
Subject area (knowledge branch, specialty, program)	Knowledge branch: 12 Information Technology Specialty: 124 System analysis Program: System analysis and control
Orientation of the educational program	Educational-professional
The main focus of the educational program and specialization	Special education in the field of information technology in the specialty System analysis of the program System analysis and control Keywords: decision-making, risks, complex systems, management and forecasting, system analysis, financial market
Features of the program	Mandatory specialty in the IT companies of the department's partners

<b>4 – Eligibility of graduates for employment and further education</b>	
Suitability for employment	Types of economic activity: 72 Activities in the field of informatization 73 Research and development 80 Education Professional titles: 2131.2 Computer Software Engineer 2132.2 Software engineer 2132.2 Programmer (database) 131.2 Software and multimedia analyst 132.2 Programmer is applied 2139.2 Computer Engineer 2149.2 Research engineer 3121.2 IT Specialist 3121.2 Specialist in Software Development and Testing 3121.2 Specialist in the development of computer programs 3121.2 Specialist in computer graphics (design)
Further training	Possibility to continue studying at the third (educational-scientific) level for obtaining the degree of Doctor of Philosophy
<b>5 – Teaching and Rating</b>	
Teaching and learning	Lectures, workshops and seminars, computer workshops and laboratory work; mixed learning technology; Baccalaureate work
Rating	Oral and written exam, testing. Evaluation is carried out on a national scale (excellent, good, satisfactory, unsatisfactory); 100-point scale and ECTS scale (A, B, C, D, E, FX, F).
<b>6 – Program competencies</b>	
Integral competence	Ability to solve complex specialized problems and practical problems of system analysis in professional activity or in the process of learning that involve application of theoretical positions and methods of system analysis and information technologies and is characterized by complexity and uncertainty of conditions
<b>General competencies (3K)</b>	
3K 1	Ability to think abstractly, apply methods of analysis and synthesis
3K 2	Ability to apply knowledge in practical situations
3K 3	Ability to plan and manage time
3K 4	Ability to know and understand subject area and professional activity
3K 5	Ability to communicate in the state language orally and in writing
3K 6	Ability to communicate in a foreign language
3K 7	Ability to search, process and analyze information from various sources
3K 8	Ability to be critical and self-critical
3K 9	Ability to flexibly adapt to different professional situations
3K 10	Ability to systematically analyze their professional and social activity, to assess the accumulated experience
3K 11	Ability to generate new ideas (creativity)
3K 12	Ability to work in a team
3K 13	Professional computer skills and information technology
3K 14	Ability to work in an international context
3K 15	Ability to assess and ensure the quality of work performed
3K 16	The ability to exercise their rights and responsibilities as a member of society, to realize the values of a civil (free democratic) society, the rule of law, human and civil rights and freedoms in Ukraine.

3K 17	Ability to generalize the main categories and concepts of the subject area in the context of the general historiographical process.
<b>Professional competence of the specialty (ΦK)</b>	
ΦK 1	Ability to build and develop logical mathematical arguments with a clear definition of assumptions and conclusions.
ΦK 2	Ability to mathematically model the situation from the real world and give a mathematical examination of non-mathematical situations.
ΦK 3	Readiness to solve new problems from new areas.
ΦK 4	Ability to receive qualitative information from quantitative data.
ΦK 5	Ability to understand problems and their abstract models.
ΦK 6	Ability to develop experimental and observational studies and analyze data obtained in them.
ΦK 7	Ability to formulate complex problems of optimization and decision making, as well as interpret solutions in the source contexts of problems.
ΦK 8	Ability to use computing tools for numerical and symbolic calculations for statement and problem solving.
ΦK 9	Knowledge of specific programming languages or software.
ΦK 10	The ability to represent mathematical arguments and conclusions from them with clarity and precision and in such forms as are appropriate for the audience, both verbally and in writing.
ΦK 11	The ability to mathematically formalize the problems described in the natural language, to recognize the general schemes in specific tasks; to build formal proofs within a certain logical theory
ΦK 12	Ability to design, apply and accompany software for processing information, data analysis, modeling, decision-making, optimization of systems.
ΦK 13	Ability to complex analysis of complex systems of different nature on the basis of system methodology..
ΦK 14	Ability to predict the behavior of complex systems of various nature using modern information technology, fundamental and applied methods of data analysis.
ΦK 15	Ability to design complex systems of various nature on the basis of system methodology using modern information technology and applied methods of analysis and synthesis of systems.
ΦK 16	Ability to make decisions in complex systems of different nature on the basis of system methodology using mathematical methods and software.
ΦK 17	Ability to design, apply and accompany system software simulations, decision-making, optimization, information processing, data analysis.
ΦK 18	Ability to organize work on the design of complex systems, the creation of appropriate technologies and software.
<b>Professional competence of specialization (ΦKC)</b>	
ΦKC 1	The ability to construct a mathematical model of a continuous or discrete dynamical system in the input-output variables or in the state space and to calculate the system's initial response to arbitrary external influences.
ΦKC 2	Ability to perform structural analysis and synthesis of automatic control systems by dynamic objects, perform analysis of the conditions of their stability, control and observation.
ΦKC 3	Ability to formalize subject knowledge in order to use them to construct strategies for solving intellectual problems.
ΦKC 4	Ability to formulate the statement of the problem of optimization in the design of control systems and decision-making, namely: mathematical models, criteria of optimality, constraints, management objectives; choose rational methods and algorithms for solving optimization and optimal control tasks.

ΦΚC 5	Ability to computer realization of mathematical models of real systems and processes; to design, apply and accompany software design, decision-making, data processing optimization, and intelligent data analysis.
<b>7 – Program learning outcomes</b>	
Program results of specialty training	
PH 1	Know and understand state and foreign languages at a level sufficient for reading professional literature, discussing professional issues and writing texts on professional topics.
PH 2	Know and be able to apply in practice the methods of analysis, synthesis and modeling of systems and processes in various fields of human activity, methods of logical conducting and decision-making.
PH 3	Know and be able to apply in practice the basic mathematical, logical, semantic, object, system simulation methods of modeling systems and processes, the language of modeling and image data and knowledge.
PH 4	Know and be able to apply in practice the basic principles and algorithms for processing information.
PH 5	Know the basics of optimization theory, optimal management, decision making, and be able to apply them in practice to solve application management and design problems of complex systems.
PH 6	Know and understand the architecture of modern computing systems, information and computer networks
PH 7	Know and be able to apply in practice system and application database management and information systems
PH 8	Know and understand the concepts, methods and means of system and information analysis to ensure the effective functioning of organizational and managerial structures.
PH 9	Know and be able to apply methods and tools for working with data and knowledge, methodology of mathematical, logical-semantic, object and simulation modeling, technology of system and statistical analysis.
PH 10	Design, implement, test, provide, support, use software tools for working with data and knowledge in computer systems and networks.
PH 11	Be able to create and apply informational computer systems with integrated information, technology of information and system analysis, in accordance with modern concepts of data and knowledge engineering, information modeling to ensure the effective functioning of organizational structures..
PH 12	Understand the principles and apply in practice computer information support technologies to all types of work with integrated information: informational analysis, accumulation, image and application of knowledge, search for laws and trends, modeling of information systems and processes.
PH 13	To understand and apply in practice methods of statistical modeling and forecasting, to carry out an estimation of initial data
PH 14	Understand and be able to build effective computational algorithms for solving system analysis problems, determine the effectiveness of programs with the help of computer software
PH 15	Own modern methods of designing programs and software complexes, developing optimal solutions for the composition of software, algorithms of procedures and operations
PH 16	Understand and be able to apply in practice the basic principles of developing comprehensive information solutions for enterprises and firms, including designing computer networks, alternative variants of computerized systems with the assessment of the resources necessary for their implementation

PH 17	To collect, process, analyze, systematize scientific and technical information, to summarize the advanced domestic and foreign experience on the development of complex systems
PH 18	Take into account the influence of environmental factors on the results of professional activity.
PH 19	Be able to use the tools of a democratic rule of law in professional and civic activities.
PH 20	Be able to apply international and national standards and practices in professional activities.
PH 21	Realize the value of protecting the independence, territorial integrity and democratic system of Ukraine.
PH 22	Know the main historical stages of the subject area.
PH 23	Be able to operate with basic categories and concepts of specialty.
<b>Program results of specialization training</b>	
PHC 1	Conduct structural and parametric synthesis of software control systems, perturb control, deviation control, and combined systems for the automatic control of complex dynamic objects.
PHC 2	Know how to formalize knowledge and basic models of image knowledge, be able to build strategies for solving intellectual problems.
PHC 3	Be able to set and solve tasks of optimization and research of operations in the field of information technology of system analysis.
PHC 4	Know and be able to apply the basic methods of qualitative analysis and integration of ordinary differential equations and systems; differential equations in partial derivatives, including equations of mathematical physics.
<b>8 – Resource support for the implementation of the program</b>	
Personnel support	It meets the personnel requirements for ensuring the implementation of educational activities in the field of higher education for the second (master) level in accordance with the requirements of Appendix 12 to the Licensing Terms, approved by the Resolution of the Cabinet of Ministers of Ukraine dated December 30, 2015 № 1187
Material and technical support	It meets the personnel requirements for ensuring the implementation of educational activities in the field of higher education for the second (master) level in accordance with the requirements of Appendix 13 to the Licensing Terms, approved by the Resolution of the Cabinet of Ministers of Ukraine dated December 30, 2015 № 1187
Information and educational and methodological support	It meets the personnel requirements for ensuring the implementation of educational activities in the field of higher education for the second (master) level in accordance with the requirements of Appendix 14 to the Licensing Terms, approved by the Resolution of the Cabinet of Ministers of Ukraine dated December 30, 2015 № 1187
<b>9 – Academic mobility</b>	
National Credit Mobility	Possibility to conclude agreements on academic mobility and double diploma
International Credit Mobility	Possibility of concluding agreements with the countries of the European Union on academic mobility and double diploma
Teaching foreign applicants for higher education	

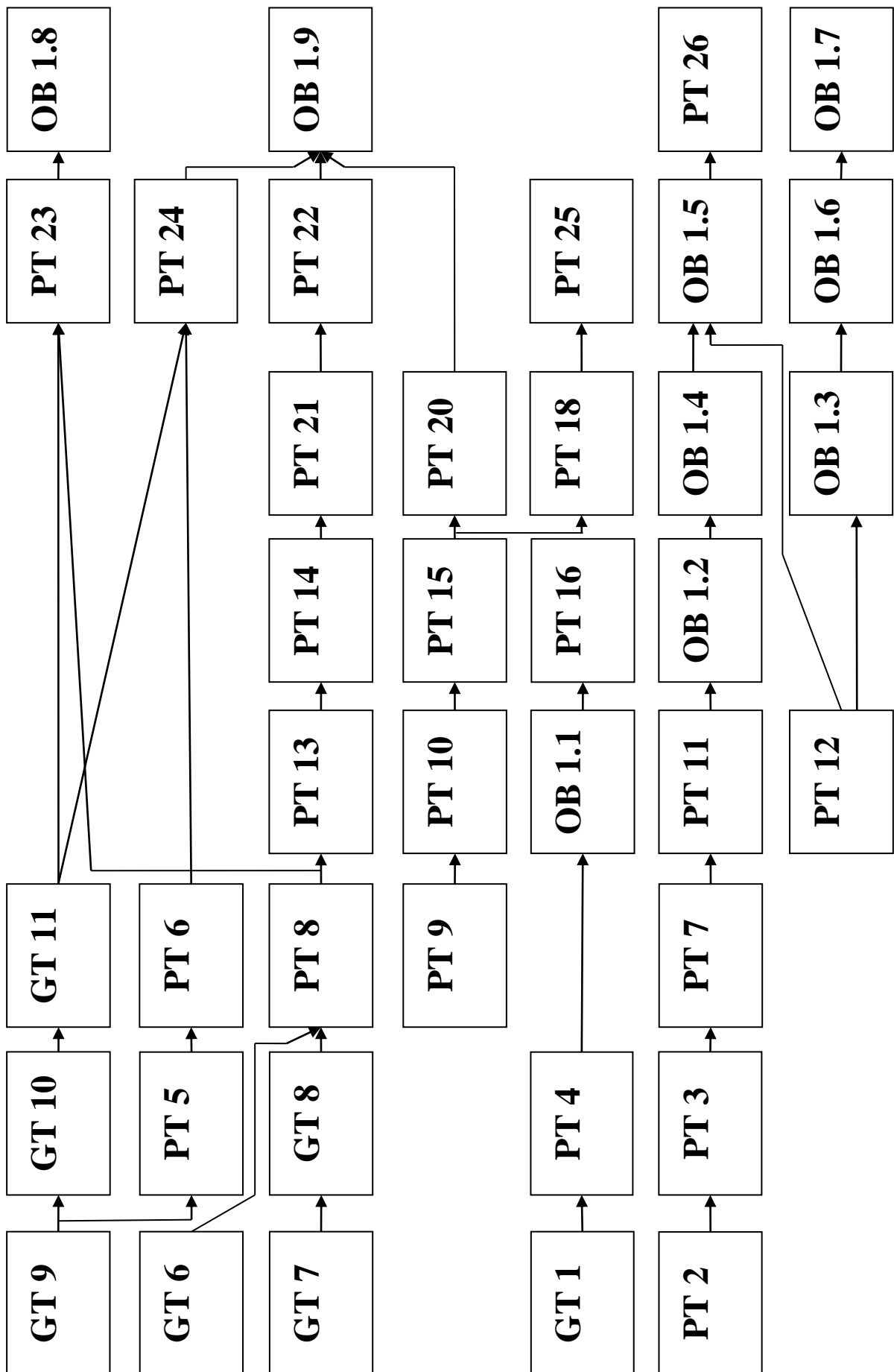


## 2. LIST OF COMPONENTS OF EDUCATIONAL PROFESSIONAL PROGRAM

Number in order	Components of the educational program (study disciplines, course projects / course works, practices, qualification work)	ECTS credits	Form of final control
1	2	3	4
<b>1. General training</b>			
GT 1	History and culture of Ukraine	4,0	Exam
GT 2	Foreign Language	12,0	Set-off, Exam
GT 3	Ukrainian as a foreign language	3,0	Exam
GT 4	Philosophy	3,0	Exam
GT 5	Science of law	3,0	Set-off
GT 6	Physics	4,0	Exam
GT 7	Algebra and geometry. Part 1	4,0	Exam
GT 8	Algebra and geometry. Part 2	4,0	Exam
GT 9	Mathematical analysis. Part 1	5,0	Exam
GT 10	Mathematical analysis. Part 2	5,0	Set-off
GT 11	Mathematical analysis. Part 3	5,0	Exam
GT 12	Ecology	3,0	Set-off
GT 17	Physical Education	12,0	Set-off
<b>2. Professional training</b>			
<b>Compulsory components of the educational program</b>			
PT 1	Introduction to computer science and information technologies	3,0	Set-off
PT 2	Programming and algorithmic languages. Part 1	6,0	Exam
PT 3	Programming and algorithmic languages. Part 2	6,0	Exam
PT 4	Architecture of computer systems	4,0	Exam
PT 5	Mathematical logic	4,0	Exam
PT 6	Discrete Math	4,0	Exam
PT 7	Object-Oriented Programming	6,0	Exam
PT 8	Differential and Difference Equations	4,0	Exam
PT 9	Theory of Probability and Mathematical Statistics . Part 1	4,0	Set-off
PT 10	Theory of Probability and Mathematical Statistics . Part 2	5,0	Exam
PT 11	Algorithms and data structures	4,0	Exam
PT 12	Computer Networks	4,0	Exam
PT 13	Numeric Methods. Part 1	5,0	Exam
PT 14	Numeric Methods. Part 2	4,0	Exam
PT 15	Data Analysis	4,0	Exam
PT 16	Organization of Databases	5,0	Exam
PT 17	History of science and technology	3,0	Set-off
PT 18	Economic analysis	3,0	Set-off
PT 19	Fundamentals of Occupational Safety and Health	3,0	Exam
PT 20	Fundamentals of System Analysis	5,0	Exam

1	2	3	4
PT 21	Optimization Methods and Operations Research	5,0	Exam
PT 22	Decision Making Theory	4,0	Exam
PT 23	Control theory	4,0	Exam
PT 24	Models and Methods of Fuzzy Logic	4,0	Exam
PT 25	Economics and organization of production of computer software	3,0	Set-off
PT 26	Computer Graphics	4,0	Exam
<b>Optional disciplines</b>			
Discipline block 01 "System Analysis and Control"			
OB 1.1	Crossplatform Programming	5,0	Exam
OB 1.2	Programming Technologies	5,0	Exam
OB 1.3	Information Systems Design	4,0	Exam
OB 1.4	Fundamentals of Internet-technologies	4,0	Exam
OB 1.5	Programming for Computer Networks	5,0	Exam
OB 1.6	Distributed and Cloud Information-analytical Systems	4,0	Exam
OB 1.7	Corporate Information Systems	4,0	Exam
OB 1.8	Mathematical Methods of Optimal Control	4,0	Exam
OB 1.9	Artificial Intelligence	4,0	Exam
	Practice	6,0	Set-off
	Attestation	6,0	
Discipline block 02 "Information Technologies of System Analysis"			
OB 2.1	Information Crossplatform Technologies	5,0	Exam
OB 2.2	Parallel Programming	5,0	Exam
OB 2.3	Technologies of Information Systems Development	4,0	Exam
OB 2.4	Internet technologies system design	4,0	Exam
OB 2.5	Programming for Computer Networks	5,0	Exam
OB 2.6	Technologies for Decision Support in Conflict-driven Systems	4,0	Exam
OB 2.7	Corporate Information Control Systems	4,0	Exam
OB 2.8	Optimal Control Theory	4,0	Exam
OB 2.9	Intelligent Information Systems	4,0	Exam
	Practice	6,0	Set-off
	Attestation	6,0	
Total for <b>general training:</b>		<b>67,0</b>	
Total for <b>professional training:</b>		<b>110,0</b>	
Total for <b>compulsory component:</b>		<b>177,0</b>	
Total for <b>selective component:</b>		<b>63,0</b>	
including <b>by choice of students:</b>		<b>12,0</b>	
<b>Total for education period</b>		<b>240</b>	

### 3. STRUCTURAL AND LOGICAL SCHEME OF THE EDUCATIONAL PROFESSIONAL PROGRAM "SYSTEM ANALYSIS AND CONTROL"



#### **4. GRADUATE CERTIFICATE OF HIGHER EDUCATION**

Graduate certification of higher education students for an educational program of specialty 124 System analysis is carried out in the form of the protection of qualification work and ends with the issuance of the document (diploma) of the established sample on awarding his bachelor's degree with qualification: **Bachelor of Systems Analysis for the Educational Program System Analysis and Control.**

Final certification is carried out openly and publicly.

## 5. COMPLIANCE OF PROGRAM COMPETENCIES WITH COMPONENTS OF THE EDUCATIONAL- PROFESSIONAL PROGRAM MATRIX

	ЗК 1	ЗК 2	ЗК 3	ЗК 4	ЗК 5	ЗК 6	ЗК 7	ЗК 8	ЗК 9	ЗК 10	ЗК 11	ЗК 12	ЗК 13	ЗК 14	ЗК 15	ЗК 16	ЗК 17	ФК 1	ФК 2	ФК 3	ФК 4	ФК 5	ФК 6	ФК 7	ФК 8	ФК 9	ФК 10	ФК 11	ФК 12	ФК 13	ФК 14	ФК 15	ФК 16	ФК 17	ФК 18	ФКС 1	ФКС 2	ФКС 3	ФКС 4	ФКС 5					
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	ФК 11	+
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	ФК 14	
	ФК 15	
	ФК 16	+
	ФК 17	+
	ФК 18	
	ФКС 1	+
	ФКС 2	+
	ФКС 3	+
	ФКС 4	+
ВБ 9	+	+

**6. PROVIDING PROGRAMMATIC LEARNING OUTCOMES FOR THE RELEVANT COMPONENTS OF AN EDUCATIONAL AND PROFESSIONAL PROGRAM MATRIX**

	PH 1	PH 2	PH 3	PH 4	PH 5	PH 6	PH 7	PH 8	PH 9	PH 10	PH 11	PH 12	PH 13	PH 14	PH 15	PH 16	PH 17	PH 18	PH 19	PH 20	PH 21	PH 22	PH 23	PHC 1	PHC 2	PHC 3	PHC 4	
3П 1																			+	+	+							
3П 2	+																+			+								
3П 3	+																+			+	+							
3П 4																			+				+					
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ПП 8		+	+	+					+																+			+
ПП 9			+	+					+				+											+				



	PH 1	PH 2	PH 3	PH 4	PH 5	PH 6	PH 7	PH 8	PH 9	PH 10	PH 11	PH 12	PH 13	PH 14	PH 15	PH 16	PH 17	PH 18	PH 19	PH 20	PH 21	PH 22	PH 23	PHC 1	PHC 2	PHC 3	PHC 4	
ПП 10			+	+					+				+										+					
ПП 11			+	+						+				+	+								+	+				
ПП 12						+	+	+		+	+				+	+	+						+	+				
ПП 13		+		+					+				+															
ПП 14		+		+					+				+															
ПП 15			+	+				+	+		+	+	+															
ПП 16			+	+		+	+		+	+	+			+	+	+								+				
ПП 17																							+					
ПП 18		+		+				+	+	+	+		+															
ПП 19																			+									
ПП 20		+						+	+		+			+			+	+					+	+			+	
ПП 21		+		+	+					+	+	+		+									+	+			+	
ПП 22		+			+				+	+	+	+	+	+										+			+	
ПП 23		+	+		+				+	+		+	+	+										+	+			
ПП 24		+	+						+	+	+													+		+		
ПП 25		+		+		+	+	+			+	+			+		+											
ПП 26								+	+	+		+		+										+				
ВБ 1							+					+			+													
ВБ 2				+							+	+		+	+									+				
ВБ 3					+	+					+	+			+	+	+											
ВБ 4				+							+	+		+														
ВБ 5							+								+													
ВБ 6		+		+	+	+	+	+		+	+	+				+	+											
ВБ 7				+	+	+	+	+		+	+	+				+	+											

	PH 1	PH 2	PH 3	PH 4	PH 5	PH 6	PH 7	PH 8	PH 9	PH 10	PH 11	PH 12	PH 13	PH 14	PH 15	PH 16	PH 17	PH 18	PH 19	PH 20	PH 21	PH 22	PH 23	PHC 1	PHC 2	PHC 3	PHC 4	
ВБ 8					+				+																+			
ВБ 9		+	+					+	+	+	+	+											+			+		