

3. Educational program.

Computer science (Bachelor's degree). Guarantor of the educational program – P.G. Demidov, Candidate of Technical Sciences, Associate Professor, Associate Professor of the Department of Computer Sciences and Information Systems

3.1. Profile of the educational program "Computer Science" in the specialty 122 "Computer Science"

1 –General information	
Full name of the institution of higher education and structural subdivision	State University of Trade and Economics Faculty of Information Technologies Department of Computer Sciences and Information Systems
Higher education degree and the name of the qualification in the language of the original	Higher education degree – Bachelor Speciality "Computer Science"
The official name of the educational program	"Computer Science"
Compliance with the standard of higher education of the Ministry of Education and Science of Ukraine	The program corresponds to the Higher Education Standards of the Ministry of Education and Science of Ukraine
Type of diploma and volume of educational program	Bachelor's degree diploma, unitary, 240 ECTS credits Term of studies - 3 years 10 months
Availability of accreditation	Certificate of accreditation of the educational program No. 1903 The date of issuance of the certificate of accreditation of the educational program is 30.06.2021 The validity period of the educational program accreditation certificate is 07/01/2026
Cycle / Level	NQF of Ukraine – the 6th level FQ for EHEA – the first cycle EQF for LLL – the 6th level
Prerequisites	Full secondary education
Language (s) of teaching	Ukrainian
The duration of the educational program	The validity period of the educational program "Computer Science" is until July 1, 2026.
Internet address of the permanent placing of the educational program	https:// knute.edu.ua
2 –The purpose of the educational program	
Training of highly qualified specialists who have mastered modern achievements in the field of computer science, have theoretical knowledge and are able to formulate and solve practical problems in complex systems of various nature using fundamental and applied methods of computer science and technology, which makes it possible to effectively solve tasks in their professional activities. To provide high-quality education in the field of information technology, competitive in the labor market, to prepare students with a special interest in issues in the field of computer science, ready to study at the master's level.	
3 - Characteristics of the educational program	
Subject area description	<i>Object(s) of study and/or activity:</i>

	<ul style="list-style-type: none"> - 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, implementation of algorithms, high-performance computing, including parallel computing and big data. <p><i>Learning objectives:</i> 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 systems of data analysis and processing of organizational, technical, natural and socio-economic systems.</p> <p><i>Theoretical content of the subject area:</i> modern models, methods, algorithms, technologies, processes and methods of obtaining, presenting, processing, analyzing, transmitting, storing data in information systems.</p> <p><i>Methods, techniques and technologies:</i> mathematical models, methods and algorithms for solving theoretical and applied problems that arise during IT development; 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; computer graphics methods and data visualization technologies; knowledge engineering technologies, CASE modeling and IT design technologies.</p> <p><i>Tools and equipment:</i> distributed computing systems; computer networks; mobile and cloud technologies, database management systems, operating systems.</p>
Orientation of the educational program	Educational and professional, fundamental, applied.
The main focus of the educational program	<p>Higher education in the field of information technologies, specialty "Computer science". The main emphasis of the educational program is based on well-known scientific and practical modern achievements in the field of information technologies, and is focused on the training of specialists capable of solving complex problems related to modeling, design, development, software implementation and support of computer systems and technologies, including those based on distributed server systems and using intelligent data analysis and processing mechanisms.</p> <p><i>Keywords:</i> programming, algorithmization, modeling, computer data processing, computing systems and technologies, Machine Learning, Big Data Processing, programming in C#, C++, Python, Java, computer networks, distributed server systems, distributed and parallel computing, fuzzy models and networks, computational intelligence methods.</p>
Peculiarities of the educational program	Availability of a variable component of professionally oriented disciplines for computer sciences; practical training in state institutions, enterprises and organizations.

	<p>A feature of the educational program "Computer Sciences" is its meaningful content, which takes into account modern trends in the field of information technologies, related to achievements in the field of intellectual data analysis, machine learning, artificial intelligence and aimed at the development and implementation of intelligent management systems. In the mandatory components, the specialty of the educational program is determined by the disciplines "Artificial Intelligence", "Machine Learning", "Fuzzy Models and Networks", "Numerical Programming Methods", which are related to the study of intelligent mechanisms of data presentation and processing. The selective part contains components related to the field of development and implementation of automated computer systems: "Intelligent systems", "Data analysis technologies", "Computer data visualization systems", "Automated design systems". Graduation qualification projects explore the subject area related to the development of automated computer systems in various areas of trade and economic activity, including those based on intelligent data processing mechanisms.</p>
4 – Suitability of graduates for employment and further education	
Suitability of graduates for employment	<p>According to the National Classifier of Types of Economic Activity DK 009:2010, as well as taking into account the requirements of the labor market, the types of professional activity of a graduate are:</p> <ul style="list-style-type: none"> - activities in the field of informatization - 72; - provision of consultations on informatization issues - 72.1; – development of software and provision of relevant consultations – 72.2 <p>A specialist with a bachelor's degree in the specialty "Computer Science" according to the National Classifier of Professions DK 003:2010 can be employed in positions with the following professional title:</p> <ul style="list-style-type: none"> 3121.2 Information technology specialist; 3121.2 Software development and testing specialist; 3121.2 Computer program development specialist; 2131.2 System administrator.
Academic and professional rights graduates	<p>They have the right to continue their studies at the second (master's) level of higher education. Acquisition of additional qualifications in the postgraduate education system.</p>
5 –Teaching and evaluation	
Teaching and evaluation	<p>Lectures, practical classes, laboratory work, seminars, self-study using textbooks, manuals and notes, consultations with teachers, preparation of final qualification work.</p> <p>Student-centered approach to learning. Credit and transfer system of training organization. Individual learning trajectory. Problem-oriented learning, self-learning (using library and Internet resources), learning through practical training. Distance learning using electronic resources.</p>
Evaluation	<p>Current control, exams, defense of final qualification work. The evaluation is carried out in accordance with the "Regulations on the evaluation of the results of students' and postgraduate studies at the SUTE", "Regulations on the organization of the educational process of students"</p>

6 –Program competencies	
Integral competence	The ability to solve complex specialized tasks and practical problems in the field of computer science 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 understanding 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>
Special (professional, subject) competences	<p>SC1. Ability to mathematically formulate and investigate continuous and discrete mathematical models, justify the choice of methods and approaches for solving theoretical and applied problems in the field of computer science, analysis and interpretation</p> <p>SC2. The 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>SC3. 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>

SC4. 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.

SC5. 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.

SC6. Ability to system thinking, application of the methodology of system analysis for the study of complex problems of various nature, methods of formalization and solving of system problems with conflicting goals, uncertainties and risks.

SC7. 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.

SC8. 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.

SC9. 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.

SC10. 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.

SC11. 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.

SC12. 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.

SC13. Ability to develop network software that functions on the basis of various topologies of structured cabling systems, uses computer systems and data transmission networks, and analyzes the quality of computer networks.

SC14. Ability to apply methods and means of security of information security, to develop and operate special software for the protection of information resources of critical information infrastructure objects.

SC15. Ability to analyze and functional modeling of business processes, construction and practical application of functional

	<p>models of organizational-economic and production-technical systems, methods of assessing the risks of their design.</p> <p>SC16. 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>
7 –Program learning outcomes	
	<p>PLO1. 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>PLO2. 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>PLO3. To use knowledge of regularities of random phenomena, their properties and operations on them, models of random processes and modern software environments to solve problems of statistical data processing and build predictive models.</p> <p>PLO4 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>PLO5. 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. PR6. 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>PLO6. 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>PLO7. 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>PLO8. 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>PLO9. 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</p>

	<p>methods and algorithms for solving problems in the field of computer science.</p> <p>PLO10. 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>PLO11 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 feasibility study, specifications, business plan, agreement, agreement, contract).</p> <p>PLO12. 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>PLO13. To know system programming languages and methods of developing programs that interact with computer system components, to know network technologies, computer network architectures, to have practical skills in the technology of computer network administration and their software.</p> <p>PLO14. To know system programming languages and methods of developing programs that interact with computer system components, to know network technologies, computer network architectures, to have practical skills in the technology of computer network administration and their software.</p> <p>PLO15. 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> <p>PLO16. 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>PLO17. 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>
8 –Resource support for the implementation of the program	
Personnel support	<p>The implementation of the educational program is provided by teachers who have the scientific degrees of candidate and doctor of sciences.</p> <p>The participation of foreign specialists and practitioners in the teaching of the disciplines of the cycle of professional training is possible.</p>
Material and technical support	<p>The basis of material and technical support consists of specialized computer laboratories with modern hardware and software</p>

	<p>resources, which ensure high-quality training of bachelors in the educational program "Computer Sciences". Students are fully provided with material resources for study and research. At their service:</p> <ul style="list-style-type: none"> - more than 30 thousand m2 of educational buildings; - dormitories; - 470 seats in the DTEU reading rooms, including in the DTEU multimedia library, where access to SCOPUS, Web of Science scientometric databases is provided; - 2,000 PC workstations with access to the Internet + WiFi. All computer equipment is equipped with basic software, special software is installed on the computers in the laboratories of the departments, necessary for conducting classes and completing tasks by students; - distance learning laboratory, which hosts 966 educational courses; - an electronic platform for student communication based on Microsoft Office 365, etc.
<p>Information and educational methodical support</p>	<p>Complete provision of educational and methodological complexes of disciplines and other types of educational and methodological materials.</p> <p>Documents regulating admission and study procedures at DTEU are available on the official website. Open access of students of higher education to informational and educational-methodical resources through educational process management information systems and other web-services:</p> <ul style="list-style-type: none"> -MOODLE distance learning system (966 educational courses, provides independent and individual training, control), - availability of free access to the Internet and e-mail; - information systems "Dean's Office", "Loading-Schedule", management of WEB-resources of the SUTE; - library fund management system - almost 1.5 million titles of educational and scientific literature in the SUTE library; - electronic document management system "OPTiMA – WorkFlow"; - corporate information environment in the form of a "personal account" of the user of the SUTE web portal. <p>Ensuring the publicity of information about educational programs, degrees of higher education and qualifications: implementation of the information policy of the SUTE, publication on the official website of the SUTE of ECTS information packages, educational programs, the schedule of classes, as well as all components of the provision of the educational process, which are subject to publication in accordance with the Law of Ukraine "On Higher education";</p> <p>Ensuring an effective system of prevention and detection of academic plagiarism in the scientific works of the SUTE employees, students of higher education (checking for plagiarism all graduation qualification papers, publications, publishing the text of dissertation research on the official website of the SUTE), compliance with the Code of Ethics of a scientist of Ukraine.</p>

9 –Academic mobility	
National credit mobility	National credit mobility is carried out in accordance with the concluded agreements on academic mobility.
International credit mobility	International credit mobility is implemented within the framework of cooperation agreements between the SUTE and institutions of higher education in France, Great Britain, Poland, and Germany, within the framework of which partner exchange and training are carried out. Study in the direction of KA1 with obtaining credits at universities of member countries of the Erasmus+ Program.
Teaching foreign applicants for higher education	Foreign students of higher education are guaranteed all rights and freedoms, in accordance with the current legislation of Ukraine and the University Charter. Education of foreign students of higher education is conducted on general terms with additional language training.

3.2. The list of components of the educational program and their logical consistency

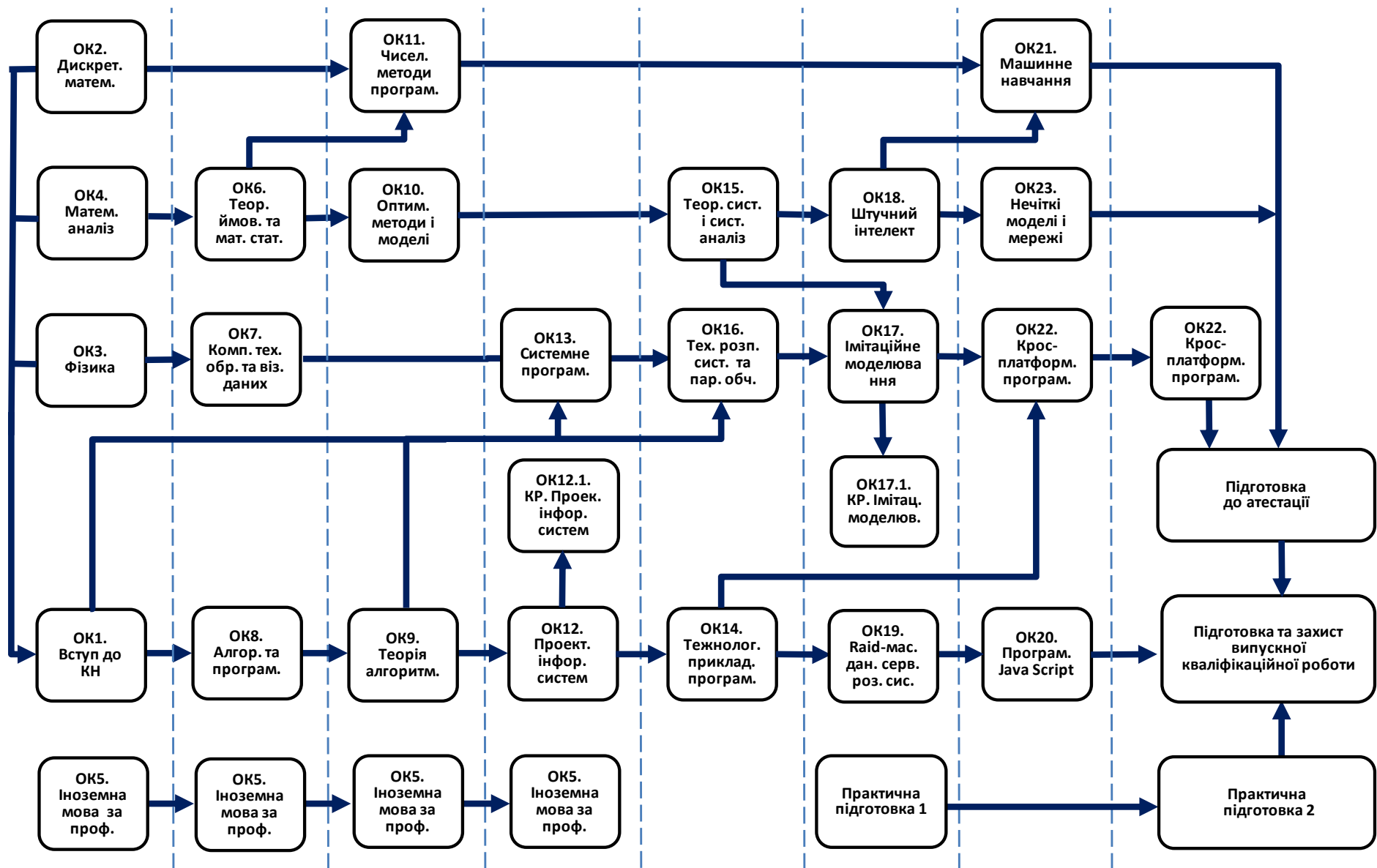
3.2.1. List of EP components

Code N / A	Components of the educational program (academic disciplines, course projects (works), practice, qualification work)	Amount of credits
1	2	3
Compulsory components of the EP		
CC 1.	Introduction to computer science	6
CC 2.	Discrete Math	6
CC 3.	Physics	6
CC 4.	Mathematical analysis	6
CC 5.	Foreign language for professional purposes	24
CC 6.	Probability theory and mathematical statistics	6
CC 7.	Computer technologies of data processing and visualization	6
CC 8.	Algorithmization and programming	6
CC 9.	Theory of algorithms	6
CC 10.	Optimization methods and models	6
CC 11.	Numerical methods of programming	6
CC 12.	Information systems design	6
CC 12.1	Course work on the design of information systems	6
CC 13.	System programming	6
CC 14.	Applied programming technologies	6
CC 15.	Systems theory and system analysis	6
CC 16.	Technologies of distributed systems and parallel computing	6
CC 17.	Simulation modeling	6
CC 17.1	Course work on simulation modeling	6
CC 18.	Artificial Intelligence	6
CC 19.	Raid data arrays and distributed server systems	6
CC 20.	Java Script Javascript programming	6
CC 21.	Machine learning	6
CC 22.	Cross-platform programming	9
CC 23.	Fuzzy models and networks	6

Total volume of compulsory components:		159
Optional components of the EP		
OC 1.	Architecture of computer systems	6
OC 2.	Safety of life	6
OC 3.	Vector and tensor analysis	6
OC 4.	Differential equations	6
OC 5.	Economic theory	6
OC 6.	Electronic trade	6
OC 7.	Electrical engineering and basics of electronics	6
OC 8.	Information wars	6
OC 9.	Engineering and computer graphics	6
OC 10.	Information systems and technologies in the economy	6
OC 11.	History of Ukrainian Culture	6
OC 12.	Computer data visualization systems	6
OC 13.	Linear algebra and analytic geometry	6
OC 14.	Mathematical logic	6
OC 15.	Management	6
OC 16.	Organization of databases and knowledge	6
OC 17.	Fundamentals of cyber security	6
OC 18.	Science of law	6
OC 19.	Psychology	6
OC 20.	Automated design systems	6
OC 21.	Sociology	6
OC 22.	Mobile application development technology	6
OC 23.	Theory of information and coding	6
OC 24.	Business analytics tools	6
OC 25.	Technologies for creating software products	6
OC 26.	Java technology	6
OC 27.	Philosophy	6
OC 28.	Digital systems and technologies	6
OC 29.	Web technologies	6
The total amount of optional components:		60
Practical training		
Internship 1		6
Internship 2		6
Total		12
Attestation		
Preparation for the attestation		3
Preparation of the final qualification work and its defense		6
Total		9
TOTAL VOLUME OF EDUCATIONAL PROGRAM		240

An exam is the form of final control for all components of the educational program.

3.2.2 Structural and logical scheme of the EP



- CC 2. Discrete Math
- CC 3. Physics
- CC 4. Mathematical analysis
- CC 5. Foreign language for professional purposes
- CC 6. Probability theory and mathematical statistics
- CC 7. Computer technologies of data processing and visualization
- CC 8. Algorithmization and programming
- CC 9. Theory of algorithms
- CC 10. Optimization methods and models
- CC 11. Numerical methods of programming
- CC 12. Information systems design
- CC 12.1 Course work on the design of information systems
- CC 13. System programming
- CC 14. Applied programming technologies
- CC 15. Systems theory and system analysis
- CC 16. Technologies of distributed systems and parallel computing
- CC 17. Simulation modeling
- CC 17.1 Course work on simulation modeling
- CC 18. Artificial Intelligence
- CC 19. Raid data arrays and distributed server systems
- CC 20. Java Script Javascript programming
- CC 21. Machine learning
- CC 22. Cross-platform programming

Preparation for attestation

Preparation of the final qualification work and its defense

Internship 1

Internship 2

3.3. Form of attestation of applicants for higher education

Attestation is carried out in the form of defense of a final qualification work.

The final qualifying thesis 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.

There should be no academic plagiarism, falsification and fabrication in the final qualification work.

The graduation thesis 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.

3.4. Matrix of compliance of program competencies to the compulsory components of the educational program

Component/ Competences	OK 1	OK 2	OK 3	OK 4	OK 5	OK 6	OK 7	OK 8	OK 9	OK 10	OK 11	OK 12	OK 12.1	OK 13	OK 14	OK 15	OK 16	OK 17	OK 17.1	OK 18	OK 19	OK 20	OK 21	OK 22	OK 23	
GC 1			•	•						•						•		•								
GC 2	•	•	•				•	•	•	•	•	•	•	•	•		•	•	•		•	•			•	•
GC 3	•						•	•				•	•	•			•	•	•	•	•	•	•	•	•	•
GC 4	•			•																						
GC 5					•																					
GC 6			•	•		•	•			•								•								•
GC 7						•	•									•								•		•
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GC 12												•	•												•	
GC 13	•											•	•							•						
GC14	•																									
GC15	•		•																							
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SC 2						•															•			•		•
SC 3								•	•			•	•						•		•					
SC 4			•					•	•	•	•								•							
SC 5		•								•							•		•							
SC 6																•										•
SC 7			•							•	•								•	•						
SC 8	•							•	•					•	•					•			•		•	•
SC 9																		•			•					
SC 10												•	•	•	•								•			
SC 11							•													•			•		•	•
SC 12	•						•					•	•	•	•		•					•		•		•
SC 13														•								•	•			
SC 14																		•			•					
SC 15												•	•						•	•						•
SC 16																		•			•					

3.5.

**Matrix of correspondence of program competences
optional components of the educational program**

Component/ Competences	OC 1	OC 2	OC 3	OC 4	OC 5	OC 6	OC 7	OC 8	OC 9	OC 10	OC 11	OC 12	OC 13	OC 14	OC 15	OC 16	OC 17	OC 18	OC 19	OC 20	OC 21	OC 22	OC 23	OC 24	OC 25	OC 26	OC 27	OC 28	OC 29
GC 1																								•			•		
GC 2				•		•		•		•		•					•												
GC 3							•			•		•				•													
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GC14		•									•							•				•							
GC15		•					•				•																		
SC 1				•									•											•					
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SC 13							•		•													•	•		•				•
SC 14	•																•								•				

**3.6. Matrix of provision of program learning outcomes
corresponding compulsory components of the educational program**

Components/ Program learning outcomes	CC1	CC2	CC3	CC4	CC5	CC6	CC7	CC8	CC9	CC10	CC11	CC12	CC12.1	CC13	CC14	CC15	CC16	CC17	CC17.1	CC18	CC19	CC20	CC21	CC22	CC23
PLO 1	•		•	•			•									•									
PLO 2		•	•	•						•		•													
PLO 3						•												•	•	•					
PLO 4											•									•			•		•
PLO 5								•	•						•										
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PLO 11					•							•	•												
PLO 12					•				•											•			•		•
PLO 13					•			•	•					•							•	•			
PLO 14					•			•	•					•							•	•			
PLO 15												•	•		•			•	•						
PLO 16	•																				•				
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