

**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE  
NATIONAL TECHNICAL UNIVERSITY  
"KHARKIV POLYTECHNIC INSTITUTE"**

**I APPROVE**

Rector of NTU "KhPI"

\_\_\_\_\_ Evgen SOKOL

"09" \_\_\_\_\_ May 2023

**EDUCATIONAL AND PROFESSIONAL PROGRAM**

**"Computer science and intelligent systems"**

First (bachelor) level of higher education

in the specialty 122 - Computer Science  
fields of knowledge 12 - Information technologies  
Bachelor's degree in computer science

**APPROVED**

**BY THE ACADEMIC COUNCIL OF NTU  
"KhPI"**

Chairman of the Academic Council

\_\_\_\_\_/ Leonid TOVAZHNIANSKYI

Protocol No. 4

from "05" \_\_\_\_\_ May 2023

Kharkiv 2023

## LETTER OF AGREEMENT

### **Educational and professional program Computer science and intelligent systems**

First level of higher education (bachelor's degree)

Branch of knowledge 12 – Information technologies

Specialty 122 – Computer Science

Bachelor's degree in computer science

#### **APPROVED**

Working group OP from the specialty  
"Computer Science"

Guarantor of the educational program  
"Computer science and intelligent systems"

\_\_\_\_\_ Andrii KOPP

"\_\_" \_\_\_\_\_ 2023

#### **RECOMMENDED**

Methodical Council of NTU "KhPI"

Deputy Chairman of the Methodical Council

\_\_\_\_\_ Ruslan MYGUSHCHENKO

"\_\_" \_\_\_\_\_ 2023

#### **AGREED**

Head of the Department of Software  
Engineering and Intelligent Management  
Technologies

\_\_\_\_\_ Ihor GAMAYUN

"\_\_" \_\_\_\_\_ 2023

#### **AGREED**

Director of the educational and scientific institute  
of computer sciences and information  
technologies

\_\_\_\_\_ Mykhailo GODLEVSKYI

"\_\_" \_\_\_\_\_ 2023

#### **AGREED**

Student (member of EP working group)  
of the KN-420ae group

\_\_\_\_\_ Vladislav DZINZYURA

"\_\_" \_\_\_\_\_ 2023

REVIEWERS: Productive comments and feedback on the project of the educational and professional program (EPP) were received from:

1. EPAM SYSTEMS LLC
2. LLC "NIX SOLUTIONS LTD"
3. ACADEMY SMART LLC

## PREFACE

Corresponds to the Standard of higher education of the first (bachelor) level of the field of knowledge 12 - Information technologies, specialty 122 - Computer science, approved and put into effect by the order of the Ministry of Education and Science of Ukraine dated 07/10/2019 No. 962.

Developed by the working group of the EPP "Computer Science and Intelligent Systems" Educational and Scientific Institute of Computer Sciences and Information Technologies of the National Technical University "Kharkiv Polytechnic Institute" consisting of:

Guarantor of the educational program

Andrii Mykhailovych Kopp, Doctor of Philosophy, Associate Professor, Associate Professor of the Department of Software Engineering and Intelligent Management Technologies

OP working group members:

1. Cherednichenko Olga Yuriiivna, Doctor of Technical Sciences, Associate Professor, Professor of the Department of Software Engineering and Intelligent Management Technologies  
(name,academic degree, academic title, position)
2. Kovalenko Svitlana Mykolaivna, Candidate of Technical Sciences, Associate Professor, Associate Professor of the Department of Software Engineering and Intelligent Management Technologies  
(name,academic degree, academic title, position)
3. Valentina Volodymyrivna Moskalenko, Doctor of Technical Sciences, Associate Professor, Professor of the Department of Information Systems and Technologies  
(name,academic degree, academic title, position)
4. Dzinzyura Vladyslav Ihorovych, student of group KN-420ae  
student (name, group)

# PROFILE OF THE EDUCATIONAL PROGRAM WITH THE SPECIALTY 122 – COMPUTER SCIENCES

<b>1 - General information</b>	
Higher educational institution and structural unit	National Technical University "Kharkiv Polytechnic Institute", Educational and Scientific Institute of Computer Sciences and Information Technologies, Department of Software Engineering and Intelligent Management Technologies
The degree of higher education and the title of the qualification in the original language	Degree of higher education: bachelor Educational qualification: bachelor's degree in computer science Diploma Qualification: Bachelor of Computer Science
The official name of the educational program	Computer science and intelligent systems
Type of diploma and scope of the educational program	Bachelor's degree, single, 240 ECTS credits, duration of study - 3 years and 10 months
Availability of accreditation	Accreditation Commission. Ukraine. Certificate - ND No. 2192167 dated 09/06/2017. Validity period - 07/01/2024.
Cycle/level	First (bachelor) level of higher education, NRK of Ukraine – level 6, QF-LLL – level 6, FQ-EHEA – first cycle.
Prerequisites	Having a complete general secondary education or a junior bachelor's degree.
Language of teaching	Ukrainian language. Teaching in English is possible.
The term of validity of the educational program	According to the validity period of the accreditation certificate Updated annually
Link to the permanent posting of the description of the educational program	<a href="http://web.kpi.kharkov.ua/asu/122-komp-yuterni-nauki/">http://web.kpi.kharkov.ua/asu/122-komp-yuterni-nauki/</a>
<b>2 - The purpose of the educational program</b>	
Training of specialists capable of conducting theoretical and experimental research in the field of computer science and intelligent management systems; apply mathematical methods and algorithmic principles in modeling, designing, developing and supporting intelligent management technologies; carry out development, implementation and support of intelligent systems of data analysis and processing of organizational, technical, natural and socio-economic systems	
<b>3 – Characteristics of the educational program</b>	
Subject area (field of knowledge, specialty, specialization)	Field of knowledge: 12 - Information technologies Specialty: 122 – Computer science Educational program -Computer science and intelligent systems Object of study: mathematical, informational, simulation models of real phenomena, objects, systems and processes, subject areas, presentation of data and knowledge; methods and technologies of obtaining, storing, processing, transmitting and using information, intelligent data analysis and decision-making; theory, analysis, development, performance evaluation, algorithm implementation, high-performance computing, including parallel computing and big data. Learning goals: training specialists capable of conducting theoretical and experimental research in the field of computer science; apply mathematical methods and algorithmic principles in modeling, designing, developing and supporting information technologies; carry out development, implementation and maintenance of intellectual

	<p>systems of data analysis and processing of organizational, technical, natural and socio-economic systems.</p> <p>Theoretical content of the subject area: modern models, methods, algorithms, technologies, processes and methods of obtaining, presenting, processing, analyzing, transmitting, storing data in information systems.</p> <p>Methods, techniques and technologies: mathematical models, methods and algorithms for solving theoretical and applied problems arising in the development of information technologies (IT); modern technologies and programming platforms; methods of collection, analysis and consolidation of distributed information; technologies and methods of design, development and quality assurance of IT components; methods of computer graphics and data visualization technologies; knowledge engineering technologies, CASE modeling and IT design technologies.</p> <p>Tools and equipment: distributed computing systems; computer networks; mobile and cloud technologies, database management systems, operating systems.</p>
Orientation of the educational program	Educational and professional program for training specialists in the field of computer science and intelligent systems.
The main focus of the educational program and specialization	<p>Special education in the field of information technologies in the specialty 122 - "Computer science", which involves in-depth study of mathematical modeling methods, information technologies for the development of intelligent systems, as well as in-depth study of a foreign language for IT specialists.</p> <p>Keywords: computer science, intelligent management systems, information technologies.</p>
Features programs	<p>Orientation on partnership with domestic and foreign educational and scientific institutions, the private sector, scientists and practitioners, participation in international programs.</p> <p>Training is carried out with the use of innovative pedagogical technologies, in particular - the project approach in the educational laboratory "Innovation Campus" of NTU "KhPI", where students have the opportunity to master practical skills in software development and testing, as well as develop soft skills that are necessary for a modern computer specialist computer sciences and intelligent systems for work in IT companies and IT departments.</p> <p>Conducting internships in IT companies and student participation in real projects.</p> <p>Ability to study in English.</p>
<b>4 – Suitability of graduates for employment and further education</b>	
Suitability for employment	<p>Graduates can work in professions according to the National Classifier of Professions DK 003:2010:</p> <p>2131 Professionals in the field of computer systems</p> <p>2131.2 Developers of computing systems</p> <p>2132 Professionals in the field of programming</p> <p>2132.2 Developers of computer programs</p> <p>2433.2 Information professionals and information analysts</p> <p>2139 Professionals in other fields of computing (computerization)</p> <p>2139.2 Professionals in other areas of computing</p> <p>2447 Professionals in the field of project and program management</p> <p>2447.2 Project and program management professionals</p>
Further education	The opportunity to study in programs of the second (master's) level of higher education.

<b>5 – Teaching and assessment</b>	
Teaching and learning	Student-centered learning, problem-oriented learning, distance learning in the Office 365 system, self-learning, learning through project practice, learning through laboratory practice. The teaching process includes the use of such educational technologies as: lectures, laboratory work, practical classes, work in small groups, seminars-discussions, brainstorming, presentations that develop communication and leadership skills, independent work with literary sources; mixed forms of education using distance platforms, project approach and "challenge-based learning" in the educational laboratory "Innovation Campus" of NTU "KhPI".
Assessment	<p>Evaluation of the student's educational achievements is carried out according to the rating system.</p> <p>Monitoring of students' knowledge and skills is carried out in the form of current and final control.</p> <p>Current control – oral and written survey, assessment of work in small groups, testing, defense of group and individual research tasks and projects.</p> <p>Final control - oral and written exams, assessments taking into account the accumulated points of the current control, defense of practical reports, defense of term papers.</p> <p>State certification – preparation and public defense (presentation) of the final qualification work.</p> <p>Evaluation is carried out according to the national scale ("excellent", "good", "satisfactory", "unsatisfactory"), 100-point scale and ECTS scale (A, B, C, D, E, FX, F).</p>
<b>6 – Software competencies</b>	
Integral competence	The ability to solve complex specialized tasks and practical problems in the field of computer science and intelligent management systems or in the learning process, which involves the application of theories and methods of information technologies and is characterized by complexity and uncertainty of conditions.
General competences	<p>GC1. Ability to abstract thinking, analysis and synthesis.</p> <p>GC2. Ability to apply knowledge in practical situations.</p> <p>GC3. Knowledge and understanding of the subject area and understanding of professional activity.</p> <p>GC4. Ability to communicate in the national language both orally and in writing.</p> <p>GC5. Ability to communicate in a foreign language.</p> <p>GC6. Ability to learn and master modern knowledge.</p> <p>GC7. Ability to search, process and analyze information from various sources.</p> <p>GC8. Ability to generate new ideas (creativity).</p> <p>GC9. Ability to work in a team.</p> <p>GC10. The ability to be critical and self-critical.</p> <p>GC11. Ability to make informed decisions.</p> <p>GC12. The ability to evaluate and ensure the quality of the work performed.</p> <p>GC13. The ability to act on the basis of ethical considerations.</p> <p>GC14. The ability to realize one's rights and responsibilities as a member of society, to realize the values of a civil (free democratic) society and the need for its sustainable development, the rule of law, the rights and freedoms of a person and a citizen in Ukraine.</p>

	<p>GC15. The ability to preserve and multiply moral, cultural, scientific values and achievements of society based on an understanding of the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and in the development of society, technology and technologies, to use various types and forms of motor activity for active recreation and leading a healthy lifestyle.</p>
<p>Special (professional) competences</p>	<p>PC1. Ability to mathematical formulation and research of continuous and discrete mathematical models, justification of the choice of methods and approaches for solving theoretical and applied problems in the field of computer science, analysis and interpretation.</p> <p>PC2. Ability to identify statistical regularities of non-deterministic phenomena, use methods of computational intelligence, in particular statistical, neural network and fuzzy data processing, methods of machine learning and genetic programming, etc.</p> <p>PC3. The ability to think logically, draw logical conclusions, use formal languages and models of algorithmic calculations, design, develop and analyze algorithms, evaluate their effectiveness and complexity, solvability and unsolvability of algorithmic problems for adequate modeling of subject areas and creation of software and information systems .</p> <p>PC4. The ability to use modern methods of mathematical modeling of objects, processes and phenomena, to develop models and algorithms for the numerical solution of mathematical modeling problems, to take into account the errors of the approximate numerical solution of professional problems.</p> <p>PC5. The ability to carry out a formalized description of operations research tasks in organizational-technical and socio-economic systems of various purposes, to determine their optimal solutions, to build optimal management models taking into account changes in the economic situation, to optimize management processes in systems of various purposes and hierarchy levels.</p> <p>PC6. Ability to system thinking, application of system analysis methodology for researching complex problems of various nature, methods of formalization and solving system problems with conflicting goals, uncertainties and risks.</p> <p>PC7. The ability to apply the theoretical and practical foundations of modeling methodology and technology to study the characteristics and behavior of complex objects and systems, conduct computational experiments with processing and analysis of results.</p> <p>PC8. Ability to design and develop software using various programming paradigms: generalized, object-oriented, functional, logical, with appropriate models, calculation methods and algorithms, data structures and control mechanisms.</p> <p>PC9. The ability to implement a multi-level computing model based on client-server architecture, including databases, knowledge and data warehouses, to perform distributed processing of large data sets on clusters of standard servers to meet the computing needs of users, including on cloud services.</p> <p>PC10. The ability to apply methodologies, technologies and tools for managing the processes of the life cycle of information and software systems, products and services of information technologies in accordance with the requirements of the customer.</p>

	<p>PC11. Ability to intellectually analyze data based on methods of computational intelligence, including large and poorly structured data, their operational processing and visualization of analysis results in the process of solving applied problems.</p> <p>PC12. The ability to ensure the organization of computing processes in information systems of various purposes, taking into account the architecture, configuration, performance indicators of the functioning of operating systems and system software.</p> <p>PC13. Ability to develop network software that operates on the basis of various topologies of structured cabling systems, uses computer systems and data transmission networks, and analyzes the quality of computer networks.</p> <p>PC14. The ability to apply methods and means of ensuring information security, to develop and operate special software for the protection of information resources of objects of critical information infrastructure.</p> <p>PC15. Ability to analyze and functional modeling of business processes, construction and practical application of functional models of organizational-economic and production-technical systems, methods of assessing the risks of their design.</p> <p>PC16. The ability to implement high-performance computing based on cloud services and technologies, parallel and distributed computing in the development and operation of distributed parallel information processing systems.</p> <p>PC17. The ability to apply the theoretical and practical foundations of the modern management theory of complex organizational-technical and socio-economic systems to build intelligent management systems, to use modern information processing technologies and computational intelligence methods in the process of designing intelligent systems.</p> <p>PC18. The ability to apply modern methods of decision-making theory, including: methods of ranking, formation and coordination of collective expert assessments, multi-criteria optimization, and others, to build intelligent management systems.</p> <p>PC19. The ability to comprehensively use methods of mathematical modeling and analysis of complex systems, methods of modeling and analysis of business processes, information technologies of business systems management to create intelligent management systems.</p> <p>PC20. The ability to develop the architecture of software systems and their individual components when building intelligent control systems in various industries, to manage the life cycle processes of the software of intelligent control systems.</p>
<b>7 - Learning outcomes</b>	
Learning outcomes	<p>LO1. Apply knowledge of the basic forms and laws of abstract and logical thinking, the basics of the methodology of scientific knowledge, the forms and methods of extracting, analyzing, processing and synthesizing information in the subject area of computer science.</p> <p>LO2. To use the modern mathematical apparatus of continuous and discrete analysis, linear algebra, analytical geometry, in professional activities to solve problems of a theoretical and applied nature in the process of designing and implementing informatization objects.</p>



	<p>LO3. To use the knowledge of regularities of random phenomena, their properties and operations on them, models of random processes and modern software environments for solving problems of statistical data processing and building predictive models.</p> <p>LO4. Use methods of computational intelligence, machine learning, neural network and fuzzy data processing, genetic and evolutionary programming to solve problems of recognition, forecasting, classification, identification of control objects, etc.</p> <p>LO5. Design, develop and analyze algorithms for solving computational and logical problems, evaluate the efficiency and complexity of algorithms based on the application of formal models of algorithms and calculated functions.</p> <p>LO6. Use the methods of numerical differentiation and integration of functions, solving ordinary differential and integral equations, features of numerical methods and the possibilities of their adaptation to engineering problems, have skills in software implementation of numerical methods.</p> <p>LO7. Understand the principles of modeling organizational and technical systems and operations; use operations research methods, solving single- and multi-criteria optimization problems of linear, integer, nonlinear, stochastic programming.</p> <p>LO8. Use the methodology of system analysis of objects, processes and systems for the tasks of analysis, forecasting, management and design of dynamic processes in macroeconomic, technical, technological and financial objects.</p> <p>LO9. To develop software models of subject environments, to choose a programming paradigm from the standpoint of convenience and quality of application for the implementation of methods and algorithms for solving problems in the field of computer science.</p> <p>LO10. Use tools for the development of client-server applications, design conceptual, logical and physical models of databases, develop and optimize queries to them, create distributed databases, data stores and showcases, knowledge bases, including on cloud services, using web languages -programming.</p> <p>LO11. To have the skills of managing the life cycle of software, products and services of information technologies in accordance with the requirements and limitations of the customer, to be able to develop project documentation (technical and economic justification, specifications, business plan, agreement, contract, contract).</p> <p>LO12. Apply methods and algorithms of computational intelligence and intelligent data analysis in the tasks of classification, forecasting, cluster analysis, finding associative rules using software tools to support multidimensional data analysis based on DataMining, TextMining, WebMining technologies.</p> <p>LO13. To know system programming languages and methods of developing programs that interact with components of computer systems, to know network technologies, computer network architectures, to have practical skills in the technology of computer network administration and their software.</p> <p>LO14. Apply knowledge of methodology and CASE-tools for designing complex systems, methods of structural analysis of systems, object-oriented design methodology when developing and researching functional models of organizational-economic and production-technical systems.</p>
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	<p>LO15. To understand the concept of information security, the principles of safe software design, to ensure the security of computer networks in conditions of incompleteness and uncertainty of source data.</p> <p>LO16. Perform parallel and distributed calculations, apply numerical methods and algorithms for parallel structures, parallel programming languages in the development and operation of parallel and distributed software.</p> <p>LO17. Apply the theoretical and practical foundations of modern management theory to build intelligent management systems, design intelligent systems using modern information processing technologies and computational intelligence methods.</p> <p>LO18. Apply modern methods of decision-making theory to build intelligent management systems, including methods of ranking, formation and coordination of collective expert assessments, multi-criteria optimization, and others.</p> <p>LO19. Create intelligent management systems using methods of mathematical modeling and analysis of complex systems, methods of modeling and analysis of business processes, information technologies for managing business systems.</p> <p>LO20. Develop the architecture of software systems and their individual components when building intelligent control systems in various industries, as well as manage the life cycle processes of software of intelligent control systems.</p> <p>LO21. Apply the principles of moral, cultural, scientific values and multiply the achievements of society, use various types and forms of motor activity to lead a healthy lifestyle and professional activity in the field of information technologies.</p>
<b>8 – Resource support for program implementation</b>	
Staff support	<p>Personnel provision of the EPP corresponds to the Resolution of the Cabinet of Ministers of Ukraine No. 1187 of 12/30/2015 "On approval of the Licensing conditions for conducting educational activities of educational institutions" (as amended in accordance with the Resolution of the Cabinet of Ministers of Ukraine No. 365 of 24/03/2021. Appendix 15-16).</p> <p>The educational process is provided by scientific and pedagogical workers who work at the main place of work and have appropriate educational and/or professional qualifications. Practical teachers, specialists and employees of IT companies, foreign experts are also involved in teaching.</p>
Material and technical support	<p>The material and technical support of the EPP corresponds to the Resolution of the Cabinet of Ministers of Ukraine No. 1187 dated 30.12.2015 "On approval of the Licensing conditions for conducting educational activities of educational institutions" (as amended in accordance with the Resolution of the Cabinet of Ministers of Ukraine No. 365 of 24.03.2021 Appendix 17).</p> <p>In the educational process, educational facilities of NTU "KhPI" are used, in particular, computer laboratories and educational laboratory "Innovation campus" of NTU "KhPI", premises for scientific and pedagogical workers, other premises.</p>
Informational and educational and methodological support	<p>The informational and educational and methodological support of the EPP corresponds to the Resolution of the Cabinet of Ministers of Ukraine No. 1187 of 12/30/2015 "On Approval of Licensing Conditions for Conducting Educational Activities of Educational</p>

	<p>Institutions" (as amended in accordance with the Resolution of the Cabinet of Ministers of Ukraine No. 365 of 24/03/2021. Appendix 18) .</p> <p>Application of the Office 365 system, LMS (Learning Management System) in the educational process, in particular, for distance learning. Access to the electronic repository (eNTUKhPIIR) of the scientific and technical library of NTU "KhPI" via the Internet (including the university Wi-Fi network) for access to educational publications and periodical scientific publications on IT, in particular, in English.</p>
<b>9 – Academic mobility</b>	
National credit mobility	Based on bilateral agreements on academic mobility with institutions of higher education within Ukraine.
International credit mobility	Based on an agreement with Université Paris-Nord (University of Paris-North, France), Univerza v Mariboru (University of Maribor, Slovenia), etc. Academic mobility projects ERASMUS+ KA1.
Education of foreign students of education	Training of foreign citizens and stateless persons is carried out in Ukrainian or English in accordance with the requirements of the Law of Ukraine "On Higher Education". At least 25% of scientific-pedagogical staff who ensure the implementation of the educational process in English have a document certifying English language proficiency at a level not lower than B2 in accordance with the Common European Recommendations on Language Education: Study, Teaching, Evaluation (Common European Framework of Reference for Languages, CEFR).

## LIST OF EDUCATIONAL COMPONENTS OF THE EDUCATIONAL PROGRAM AND THEIR LOGICAL SEQUENCE

Code n/a	Components of the educational program	Number of credits	Final control form	
			Exams (semesters)	Tests (semesters)
1	2	3	4	5
<b>Mandatory OP components</b>				
<i>General training</i>				
GT 1	History and culture of Ukraine	3	1	
GT 2	Ukrainian language (professional direction)	3	1	
GT 3	Foreign language by professional direction	6	2	1
GT 4	Basics of humanitarian and philosophical knowledge in professional activity	3	2	
GT 5	Higher mathematics	11	1-2	
GT 6	Physics	4	1	
GT 7	A foreign language for professional communication	6	8	6-7
GT 8	Physical Education	12		1-6
<i>Special (professional) training</i>				
PT 1	Algorithmization and programming	11	1-2	
PT 2	Basics of computer science and methods of artificial intelligence	4		1
PT 3	Probability theory and mathematical statistics	5	3	
PT 4	Operating Systems	4		2
PT 5	Algorithms and data structures	4		2
PT 6	Discrete Math	4		4
PT 7	Numerical Methods	5	5	
PT 8	Operations Research	8	6	7
PT 9	Databases	8	3-4	
PT 10	Object-oriented programming	4	3	
PT 11	Computer networks	3		3
PT 12	Basics of web development	4	4	
PT 13	Business analysis methods for requirements management	4		4
PT 14	Distributed computing and cloud services	3		5
PT 15	Software architecture and design	8	5-6	
PT 16	Software quality, testing and support	4	5	
PT 17	Fundamentals of cyber security	3	6	
PT 18	Decision making theory	4	7	
PT 19	Mathematical modeling and analysis of systems	5		3
PT 20	Methods of computational intelligence	4	8	
PT 21	Intelligent management systems and knowledge bases	5		8
PT 22	Intelligent data analysis	4		8
PT 23	IT project management	3	8	

Code n/a	Components of the educational program	Number of credits	Final control form	
			Exams (semesters)	Tests (semesters)
1	2	3	4	5
PT 24	Familiarization practice at "Innovation Campus"	3		2
PT 25	Project (practice)	6		6
PT 26	Pre-diploma practice	6		8
	Certification	6		
<b>The total amount of mandatory components</b>		<b>180</b>		
<b>Selective OP components</b>				
<b>Profiled package of disciplines 01 "Research and Development"</b>				
OP 1.1	Data collection and preparation	4		3
OP 1.2	Probabilistic and statistical models	4		4
OP 1.3	Experiment planning	4		5
OP 1.4	Methods of modeling complex systems	4		6
OP 1.5	Fuzzy logic and fuzzy systems	4		7
OP 1.6	Basics of Machine Learning	4		7
OP 1.7	Foreign language for scientific research	9	5	3-4
<b>Profiled package of disciplines 02 "Software Development and Startup"</b>				
OP 2.1	Basics of entrepreneurship	4		3
OP 2.2	Business modeling	4		4
OP 2.3	Basics of prototyping	4		5
OP 2.4	Business planning of a startup	4		6
OP 2.5	Internet marketing	4		7
OP 2.6	Business analytics of a startup	4		7
OP 2.7	Foreign language for business communication	9	5	3-4
<b>Profiled package of disciplines 03 "Innovation Campus"</b>				
OP 3.1	Development of corporate information systems (part 1)	4		3
OP 3.2	Development of corporate information systems (part 2)	4		4
OP 3.3	Databases for corporate information systems	4		5
OP 3.4	Architecture of corporate information systems	4		6
OP 3.5	Project practicum	4		7
OP 3.6	Formation and development of IT project teams	4		7
OP 3.7	A foreign language for the development of corporate information systems	9	5	3-4
<b>Disciplines of the student's free choice of specialized training according to the list</b>		<b>15</b>		<b>4-6</b>
<b>Disciplines of the student's free choice from the university-wide catalog of disciplines</b>				
OD 1	Discipline 1	4		7
OD 2	Discipline 2	4		7
OD 3	Discipline 3	4		7

Code n/a	Components of the educational program	Number of credits	Final control form	
			Exams (semesters)	Tests (semesters)
1	2	3	4	5
<b>The total amount of sample components:</b>		<b>60</b>		
<b>GENERAL SCOPE OF THE EDUCATIONAL PROGRAM:</b>		<b>240</b>		

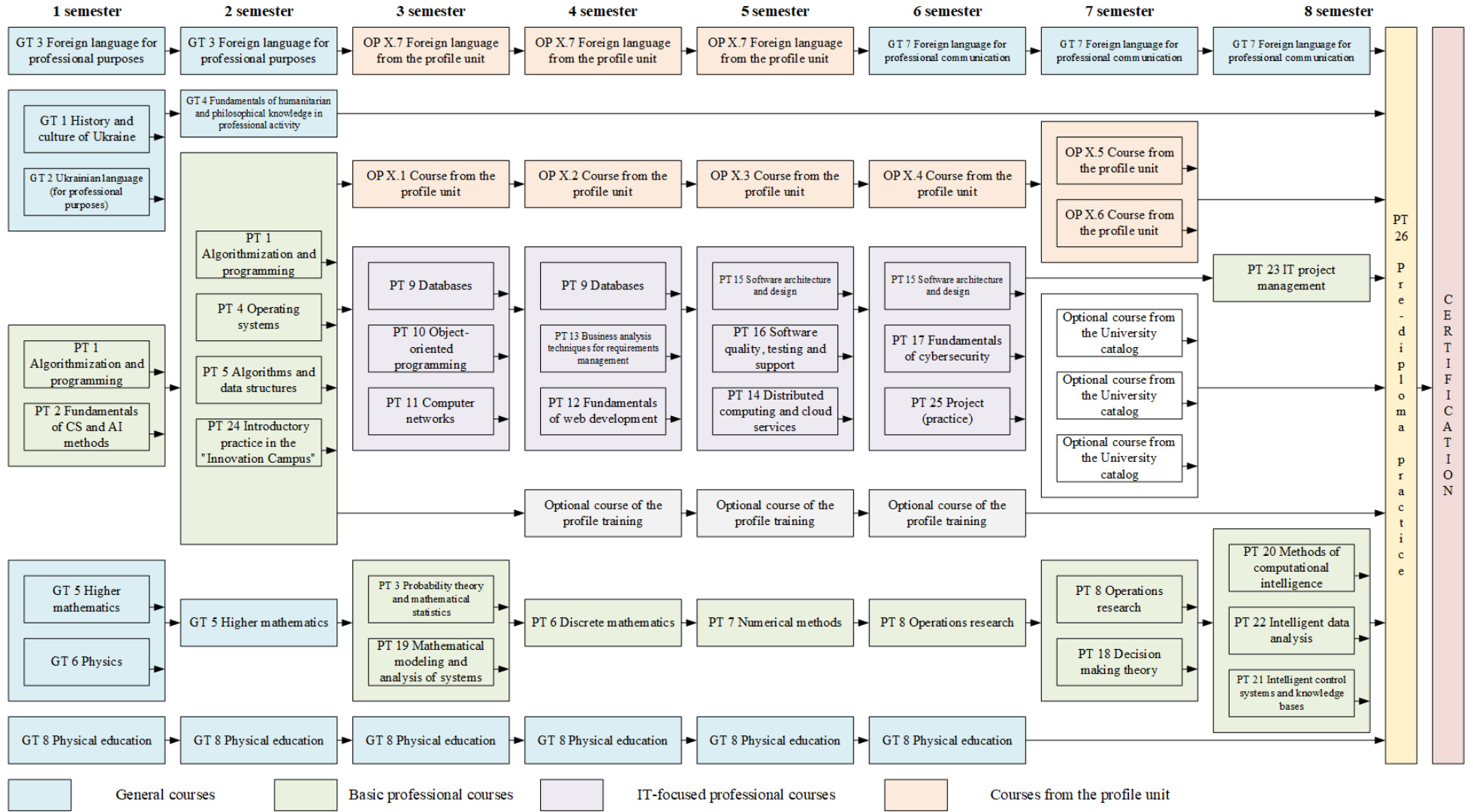
### DISTRIBUTION OF THE CONTENT OF THE EDUCATIONAL PROGRAM BY GROUPS OF COMPONENTS AND TRAINING CYCLES

No	Training cycle	The volume of the educational load of the student of higher education (ECTS credits / %)		
		Mandatory components of the educational and professional program	Elective components of the educational and professional program	Total for the entire period of study
1	General training	52 / 22	-	<b>52 / 22</b>
2	Special (professional) training	128 / 53	-	<b>128 / 53</b>
3	Disciplines of free choice	-	60 / 25	<b>60 / 25</b>
Total for the entire period of study		<b>180 / 75</b>	<b>60 / 25</b>	<b>240 / 100</b>

### FORM OF CERTIFICATION OF HIGHER EDUCATION ACQUIRES

<b>Forms of attestation of applicants of higher education</b>	Attestation is carried out in the form of defense of the qualification work.
<b>Requirements for qualifying work</b>	<p>The qualification work should involve a theoretical, system engineering or experimental study of a complex specialized task or practical problem in the field of computer science, which is characterized by complexity and uncertainty of conditions and requires the application of theories and methods of information technologies.</p> <p>There should be no academic plagiarism, falsification and fabrication in the qualification work.</p> <p>The qualification work must be published on the official website of the institution of higher education or its structural division, or in the repository of the institution of higher education.</p>

# STRUCTURAL AND LOGICAL SCHEME



**CORRESPONDENCE MATRICES OF DETERMINED LEARNING OUTCOMES, COMPETENCES AND EDUCATIONAL COMPONENTS**

Educational components	Learning outcomes																					
	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10	LO11	LO12	LO13	LO14	LO15	LO16	LO17	LO18	LO19	LO20	LO21	
GT 1																					+	
GT 2																						+
GT 3																						+
GT 4	+																					+
GT 5		+																				
GT 6	+																					
GT 7																						+
GT 8																						+
PT 1	+				+				+													
PT 2	+																					
PT 3			+	+																		
PT 4													+									
PT 5	+				+																	
PT 6	+	+			+																	
PT 7		+			+	+																
PT 8		+			+	+	+	+														
PT 9										+				+								
PT 10					+				+					+								
PT 11													+		+							
PT 12									+	+												
PT 13								+			+			+						+		
PT 14										+						+						
PT 15									+	+	+									+	+	
PT 16									+													
PT 17															+							
PT 18		+					+	+											+			
PT 19	+	+				+	+	+											+	+		
PT 20			+	+				+				+						+				
PT 21	+		+	+			+	+		+		+						+		+	+	
PT 22			+	+								+				+	+					
PT 23											+										+	
PT 24	+				+				+													
PT 25									+	+	+		+		+	+					+	
PT 26	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+



Educational components	General competences														
	GC1	GC2	GC3	GC4	GC5	GC6	GC7	GC8	GC9	GC10	GC11	GC12	GC13	GC14	GC15
GT 1						+								+	+
GT 2				+		+	+								
GT 3			+		+	+	+								
GT 4	+					+				+			+		+
GT 5	+	+				+									
GT 6	+					+									
GT 7			+		+	+	+		+						
GT 8															+
PT 1	+	+	+			+	+		+						
PT 2	+	+	+			+	+								
PT 3	+	+	+												
PT 4	+	+	+			+									
PT 5	+	+	+			+	+								
PT 6	+	+	+			+	+								
PT 7	+	+	+			+									
PT 8	+	+	+			+									
PT 9	+	+	+			+									
PT 10	+	+	+			+			+						
PT 11	+	+	+			+									
PT 12	+	+	+			+			+						
PT 13	+	+	+			+	+	+		+	+				
PT 14	+	+	+			+			+						
PT 15	+	+	+			+			+						
PT 16	+	+	+			+	+		+	+		+			
PT 17	+	+	+			+									
PT 18	+	+	+			+	+		+		+	+	+		
PT 19	+	+	+			+	+								
PT 20	+	+	+			+	+								
PT 21	+	+	+			+	+								
PT 22	+	+	+			+	+								
PT 23	+	+	+			+	+		+	+	+	+		+	
PT 24	+	+	+	+	+	+	+	+	+			+	+	+	
PT 25	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
PT 26	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

Educational components	Special (professional) competences																			
	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10	PC11	PC12	PC13	PC14	PC15	PC16	PC17	PC18	PC19	PC20
GT 1																				
GT 2																				
GT 3																				
GT 4																				
GT 5	+																			
GT 6																				
GT 7																				
GT 8																				
PT 1			+					+												
PT 2			+								+									
PT 3		+																		
PT 4												+								
PT 5			+					+												
PT 6	+		+																	
PT 7	+		+	+																
PT 8	+		+	+	+	+	+													
PT 9								+	+											
PT 10								+												
PT 11													+							
PT 12								+	+											
PT 13						+									+				+	
PT 14									+			+				+				
PT 15								+	+	+		+			+				+	+
PT 16										+										
PT 17														+						
PT 18	+				+	+	+											+		
PT 19	+		+	+	+	+												+	+	
PT 20		+		+		+					+							+		
PT 21		+	+		+	+	+		+		+							+		
PT 22		+									+						+	+		
PT 23										+										+
PT 24			+					+												
PT 25	+						+	+	+	+	+		+	+	+					+
PT 26	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+