BORYS GRINCHENKO KYIV UNIVERSITY

«APPROVED»
Decision of the Academic Board of
Borys Grinchenko Kyiv University
April 27, 2020, Protocol No. 3
(new edition)

Chief of the Academic Board, Rector

_____ VIKTOR OGNEVIUK

EDUCATIONAL AND PROFESSIONAL PROGRAM

122.00.01 Informatics

The first (bachelor's) level of higher education

Field of Knowledge: 12 Information Technology

Specialty: 122 Computer Science

Qualification: Bachelor of Computer Science

Enacted since September 1, 2020
(Order No. 319, dated 03.06.2020)

Kyiv 2020

LETTER OF APPROVAL

Changes to the Educational and Professional Program
122.00.01 Informatics

The Program was revised and updated in 2020.

Chair of Computer Science and Mathematics
Protocol No. 3 from March 4, 2020
Head of the Chair _____ Oksana LYTVYN
(signature)

Academic Council of the Faculty of Information Technology and Management
Protocol No. 3 from April 15, 2020
Head of the Academic Council _____ Alla MYKHATSKA
(signature)

Scientific and Methodological Centre of Standardization and Quality of Education

Head _____ Olha LEONTIEVA
April 26, 2020

Vice-Rector on Academic Affairs

_____ Oleksii ZHYLTSOV
April 26, 2020

PREFACE

Educational and professional program 122.00.01 Informatics is developed on the basis of the Law of Ukraine "On Higher Education" and the Standard of Higher Education of Ukraine of the first (bachelor's) level in the field of knowledge 12 Information Technology, specialty 122 Computer Science, approved by the Ministry of Education and Science of Ukraine from July10, 2019, № 962.

IT IS DRAFTED BY THE PROJECT GROUP CONSISTING OF:

Project group leader (educational program guarantor):
MASHKINA Iryna Viktorivna, Candidate of Technical Sciences, Associate Professor, Associate Professor of the Chair of Computer Science and Mathematics, Borys Grinchenko Kyiv University   _____

Members of the project group:
Doctor of Technical Sciences, Professor, Professor of the Chair of Computer Science and Mathematics, Borys Grinchenko Kyiv University   _____

YASKEVYCH Vladyslav Oleksandrovych, Candidate of Technical Sciences, Associate Professor of the Chair of Computer Science and Mathematics, Borys Grinchenko Kyiv University   _____

EXTERNAL REVIEWERS:

Tymashov O.O, Candidate of Technical Sciences, Associate Professor, Leading Researcher of the Department of Problem-Oriented Computers and Systems of the Glushkov Institute of Cybernetics of the National Academy of Sciences of Ukraine

REVIEWS OF EMPLOYER'S REPRESENTATIVES:

1. **Nazarov Y.L.,** Director of the Department of Information and Communication Technologies of the Kyiv City State Administration

2. **Lomakovska H.V.,** director of the lyceum of information technologies № 79, Kyiv.

The educational program was put into effect on September 1, 2017.
Term of revision of the educational program is once in 4 years.

Updated:

Date of review of the EP / amendments to the EP	August 27, 2019	April 27, 2020	
Signature			
Name of the EP guarantor	Mashkina I.V.	Mashkina I.V.	

SUBSTANTIATION

Changes to the educational and professional program are due to the need to agree on the content of the educational and professional program 122.00.01 "Informatics", approved by the decision of the Academic Council of Borys Grinchenko Kyiv University from March 23,2017, protocol № 3 (Order from May 26, 2017, № 348), as amended by the decision of the Academic Council dated August 29, 2019, protocol № 7 (Order dated August 30, 2019, № 509) and taking into account the order of the Ministry of Education and Science of Ukraine dated July 10, 2019, № 962 On approval of the Standard of Higher Education in the specialty 122 "Computer Science" for the first (bachelor's) level.

In addition, in the process of implementing of the educational program (implementation of the curriculum, development of working programs of disciplines, practical training and certification) during the 2017-2018, 2018-2019, 2019-2020 academic years, the support group received feedback from teachers, students, heads of practice bases and employers with a number of wishes for the optimization of certain components of the educational and professional program.

Thus, in accordance with the standard of higher education in the specialty 122 Computer Science for the first (bachelor's) level of higher education and feedback from stakeholders, the following sections were developed and amended:

- general information about the educational program,
- list of graduate competencies,
- program learning outcomes,
- list of components of the educational-professional program and their logical sequence
- forms of certification of higher education applicants.

These changes led to the development of a new version of the description of the educational and professional program.

1. Profile of the educational program

122.00.01 Informatics

in the Specialty 122 "Computer Science"

1 – General information	
Full name of the institution of higher education and the structural unit	Borys Grinchenko Kyiv University Faculty of Information Technologies and Management
Degree of higher education and title of qualification in the original language	Degree of higher education: Bachelor Specialty: 122 Computer Science Educational program: 122.00.01 Informatics Qualification: Bachelor of Computer Science
Official name of educational program	122.00.01 Informatics
Type of diploma and volume of educational program	Bachelor's degree, single, 240 ECTS credits, term of study 3 years 10 months
Availability of accreditation	Ministry of Education and Science of Ukraine, Certificate (UK № 11006865) of accreditation specialty 122 Computer Science, validity of the certificate until July 1, 2026 National Agency for Quality Assurance in Higher Education. Ukraine. The deadline for submitting the program for accreditation is 2026.
Cycle / level	HPK - level 7, FQ-EHEA - the first cycle, EQF LLL - level 6,
Prerequisites	Complete secondary education
Language (s) of instruction	Ukrainian
Term of EP's validity	According to the term of accreditation
Internet address of the permanent placement of the description of educational program	http://kubg.edu.ua
2 – The purpose of the educational program	
To train specialists who have fundamental and professional knowledge and developed practical skills in the field of informatics and information technologies and are ready for further self-development and professional growth.	
3 - Characteristics of the educational program	
Subject area	*Objects of study and / or activity:* – mathematical, informational, simulation models of real phenomena, objects, systems, processes, data and knowledge representation; – methods and technologies for obtaining, storing, processing, transmitting and using information, data mining and decision making; – theory, analysis, development and evaluation of algorithms and their software implementation;

	– theory, analysis, development, evaluation of efficiency, implementation of algorithms, high-performance computing, including parallel computing and big data; – methods, technologies and tools for creating, editing graphic objects, including three-dimensional and virtual/augmented reality; design, programming and design of computer-games. *Learning objectives:* training of specialists capable of conducting theoretical and experimental research in the field of computer science; apply mathematical methods and algorithmic principles in modeling, design, development and maintenance of information technology; to carry out development, implementation and support of intelligent systems of analysis and data processing of organizational, technical, natural and socio-economic systems. *Theoretical content of the subject area:* modern models, methods, algorithms, technologies, processes and methods of obtaining, presenting, processing, analysis, transmission, storage of data in information systems. *Methods, techniques and technologies:* mathematical models, methods and algorithms for solving theoretical and applied problems that arise in the development of IT; modern technologies and programming forms; methods of collecting, analyzing and consolidating 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-technologies of IT modeling and design. *Tools and equipment:* distributed computing systems; computer networks; mobile and cloud technologies; database management systems; Operating Systems; software design and development environments; microprocessor embedded systems. *The ratio of the total and professional components and the sample:* <u>Mandatory part (180 credits, 75%):</u> – cycle of humanitarian training (28 ECTS credits, 840 hours); – cycle of disciplines of mathematical and fundamental training (35 ECTS credits, 1050 hours); – cycle of professional and practical training (117 ECTS credits, 3510 hours together with writing a term paper for 3 years, internship for 1,2,4 years, writing and defense of a qualifying work for 4 years); *Share of practices*: 24 ECTS credits (13.3%). <u>Elective part (60 credits, 25%):</u> free choice disciplines.
Orientatin of the educational program	Educational and professional program with an applied orientation The program provides acquaintance with: - modern methods of effective access to information, its collection, systematization, storage and protection; - the main paradigms of design and development of software products, including mobile applications, and hardware and software of computerized systems, including embedded; - design and administration of computer networks, the main protocols of the Internet; - design and creation of information and intelligent systems; - computer graphics, virtual and augmented reality technologies, creation of computer games.
The main focus educational program	General education in computer science

Specifics of the program	

4 – Suitability of graduates for employment and further study	
Suitability for employment	Graduates can work in the public and private sectors of IT companies in Kyiv, Ukraine and the European Union in the following areas of activity: design and development of software products, computer network administration, design and creation of information and intelligent systems, computer graphics, Web design , development of embedded automated systems, testing of software and Internet of Things systems, support of scientific research Graduates can work in professions according to the National Classification of Occupations DK 003: 2010: 3121 System Administration Technician 3121 Technician-programmer 3121 Information Technology Specialist 3121 Computer Graphics (Design) Specialist 3121 Software Development and Testing Specialist 3121 Specialist in computer program development
Further study	Continuation of study at the second (master's) level of higher education. Acquisition of additional qualifications in the system of postgraduate education.

5 – Teaching and assessment	
Teaching and assessment	Based on the principles of student-centeredness and individual-personal approach; implemented through research-based learning, strengthening practical orientation and creative orientation in the form of a combination of lectures, practical classes, independent teaching and research work using elements of distance learning, solving applied problems, project implementation, training and production practices, term papers.
Evaluation	Cumulative module-rating system, which provides for the assessment of students for all types of classroom and extracurricular educational activities: current, modular, final control; written exams, testing, laboratory reports, presentations, tests, practice reports, term papers, bachelor's thesis.

6 – Program competencies		
Integral competence	Ability to solve complex specialized problems and practical problems in the field of computer science or in the learning process, which involves the use of theories and methods of computer science, information technology and is characterized by complexity and uncertainty of conditions.	
General competencies (GC)	GC -1	Ability to abstract thinking, analysis and synthesis.
	GC -2	Ability to apply knowledge in practical situations
	GC -3	Knowledge and understanding of the subject area and understanding of the professional activity
	GC -4	Ability to communicate in the state language both orally and in writing
	GC -5	Ability to communicate in a foreign language.
	GC -6	Ability to learn and master modern knowledge.
	GC -7	Ability to search, process and analyze information from various sources; to a critical assessment of the information obtained, the use of logic and rational reasoning.
	GC -8	Ability to generate new ideas (creativity)
	GC -9	Ability to work in a team, take responsibility for joint work; ability to lead a discussion, arguing their point of view.
	GC -10	The ability to be critical and self-critical

	GC -11	Ability to make informed decisions and justify proposed decisions at the modern scientific, technical and professional level
	GC -12	Ability to evaluate and ensure the quality of work performed, to present the results of work.
	GC -13	Ability to act on ethical considerations.
	GC -14	The ability to exercise their rights and responsibilities as a member of society, to realize the values of civil (free democratic) society and the need for its sustainable development, the rule of law, human and civil rights and freedoms in Ukraine.
	GC -15	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 technology, use different types and forms of motor activities for active recreation and a healthy lifestyle.
Special (professional) competencies (SC)	SC -1	Ability to mathematical formulation and research of continuous and discrete mathematical models, substantiation of the choice of methods and approaches for solving theoretical and applied problems in the field of computer science, analysis and interpretation of the obtained results.
	SC -2	Ability to detect statistical patterns of nondeterministic phenomena, application of methods of computational intelligence, including statistical, neural network and fuzzy data processing, methods of machine learning and genetic programming, etc.
	SC -3	Ability to think logically, build logical conclusions, use formal languages and models of algorithmic calculations, design, development and analysis of algorithms, evaluate their effectiveness and complexity, solvability and unsolvability of algorithmic problems for adequate modeling -not subject areas and the creation of software and information systems.
	SC -4	Ability to use modern methods of mathematical modeling of objects, processes and phenomena, to develop models and algorithms for numerical solution of mathematical modeling problems, to take into account the errors of approximate numerical solution of professional problems.
	SC -5	Ability to make a formalized description of operations research tasks in organizational-technical and socio-economic systems of different purposes, to determine their optimal solutions, to build models of optimal management taking into account changes in economic situation, to optimize management processes in systems of different purpose and hierarchy level.
	SC -6	Ability to think systematically, apply systems analysis methodology to study complex problems of various natures, methods of formalizing and solving system problems that have conflicting goals, uncertainties and risks.
	SC -7	Ability to apply the theoretical and practical foundations of methodology and modeling technology to study the characteristics and behavior of complex objects and systems, to conduct computational experiments with processing and analysis of results.
	SC -8	Ability to design and develop software using different programming paradigms: generalized, object-oriented, functional, logical, with appropriate models, methods and algorithms of calculations, data structures and control mechanisms.
	SC -9	Ability to implement a multi-level computational 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 cloud services.
	SC -10	Ability to apply methodologies, technologies and tools to manage the life cycle processes of information and software systems, information technology products and services in accordance with customer requirements.
	SC -11	Ability to data mining based on methods of computational intelligence, including large and poorly structured data, their prompt processing and visualization of analysis results in the process of solving applied problems.
	SC -12	Ability to ensure the organization of computational processes in information systems for various purposes, taking into account the architecture, configuration, performance indicators of operating systems and system software.
	SC -13	Ability to develop network software based on different topologies of structured cabling systems, using computer systems and data networks and analyzing the quality of computer networks.
	SC -14	Ability to apply methods and means of information security, to develop and operate special software for protection of information resources of critical information infrastructure.
	SC -15	Ability to analyze and functional modeling of business processes, construction and practical application of functional models of organizational, economic and production and technical systems, methods of risk assessment of their design.
	SC -16	Ability to implement high-performance computing based on cloud services and technologies, parallel and distributed computing in the development and operation of distributed systems of parallel information processing.
	SC -17	Possession of system information and basic knowledge of the basics of computer graphics, the ability to build graphic objects, including three-dimensional, virtual and augmented reality objects, the creation of computer animation, design, design and programming of computer games.

7 – Program learning outcomes

PLO-1	apply knowledge of the basic forms and laws of abstract-logical thinking, the basics of the methodology of scientific knowledge, forms and methods of extraction, analysis, processing and synthesis of information in the subject area of computer science;
PLO -2	use a modern mathematical apparatus of continuous and discrete analysis, linear algebra, analytical geometry, in professional activities to solve problems of theoretical and applied nature in the design and implementation of informatization objects;
PLO -3	use knowledge of the laws 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 construction of predictive models.
PLO -4	use methods of computational intelligence, machine learning, neural network and fuzzy data processing, genetic and evolutionary programming to solve problems of recognition, prediction, classification, identification of control objects, etc .;
PLO -5	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 computational functions;
PLO -6	to use methods of numerical differentiation and integration of functions, solution of usual differential and integral equations, features of numerical methods and possibilities of their adaptation to engineering problems, to have skills of program realization of numerical methods

PLO -7	understand the principles of modeling of organizational and technical systems and operations; use methods of research of operations, solution of one- and multicriteria optimization problems of linear, integer, nonlinear, stochastic programming;
PLO -8	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.
PLO -9	to develop software models of subject environments, to choose a paradigm of programming from positions of convenience and quality of application for realization of methods and algorithms of the decision of problems in the field of computer sciences;
PLO -10	use tools for developing client-server applications, design conceptual, logical and physical models of databases, develop and optimize queries to them, create distributed databases, repositories and showcases of databases, knowledge bases, including on cloud services, using web programming languages;
PLO -11	have the skills to manage the life cycle of software, products and services of information technology in accordance with the requirements and restrictions of the customer, be able to develop project documentation (feasibility study, terms of reference, business plan, agreement, contract, contract).
PLO -12	apply methods and algorithms of computational intelligence and data mining in the problems of classification, forecasting, cluster analysis, search for associative rules using software tools to support multidimensional data analysis based on technologies DataMining, TextMining, WebMining.
PLO -13	to know the languages of system programming and methods of program development that interact with the components of computer systems, to know network technologies, architectures of computer networks, to have practical skills in the technology of administration of computer networks and their software
PLO -14	apply knowledge of methodology and CASE-tools for designing complex systems, methods of structural analysis of systems, object-oriented design methodology in the development and study of functional models of organizational-economic and production-technical systems.
PLO -15	understand the concept of information security, the principles of secure software design, ensure the security of computer networks in conditions of incomplete and uncertain source data.
PLO -16	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;
PLO -17	build graphic objects (including three-dimensional), virtual and augmented reality objects, create computer animation, design and create computer games using the appropriate software;
PLO -18	communicate orally and in writing in native and foreign languages on professional issues, in particular, present comprehensive information, present an idea, explain the essence of the problem (task), method of solution and result; read special literature in a foreign language, find, analyze and use information from various reference sources.
PLO -19	adhere to the norms of a healthy lifestyle, achieve results, control your physical and mental condition.

8 – Resource support for program implementation

Staffing	The staffing of the educational program consists of the teaching staff of the Department of Computer Science and Mathematics, Faculty of Information Technology and Management, which provide 90% of professionally-oriented disciplines. According to their competence and experience, the teaching staff of the departments of information and cyber security (Faculty of Information Technologies and Management), foreign languages (Faculty of Law and International Relations), philosophy and history of Ukraine (historical and philosophical) is involved in teaching certain disciplines. Faculty), Department

	of Ukrainian Language (Institute of Philology), Physical Education and Sports Pedagogy (Faculty of Health, Physical Education and Sports). The practice-oriented nature of the educational program involves a wide participation of practitioners who correspond to the direction of the program, which strengthens the synergistic connection of theoretical and practical training. The guarantor of the educational program and the teaching staff that ensures its implementation meet the requirements set by the licensing conditions of educational activities of educational institutions.
Logistics	Sufficient number of specialized computer classes and laboratories, which are equipped with computers with appropriate software, multimedia equipment, modern information security technology, microprocessor systems based on major platforms (Arduino, RaspberryPi, Galileo), 3D printer and scanner, training network equipment (including Cisco, Dell). All workstations in computer classrooms are connected to the Internet. Specialized auditoriums, gyms.
Information and training methodological support	Library electronic resources, electronic scientific publications, electronic training courses with the possibility of distance learning and independent work. The use of e-learning educational environment of Borys Grinchenko Kyiv University and author's developments of scientific and pedagogical workers
9 – Academic mobility	
National credit mobility	
International credit mobility	Agreements on student mobility have been concluded with the Pomeranian Academy in Slupsk (Poland), Vilnius University (Lithuania) of the Erasmus + KA1 Program with the University of Foggia (Italy), the University of Cadiz (Spain)
Training of foreign applicants for higher education	According to the license, training of foreigners and stateless persons is provided. The learning process is conducted in Ukrainian, so citizens of other countries who speak Ukrainian at least level B1 can receive education in this educational program.

2. List of components of the educational and professional program
3. and their logical order

2.1 List of EPP components

Component Code	Components of the educational program (academic disciplines, course projects (works), practices, qualification work)	Number of credits	Final control form
1	2	3	4
Compulsory EPP components			
Formation of general competencies			
CEC.01	University Studies	4	credit
	I am a student	1	
	Service leadership	1	
	Introduction to the specialty	2	
CEC.02	Foreign Language	10	exam
CEC.03	Physical Education	4	credit
CEC.04	Ukrainian studies	6	exam
	History of Ukrainian Culture	2	
	Culture of oral and written speech (Ukrainian)	2	
	Human rights, rights of citizen of Ukraine	2	
CEC.05	Philosophical studies	4	exam
Formation of special (professional) competencies			
SCF.01	Architecture of computer systems	5	exam
SCF.02	Physical processes in computing systems	5	exam
SCF.03	Higher mathematics	15	exam
	Linear algebra and analytic geometry	6	
	Mathematical analysis	5	
	Differential equations	4	
SCF.04	Mathematical logic and theory of algorithms	4	exam
SCF.05	Algorithms and data structures	6	exam
SCF.06	Discrete Math	4	exam
SCF.07	Programming	18	exam
	Object-oriented programming	5	
	Web programming	4	
	Programming for mobile devices	3	
	Cross-platform programming	5	
	Coursework	1	
SCF.08	Technology for creating software products	4	exam
SCF.09	Probability Theory and Mathematical Statistics	4	exam
SCF.10	Numerical Methods	4	credit
SCF.11	Computer networks	4	exam
SCF.12	Operating systems and system programming	5	exam
SCF.13	System analysis	4	exam
SCF.14	Methods of optimization and research of operations	4	credit
SCF.15	Modeling of systems and processes	5	exam
SCF.16	Fundamentals of artificial intelligence	9	exam
	Intelligent information systems	5	
	Data Mining	4	
SCF.17	Databases and information systems	5	exam
SCF.18	Parallel and distributed calculations	4	credit

1	2	3	4
SCF.19	Computer graphics and animation	9	exam
	Three-dimensional computer graphics	2	
	Virtual and augmented reality	2	
	Game graphics. Development of computer games	5	
SCF.20	Information protection	4	exam
Total theoretical training		**150**	**-**
Practice			
EP.01	Educational (computer science) practice	6	credit
EP.02	Production (computer science) practice	12	credit
EP.03	Undergraduate practice	6	credit
Всього практика		**24**	**-**
Attestation			
EA.1	Preparation of qualification work	4,5	
	Defence of qualification work	1,5	
The total amount of required components		**180**	
Elective components of the EP (Annex 1)			
Elective block 1 "Secondary education (Informatics)"			
SCI.1.01	Psychology	4	credit
SCI.1.02	Pedagogy	5	exam
SCI.1.03	Inclusive education	4	credit
SCI.1.04	E-learning technologies	4	exam
SCI.1.05	Workshop on solving Olympiad problems in computer science	4	credit
SCI.1.06	Methods of teaching computer science	10	exam
SCI.1.07	Foreign language (advanced course)	8	credit
SP.1.01	Educational practice	3	credit
SP.1.02	Internship	16,5	credit
SA.1.01	Comprehensive qualifying exam	1,5	
Total		60	
Elective block 2 "Internet of Things"			
SCI.2.01	Microcontrollers and digital circuitry	6	credit
SCI.2.02	Design of embedded systems	7	exam
SCI.2.03	Robotics	4	exam
SCI.2.04	Entrepreneurship and StartUP	6	credit
SCI.2.05	SMART-technologies	8	exam
SCI.2.06	Foreign language (in-depth course)	8	credit
SP.2.01	Educational practice	3	credit
SP.2.02	Internship	18	credit
Всього		60	
Elective block 3 "Selection from the catalog of courses"			
SCI. 3.01-3.08	The student chooses disciplines for the appropriate number of credits	60	credit, exam
The total amount of selected components		**60**	
TOTAL VOLUME OF THE EDUCATIONAL PROGRAM		**240**	

2.2. Structural and logical scheme of EP

1 COURSE	2 COURSE	3 COURSE	4 COURSE

I. Mandatory part

- University Studies, 6 cred
- Ukrainian Studies, 6 credits
- Foreign language, 5 cred. / 5 cred.
- Physical Education, 2 cred. / 2 cred.

Higher mathematics, 15 credits
- Linear algebra and analytic geometry, 4 cred. / 2 cred.
- Mathematical analysis, 5 cred.
- Differential equations, 4 cred.

- Mathematical logic and theory of algorithms, 5 cred.
- Discrete Math, 4 cred.
- Probability Theory and Mathematical Statistics, 4 cred.

Algorithms and data structures 4 cred. / 2 cred.

- Computing systems architecture, 5 cred.
- Physical processes in computational systems, 5 cred.
- Training practice in computer sciences, 3 cred.

Course 2:
- Computer networks, 4 cred.
- Methods of optimization and research of operations, 4 cred.
- Operating systems and system programming, 5 cred.
- System analysis, 4 cred.
- Numerical Methods, 4 cred.
- Educational practice in computer science, 3 cred.

Course 3:
- Philosophical studies, 4 cred.
- Modeling of systems and processes, 5 cred.
- Databases and information systems, 5 cred.
- Parallel and distributed calculations, 4 cred.

Computer graphics and animation, 9 cred.
- Three-dimensional computer graphics, 2 cred.
- Virtual and augmented reality, 2 cred.
- Game graphics, development of computer games, 5 cred.

Fundamentals of artificial intelligence, 9 cred.
- Intelligent information systems, 5 cred.
- Data mining, 4 cred.

- Technologies for software development, 4 cred.

Programming, 17 cred
- Object-based programming, 3 cred. / 2 cred.
- Web programming, 4 cred.
- Programming for mobile devices, 3 cred.
- Cross-platform programming, 5 cred.
- Term Paper

Course 4:
- Information protection, 4 cred.
- Production practice in computer science, 6 cred. / 6 cred.
- Undergraduate practice, 6 cred.
- Attestation (6 cred.): 1) Preparation of qualifying work (4,5 cred.); 2) Defense of qualifying work (1,5 cred.)

II. Selective part

Block 1 "Secondary education (Informatics)", 60 cred.
- Psychology, 4 cred.
- Inclusive education, 4 cred.
- Pedagogy, 3 cred. / 2 cred.
- E-learning technologies, 4 cred.
- Workshop on solving Olympiad problems in computer science, 4 cred.
- Methods of teaching computer science, 3 cred. / 3 cred. / 4 cred.
- Навчальна (психолого-педагогічна) практика, 3 cred.
- Training pedagogical practice, 6 cred.
- Training pedagogical practice, 10,5 cred.
- Attestation (1,5 cred.): complex qualifying exam
- Foreign language (in-depth course): 2 cred. / 2 cred. / 1 cred. / 2 cred. / 1 cred.

Block 2 "Internet of Things", 60 cred.
- Microcontrollers and digital circuitry, 4 cred. / 2 cred.
- Design of embedded systems, 3 cred. / 4 cred.
- Entrepreneurship and StartUp, 3 cred. / 3 cred.
- Robotics, 4 cred.
- Smart technologies, 4 cred. / 4 cred.
- Training practice, 3 cred.
- Production practice, 6 cred.
- Production practice, 12 cred.
- Foreign language (in-depth course): 2 cred. / 2 cred. / 1 cred. / 2 cred. / 1 cred.

Selection from the catalog of subjects, 60 cred.
9 cred. / 8 cred. / 8 cred. / 12 cred. / 11 cred. / 12 cred.

3. Form of certification of applicants for higher education

Certification of graduates of the educational program of specialty 122 "Computer Science" is carried out in the form of defense of qualifying work. Qualification work involves theoretical, systems or experimental research 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 use of theories and methods of information technology.

Qualification work must be checked for academic plagiarism and must be published in the University repository. Certification is carried out openly and publicly.

The implementation of the educational-professional program in full is completed by issuing the graduate with a standard document on awarding him a bachelor's degree with the qualification: Bachelor of Computer Science.

4. Matrix of correspondence of program competences to components of the educational program

	CEC.01	CEC.02	CEC.03	CEC.04	CEC.05	CEC.01	SCF.02	SCF.03	SCF.04	SCF.05	SCF.06	SCF.07	SCF.08	SCF.09	SCF.10	SCF.11	SCF.12	SCF.13	SCF.14	SCF.15	SCF.16	SCF.17	SCF.18	SCF.19	SCF.20	EP.01,02	EP.03	EA.01
GC1					+			+	+									+		+	+		+				+	+
GC 2												+				+	+			+	+		+	+	+	+	+	+
GC 3	+					+	+			+		+	+			+	+				+	+	+	+	+	+		
GC 4				+	+								+											+		+	+	+
GC 5		+											+											+		+	+	+
GC 6	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+			
GC 7	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+
GC 8	+											+				+	+				+	+	+	+		+	+	+
GC 9	+		+										+								+		+	+			+	
GC 10	+											+	+													+		
GC 11												+	+					+	+	+	+			+	+		+	+
GC 12												+	+			+	+			+	+	+	+	+	+	+	+	+
GC 13	+			+																				+				
GC 14	+			+	+																						+	
GC 15	+		+	+																								
SC1								+	+		+			+	+			+	+	+			+					
SC 2														+	+							+		+				
SC 3									+	+	+	+			+				+	+			+	+			+	+
SC 4								+	+		+				+				+	+							+	+
SC 5															+				+	+						+	+	+
SC 6																		+	+	+		+				+	+	+
SC 7											+			+	+			+	+	+								
SC 8										+		+	+				+				+		+			+	+	+

	CEC.01	CEC.02	CEC.03	CEC.04	CEC.05	CEC.01	SCF.02	SCF.03	SCF.04	SCF.05	SCF.06	SCF.07	SCF.08	SCF.09	SCF.10	SCF.11	SCF.12	SCF.13	SCF.14	SCF.15	SCF.16	SCF.17	SCF.18	SCF.19	SCF.20	EP.01,02	EP.03	EA.01
SC 9						+	+			+		+				+						+	+					
SC 10						+						+	+			+						+		+	+	+	+	+
SC 11														+							+		+					
SC 12						+	+			+						+	+									+		
SC 13													+	+								+	+			+		
SC 14													+			+	+					+				+	+	+
SC 15													+							+	+	+						
SC 16						+				+		+			+	+	+						+					
SC 17								+				+	+											+				

5. Matrix for providing program learning outcomes by the relevant components of the educational program

	CEC.01	CEC.02	CEC.03	CEC.04	CEC.05	CEC.01	CEC.02	CEC.03	CEC.04	CEC.05	CEC.06	CEC.07	CEC.08	CEC.09	CEC.10	CEC.11	CEC.12	CEC.13	CEC.14	CEC.15	CEC.16	CEC.17	CEC.18	CEC.19	CEC.20	EP.01,02	EP.03	EA.01
PLO-1	+				+			+	+			+		+	+			+		+	+					+	+	+
PLO -2								+	+			+											+					
PLO -3											+	+		+	+				+									
PLO -4												+											+					
PLO -5									+	+					+				+							+	+	+
PLO -6								+			+	+		+	+													
PLO -7																			+	+								
PLO -8					+	+												+	+	+	+	+		+		+	+	+
PLO -9												+	+			+					+		+	+		+	+	+
PLO -10												+										+				+	+	+
PLO -11			+									+	+										+			+	+	+
PLO -12																					+							
PLO -13					+	+						+				+	+						+	+				
PLO -14												+						+		+							+	+
PLO -15												+				+	+							+		+	+	+
PLO -16					+					+		+		+	+	+							+					
PLO -17								+				+	+										+					
PLO -18	+	+		+								+																
PLO -19			+																									

Annex 1 - ELECTIVE PART OF THE EDUCATIONAL PROGRAM

Students exercise the right to free choice of disciplines provided for in paragraph 15 of the first part of Article 62 of the Law of Ukraine "On Higher Education" at Borys Grinchenko Kyiv University in accordance with the Regulations on the procedure from November 25, 2016, № 642.

1. Elective block 1 "Secondary education (Informatics)"

The student's choice of the block "Secondary Education (Informatics)" creates conditions for the formation of professional competencies within another specialty (014 Secondary Education (Informatics)) in order to deepen program competencies within the main specialty 122 Computer Science, including foreign language, so expanding opportunities for further employment in educational institutions. In particular, graduates who have chosen this unit will be able to work as computer science teachers in secondary schools and vocational schools of various forms of ownership; coaches of clubs, electives; teachers of specialized courses of corporate academies, etc.

As part of the study of the unit, additional certification of higher education seekers in the form of a Comprehensive Qualification Exam is provided.

Bachelors who have met the requirements of the disciplines of the selective block "Secondary Education (Computer Science)", in addition to the qualification "Bachelor of Computer Science" are awarded the professional qualification "Teacher of Informatics". The qualification is recorded in the appendix to the diploma.

To assign the professional qualification "Teacher of Informatics" requires a successful, with a score of not less than 75 points: mastering the competencies formed during the study of disciplines of the sample block SCI.1.01-1.07, the passage of industrial (pedagogical) practice SP.1.02, as well as passing the complex qualification exam SA.1.01; achievement of additional program learning outcomes.

The University has no obligations to assign professional qualifications to students who have not met the conditions for its assignment.

Additional special (professional) competencies	
ASC 1	Ability to use knowledge of psychology, pedagogy, mathematics, computer science, methods of teaching computer science, Ukrainian studies and worldview disciplines to ensure the appropriate level of teaching in accordance with existing curricula, complying with the requirements of the State standard of basic and complete general secondary education
ASC 2	Ability to model and organize the process of teaching computer science; ability to choose the necessary means, forms and methods of organizing the activities of students, including students with special needs, to design and create their own educational products and resources; to introduce modern educational technologies, innovative approaches, advanced pedagogical experience.
ASC 3	The ability to cultivate the cognitive independence of each student, to adhere to a certain methodological approach to the study and analysis of personality, to form an educated personality, prepared for active work in a high-tech society, active and responsible citizen.
Additional program learning outcomes	
APR-1	Be able to plan Informatics training in accordance with current curricula, complying with the requirements of the State standard of basic and complete secondary education, using various organizational forms and means of training, determine the functions, goals and objectives of computer science training, prepare and conduct lessons of various types, including in remote format.
APR-2	Be able to use existing domestic and foreign teaching aids and create new ones, in particular, computer-oriented, to develop computer programs for educational purposes in accordance with the terms of reference, to develop tools for organizing and monitoring knowledge and skills of students.

APR -3	Be able to plan, organize and conduct extracurricular activities, subject groups, school subject competitions, educational work with students, taking into account their age, physiological and psychological characteristics, to conduct successful communication with parents.

Matrices of correspondence of program competencies and learning outcomes to the elective components of block 1

	SCI.1.01	SCI.1.02	SCI.1.03	SCI.1.04	SCI.1.05	SCI.1.06	SCI.1.07	SP.1.01	SP.1.02	SA.01
GC1					+	+			+	
GC 2	+			+	+	+		+	+	+
GC 3				+		+		+	+	+
GC 4	+	+	+		+	+		+	+	+
GC 5						+	+			
GC 6	+	+		+			+			+
GC 7	+				+	+		+		+
GC 8					+	+		+	+	
GC 9	+							+	+	
GC 10	+					+		+	+	
GC 11	+			+		+		+	+	
GC 12				+		+		+	+	+
GC 13	+	+	+	+		+		+	+	
GC 14	+		+						+	
GC 15	+					+		+	+	
SC1										
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										
SC 17				+	+	+		+	+	+
ASC 1	+	+	+	+	+	+		+	+	+
ASC 2	+	+	+	+		+		+	+	+
ASC 3	+	+	+				+		+	

	SCI.1.01	SCI.1.02	SCI.1.03	SCI.1.04	SCI.1.05	SCI.1.06	SCI.1.07	SP.1.01	SP.1.02	SA.01
SP-1					+					
SP-2						+			+	+
SP -3										
SP-4										
SP-5					+	+		+	+	+
SP-6										
SP-7										
SP-8						+			+	+
SP-9				+	+	+		+	+	
SP-10				+		+		+	+	
SP-11				+						
SP-12										
SP-13				+		+		+	+	+
SP-14				+		+			+	
SP-15				+		+		+	+	+
SP-16										
SP-17				+	+	+			+	
ПР-18	+	+	+			+	+	+	+	+
SP-19	+	+						+	+	
APR-1	+		+		+			+	+	+
APR-2	+		+		+	+			+	+
APR-3	+	+	+		+	+			+	

2. Elective block 2 "Internet of Things"

The selective block "Internet of Things" is aimed at deepening the general, in particular, knowledge of a foreign language, and professional competencies within the chosen specialty 122 Computer Science (educational program "Informatics") in the direction of hardware, software, information and organizational support of automation systems for the collection, transmission and processing of information in various fields, their management and integration into information technology and SMART systems using modern microprocessor technology, specialized application software, data processing technologies and communication technologies.

Additional special (professional) competencies	
ASC 1	Ability to design, create and program Internet of Things systems, implement information exchange between such devices, processing and analysis of received data using modern communication and cloud technologies.
ASC 2	Ability to develop software for interaction between consumers and smart devices using appropriate special software (automated modeling and design systems)
ASC 3	Ability to design, create and use information and SMART-technologies to create a comfortable, efficient and safe public space; readiness to start and build your business on the basis of innovative technologies.
Additional program learning outcomes	
APR-1	Be able to design, build, program simple electromechanical and robotic microprocessor systems to perform various tasks, including their integration into the SMART-space.
APR -2	Be able to design Internet of Things systems, develop their software using modern computer-aided design systems; implement information exchange, data storage and management using the main types of interfaces and network protocols used in Internet of Things devices.
APR -3	Know modern trends in business and business organization; be able to conduct market analysis, business planning, assessment of resources (technical, financial, human) and threats in the organization of their own business; carry out effective business communication and project team management.

Matrices of correspondence of program competencies and learning outcomes to the elective components of block 2

	ВДС.2.01	ВДС.2.02	ВДС.2.03	ВДС.2.04	ВДС.2.05	ВДС.2.06	ВП.2.01	ВП.2.02
GC1	+		+		+			+
GC 2		+	+	+	+			+
GC 3		+	+	+	+		+	+
GC 4				+	+		+	+
GC 5				+	+	+	+	+
GC 6	+	+	+	+	+	+	+	+
GC 7	+			+	+		+	+
GC 8		+		+	+		+	+
GC 9				+			+	+
GC 10		+		+	+		+	+
GC 11		+	+	+	+			+
GC 12				+	+		+	+

	ВДС.2.01	ВДС.2.02	ВДС.2.03	ВДС.2.04	ВДС.2.05	ВДС.2.06	ВП.2.01	ВП.2.02
SP-1					+		+	+
SP-2	+	+			+			
SP-3		+		+	+			+
SP-4		+			+			+
SP-5		+	+		+			+
SP-6		+	+		+			+
SP-7				+	+		+	+
SP-8		+		+	+		+	+
SP-9	+	+	+		+			+
SP-10		+			+			+
SP-11		+		+	+		+	+
SP-12					+			+

	ВДС.2.01	ВДС.2.02	ВДС.2.03	ВДС.2.04	ВДС.2.05	ВДС.2.06	ВП.2.01	ВП.2.02
GC 13			+	+	+		+	+
GC 14				+	+			
GC 15				+				
SC1		+	+		+			+
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		+			+			+
CK17		+	+		+		+	+
ASC 1	+	+	+		+		+	+
ASC 2	+	+	+		+	+	+	+
ASC 3				+	+	+	+	+

	ВДС.2.01	ВДС.2.02	ВДС.2.03	ВДС.2.04	ВДС.2.05	ВДС.2.06	ВП.2.01	ВП.2.02
SP-13	+	+	+		+		+	+
SP-14		+		+	+			+
SP-15		+			+		+	+
SP-16		+			+			+
SP-17		+	+		+		+	+
SP-18		+		+	+	+	+	+
SP-19				+			+	+
APR-1	+	+	+			+	+	+
APR-2	+	+	+		+	+	+	+
APR-3				+	+	+		+

3. Elective block 3 "Selection from the catalog of courses"

The choice of disciplines from the catalog of courses taking into account own needs and interests concerning the future professional activity allows the student to deepen the knowledge and to get additional general and general professional competences within related specialties and branches of knowledge and / or to get acquainted with a modern level of scientific researches. areas of knowledge and expand or deepen knowledge in general competencies.