BORYS GRINCHENKO KYIV UNIVERSITY

«APPROVED»
Decision of the Academic Board of
Borys Grinchenko Kyiv University
April 25, 2019, Protocol No. 4

Chief of the Academic Board, Rector
Viktor Ogneviuk

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(signature)

PROGRAMME OF STUDY (VOCATIONAL)

122.00.02 Information and Analytical Systems

The second (Master's) level of higher education

Field of Knowledge:	12 Information Technology
Specialty:	122 Computer Science

Enacted since September 1, 2019
(Order No. 295, dated April 25, 2019)

Kyiv – 2019

LETTER OF APPROVAL
Programme of Study (Vocational)

Chair of Computer Science and Mathematics
Protocol No. 3 from February 27, 2019

Head of the Chair _____ Oksana Lytvyn

Academic Council of the Faculty of Information Technology and Management
Protocol No. 4 from April 17, 2019

Head of the Academic Council _____ Alla Mykhatska

Scientific and Methodological Centre of Standardization and Quality of Education

Head_____ Olha Leontieva
April 24, 2019

Vice-Rector on Academic Affairs

_____ Oleksii Zhyltsov
April 24, 2019

PREAMBLE

The programme of study (vocational) complies with the Law of Ukraine "On Higher Education" and the Draft of the Standard for Higher Education of Ukraine in the field of knowledge of specialty 122 Computer Science for Level Two (Master) of higher education.

It is drafted by the project group consisting of:

The Head of the project group:
Oleksandr Bushma, Doctor of Technical Sciences,
Professor of the Chair of Computer Science and
Mathematics, Borys Grinchenko Kyiv University

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The members of the project group:
Iryna Mashkina, PhD in Technical Sciences, Associate Professor,
Associate Professor of the Chair of Computer Science and
Mathematics, Borys Grinchenko Kyiv University

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Tetyana Nosenko, PhD in Technical Sciences, Associate Professor, Associate Professor of the Chair of Computer Science and
Mathematics, Borys Grinchenko Kyiv University

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External Reviewers:

1. Acting on behalf of **Scientific-methodical subcommission 122-1 Computer Sciences of the Ministry of Education and Science of Ukraine** – *Tetiana Kovaliuk*, PhD in Technical Sciences, Associate Professor of the Chair of Automated Systems of Information Processing and Management at National Technical University of Ukraine «Igor Sikorsky Kyiv Polytechnic Institute»
2. *Volodymyr Ivanov*, Director of the Limited Liability Company "ART Consulting" (activity: 62.01 Computer Programming).

The programme of study (vocational) is implemented in 2019.
The programme of study (vocational) is to be reviewed every five years.

Actualized:

Date of Review of the PS /Amendments to PS	August 29, 2019		
Signature			
PS Guarantor			

I. Profile of the Programme of Study (Vocational)

Specialty 122 «Computer Sciences»

1 – General information	
The full name of the higher education institution and the structural unit	Borys Grinchenko Kyiv University Faculty of Information Technologies and Management
Degree of higher education Educational qualification	Master Master of Computer Sciences
Official name of the programme of study	122.00.02 122.00.02 Information and Analytical Systems
Type of diploma and term of study according to the programme	90 credits ECTS Master's degree, unitary term of study: 1 year 4 months
Availability of accreditation	Implemented in 2019
Cycle / Level	Level Two (Master) / FQ-EHEA – Cycle II, EQF LLL – Level 7, the National Qualification Framework of Ukraine – Level 7
The education level required to commence study under the programme	Level One (Bachelor) of higher education or the Specialist degree
Language (s) of teaching	Ukrainian
Validity of the programme of study	2024
Internet address of the permanent placement of the description of the programme of study	kubg.edu.ua/

2 – The purpose of the Programme of Study (vocational)
To provide students with the fundamental theoretical and practical training for acquiring the ability to perform professional tasks and responsibilities of research and innovation in the fields of modern computer science, pedagogy and methodology of higher education, and the ability to independently carry out scientific and pedagogical activities.

3 – Characteristics of Educational Program	
Subject area	*Objects of study and /or activity:* - Principles of functioning, cooperation and development of large systems, methods for studying systems of varying complexity and purposes, practical recommendations for their use; - principles and methods of modeling complex systems and processes, modern software products for constructing models; - models, methods and methods of information-analytical activity, special information-analytical systems and SMART-technologies that provide sub-decision-making in the process of organizational management; - concepts of design, construction and operation of a Smart City, including computer systems for urban monitoring; - regularities of the functioning of the psyche of the student as a subject of training and professional activity, the specifics of the teacher's scientific and pedagogical activity, the teaching staff training of higher qualification, the form of organization of educational and educational processes in higher education institutions;

	- concepts, theories, methods and methodologies of teaching of informatics disciplines in the system of higher education. *Training objectives*: formation of higher education students understanding of fundamental problems of informatics, a complex of knowledge, skills and abilities for use in professional activities in the field of computer sciences and information technologies, computer modeling and designing, system analysis, and the solution of applied problems. *The theoretical content of the subject area is* the basic notions and positions of the theory of systems and methods of system analysis; modern models and methods of production and management of information-analytical systems and processes; concept and provisions of the theory of intellectual analysis of large data; concepts of didactics, pedagogical technologies, laws and regularities of pedagogical process management in higher educational institutions, teaching methods of professional disciplines. *Methods and technologies:* methods of computer modeling, prediction of properties and behavior of mathematical models on the basis of empirical data; methodology of abstract thinking, analysis and synthesis; methods of scientific research; information, hardware, software and communication technologies. *Tools and equipment:* simulation, design, analysis of information systems, computer networks, cloud technologies, database management systems, operating systems, production environments and software development. *The proportion of the volumes of the general and professional components and optional parts.* Mandatory part (67 credits, 74.5%): – general and special (professional) competencies for the speciality (53 ECTS credits, 1590 hours, 2-nd year – practice hours); – cycle of pedagogical training disciplines (14 ECTS credits, 420 hours, 2-nd year – practice hours). Optional part (23 credits, 25,5 %). *Field practice share:*: 15 ECTS credits (16,7 %)
Orientation of the Programme of Study	The Programme of Study (Vocational) includes in-depth basic, special and scientific-practical training taking into account today's state of information technologies, focuses on the actual directions within which further professional and scientific careers are possible: informational and analytical systems; computer simulation, forecasting, analysis and visualization; URBAN -information; e-government.
The main focus of the Programme of Study	Fundamental education in the field of "Computer Science"; psychological and pedagogical and methodical preparation for pedagogical activity in high school.
Specific features of the Programme	- the programme includes the newest disciplines aimed at studying and managing the modern methods, technologies and means of modeling and analyzing informational processes in the society; - the programme provides for theoretical and practical study of basic disciplines in the field of teaching methods in higher education (computer science), including production assistant practice.
4 – Eligibility of graduates to employment and further studying	
Employment	Jobs in educational institutions, research institutions, in public and private institutions and non-governmental associations: specialist in the design, implementation and operation of special information-analytical and monitoring systems, specialist in computer modeling, forecasting, optimization of economic or social processes, teacher of disciplines of computer science, researcher, computer science consultant, head (assistant to the head) of the enterprise (institution, organization). According to the National Classification of Professions ДК 003: 2010, graduates who have completed training according to the Programme may hold the following primary positions:

	2131.2 Developers of Computing Systems 2131.2 System Administrator 2131.2 Analyst of Computer Systems 2131.2 Designer of Computer Systems 2310 Teachers of Universities and Higher Education Institutions	
Further learning	The learner with Master's degree can continue training to get the third (educational and scientific) level of higher education, as well as improve qualifications and receive additional postgraduate education.	
5 – Teaching and Assessment		
Teaching and learning	Student-centered learning and individual-personality approach; are realized through studies based on research, strengthening of practical orientation and creative orientation in the form of a combination of lectures, practical classes, independent study and research work using the elements of distance learning, solving applied tasks, implementing projects, production practices, qualification master's work.	
Assessment	Cumulative rating system, which involves student evaluation for all types of classroom and non-classroom educational activities: current, modular, final control; written examinations, testing, laboratory reports, presentations, credits, practice reports, qualification master's work.	
6 – Programme competencies		
Integral competence	Ability to solve complex specialized problems and practical problems in the field of computer sciences or in the process of learning that involves the application of theories and methods of computer science, information technology and is characterized by complexity and uncertainty of the conditions.	
General competencies (GC)	**GC -1**	***Ability to solve complex problems.*** Ability to reveal the scientific essence of problems in the professional sphere, to find adequate ways of their solution; the knowledge of a system, a holistic approach to the analysis and assessment of the situation.
	GC -2	***Critical thinking.*** Ability to analyze, verify, evaluate the completeness and reliability of information in the course of professional activity, if necessary, to supplement and synthesize missing information**.**
	GC -3	***Creativity.*** Openness to new knowledge, ideas and technologies; the ability to produce non-standard ideas, approaches, deviate from traditional problem-solving schemes; ability to innovate.
	GC -4	***Staff management.*** Ability to take initiative and carry out leadership functions in the team in order to achieve a common goal; ability to manage projects, organize team work, set goals, evaluate and ensure the effectiveness of teamwork; to manage the strategic development of the team in the process of professional activity.
	GC -5	***Coordination with others.*** Ability and willingness to carry out collective projects, assume responsibility for the work of a separate group; ability to conduct a discussion, arguing for his point of view; the ability to communicate their own knowledge, substantiation and conclusions to the specialists and the general public.
	GC -6	***Conducting negotiations.*** Ability to communicate in Ukrainian and foreign languages with representatives of other professional groups of different levels (with experts from other fields of knowledge / types of economic activity, customers, auditors of certification bodies, etc.); skills of effective use of modern communication technologies.
	GC -7	***Emotional intelligence.*** Understanding your own emotional state, self-control and self-regulation; self-esteem and confidence; ability to overcome difficulties, resistance to stress; general optimistic mood, initiative, adjustment to a positive result.

	GC -8	***Cognitive Flexibility.*** Ability to acquire new knowledge, skills and integrate them with existing ones; independent development of new methods of research, changes in the scientific and production profile of their activities.
	GC -9	***Customer Orientated Approach.*** Ability to communicate effectively with the customer, formulate a technical task, develop a plan for its implementation, present the results of work and substantiate the proposed solutions at the modern scientific, technical and professional level.
	GC -10	***Making judgments and making decisions.*** The ability to navigate in different perspectives on the problem, to form their own opinion; be able to formulate the task, reasonably choose the best ways to solve, analyze and comprehend the resulting solution.
Professional competencies (PC)	**PC -1**	The ability to evaluate, analyse and effectively use the methods, technologies and tools of informatics in all spheres of public life; understanding the main areas of further development of computer science and information technologies.
	PC -2	The ability to reasonably choose methods and approaches to solving theoretical and applied problems in the field of computer sciences, interpretation of the results.
	PC -3	The ability to formulate and explore mathematical models of systems and processes, develop adequate computer models and algorithms for solving professional problems with the use of modern technologies and tools.
	PC -4	The ability to organize computational processes and management in information-analytical systems of different purposes, taking into account their architecture, configuration, software and organizational structure.
	PC -5	The ability to extract knowledge by integrating and analyzing large data from diverse and diverse sources of information; to design and program to implement methods and algorithms of computer processing and analysis of large volumes of data in information environments of different purposes.
	PC -6	The ability to apply modern information and computer technologies, including SMART, for the development of city infrastructure (systems for monitoring, analyzing and control processes, embedded and distributed applications, specialized Internet of things systems, etc.).
	PC -7	The ability to introduce and accompany the use of digital technologies in the management of public and private organizations, educational institutions, e-government.
	PC -8	The ability to prepare applications for inventions and utility models in the IT industry, organize work on the implementation of author's supervision in the development, debugging, testing and delivery of the software product to the customer, provide protection and assessment of the cost of intellectual property, participate in the consideration of various technical documentation, to prepare the necessary reviews, reviews, conclusions.
	PC -9	Possession of a complex of knowledge, skills and other competences that provides the ability to organize and conduct qualitative studies and educational work in higher education institutions.
	PC -10	The ability to apply the latest educational technologies in professional activity, readiness and ability through self-education, studying positive experience to improve their pedagogical skills.
7 – Program learning outcomes		
Knowledge and understanding	**PLOk -1**	basic concepts and provisions of the theory of systems; principles, methods, structure of system analysis; factors, operations, system analysis functions.
	PLOk -2	existing methodologies, technologies and means of modeling, analysis, optimization and forecasting of information processes in society and the principles of their rational use.
	PLOk -3	principles and means of collecting, systematizing, generalizing social and economic information, technologies and analytical tools; theoretical foundations for the construction of information and analytical systems for the

		creation of an integrated corporate information system for economic or other purposes.
	PLOk -4	mathematical bases of extraction and intellectual analysis of large data of various nature and basic algorithms for their implementation.
	PLOk -5	principles and means of obtaining reliable environmental information with minimal impact on it, transmission technology, accumulation and processing of real-time digital data for monitoring systems.
	PLOk -6	general principles, methods and technologies of informational and analytical support of public administration, including e-government systems, approaches to their implementation, evaluation and support.
	PLOk -7	normative base in the field of protection of intellectual property in the field of information technologies, principles of legal support for the introduction of information systems and software (including software development, search engine optimization, provision of services in electronic format, etc.).
	PLOk -8	competent construction of communication in the educational and scientific process, professional activity (in Ukrainian and foreign languages).
	PLOk -9	the principles of didactics of teaching of professional disciplines, methods, methods and means of organizing students' educational activities, scientific, educational and organizational work at a higher educational institution.
	PLOk -10	science-learning conceptual apparatus, methodology, methods, forms of scientific research, requirements and rules of scientific publications, ethical aspects of scientific research.
Skills	**PLOs -1**	to select and apply appropriate analytical, computational and experimental methods for solving professional problems, to process and systematise information, to interpret results.
	PLOs -2	effectively use modern mathematical apparatus in professional activity, to design, develop and analyse models and algorithms of information processes in systems, to evaluate their adequacy, efficiency, complexity, solvability.
	PLOs -3	use software tools for the design and operation of information and analytical systems, design and implement modules of systems of different levels.
	PLOs -4	design, build and provide efficient working regimes for robotic and microcontroller computer systems and SMART-technologies for the development of urban infrastructure, social services, etc.
	PLOs -5	to create and operate information systems that ensure the functioning of government bodies in electronic format and their communication with citisens, legal entities, non-governmental organisations; to evaluate and analyze the state of the developed e-government systems.
	PLOs -6	to prepare applications for inventions and utility models in the IT industry, to protect and evaluate the cost of intellectual property, to participate in the consideration of various technical documentation, to prepare the necessary reviews, feedback, conclusions.
	PLOs -7	to plan the teaching of informatics disciplines using various organizational forms and means of training, to define the functions, purpose and tasks of teaching at a higher educational institution, to prepare and conduct classes of various types and forms.
	PLOs -8	to create and use didactic and methodical means, in particular computer-oriented, to develop computer training programmes according to the set of technical requirements.
	PLOs -9	to plan, organise and conduct educational work, student scientific circles; to analyze situations concerning solving educational problems in different contexts.
	PLOs -10	to speak in oral and written way in native and foreign languages in scientific, industrial and social-social spheres of professional activities.

8 – Resource support for the implementation of the Programme	
Personnel	The head of the project group and the teaching staff, which ensures its implementation, meets the requirements specified by the Licensing Conditions for the educational activities of educational institutions. The maintenance of the programme of study is carried out by the teaching staff of the Department of Computer Science and Mathematics of the Faculty of Information Technology and Management. The practice-oriented nature of the programme of study involves the broad participation of practitioners that are relevant to the direction of the program.
Material and technical support	Computer classes and competence centers are specially equipped with hardware software, visual and methodological materials, namely: the laboratory of embedded systems and 3D modeling, the center of modeling and programming, the center of educational technologies, the computer laboratory networks.
Information, educational and methodological support	Library electronic resources, electronic scientific editions, electronic training courses with the possibility of distance learning and independent work, cloud services.
9 – Academic mobility	
National Credit Mobility	
International Credit Mobility	The Regulations on the procedure for exercising the right to academic mobility of the participants of the educational process of the University were put into effect by order dated September 30, 2016. Agreements were envisaged that stipulate student mobility with universities of European countries and within the framework of the Erasmus + CA1 program. Among them are the University of Vilnius (Lithuania), the University of Constantine Philosopher in Nitri (Slovakia), the University of Extremadura (Spain), the Silesian University in Katowice (Poland), the Jan Długosz Academy in Częstochowa (Poland), the University of Ostrava (Czech Republic), the University of Lisbon (Portugal) and others.
Studying of foreign higher education learners	According to the license, preparation of foreigners and stateless persons is envisaged.

II. The List of Components of the Programme of Study (Vocational) Information and Analytical Systems and their Logical Coherence

2.1. List of the PS Components

	Component Code	Components of the Programme of Study (Vocational) (academic disciplines, course papers, practices, degree papers)	Number of credits	Form of assessment
	1	2	3	4
Compulsory components of PS				
Educational disciplines				
EC 1	CSP.01	Professional Foreign Language	5	credit
EC 2	CSP.02	Intellectual Property in the IT Sector	4	exam
EC 3	CSP.03	Theory of Systems and Systemic Analysis	4	credit
EC 4	CSP.04	Modelling of Systems and Processes	4	exam
EC 5	CSP.05	Information and Analytical Systems. SMART-technologies	5	exam
EC 6	CSP.06	Big Data Analysis and Processing	6	exam
EC 7	CSP.07	Computer Systems for URBAN-Monitoring	5	exam
EC 8	CSP.08	Digital Technology for Communication and Management	5	credit
EC 9	CSP.09	Teaching at Higher School	8	exam
		Pedagogy and Psychology of Higher School Methodology of teaching of professional disciplines	4 4	
	Total amount of the compulsory components:		*46*	
Practice				
EC 10	CSP.01	Field (assistance)	6	credit
EC 11	CSP.02	Pre-diploma practice	9	credit
	Total amount of practice		*15*	-
Attestation				
EC 12	CSP.1	Preparation of Master‘s Degree Paper	4,5	
		Master’s Degree Paper Defense	1,5	
Total amount of the compulsory components			**67**	
Optional components of the PS				
Choice from the Catalogue of Courses (students choose academic disciplines to get the certain amount of credits)				
	Total		23	credits
Total amount of the optional components			**23**	
TOTAL AMOUNT OF THE PROGRAMME OF STUDY			**90**	

2.2. Structural Logical Scheme of the Programme of Study (Vocational)

SEMESTER I 30 ECTS Credits	SEMESTER II 34,5 ECTS Credits	SEMESTER III 25,5 ECTS Credits
Professional Foreign Language 5 ECTS Credits	Big Data Analysis and Processing 6 ECTS Credits	Choice from the Catalogue of Courses 9 ECTS Credits
Intellectual Property in the IT Sector 4 ECTS Credits	Computer Systems for URBAN-Monitoring 5 ECTS Credits	Field (assistance) 6 ECTS Credits
Theory of Systems and Systemic Analysis 4 ECTS Credits	Digital Technology for Communication and Management 5 ECTS Credits	Pre-diploma practice 9 ECTS Credits
Modelling of Systems and Processes 4 ECTS Credits	Teaching at Higher School 8 ECTS Credits	**Attestation** 1,5 ECTS Credits Master Degree Paper Defense
Information and Analytical Systems 5 ECTS Credits	Pedagogy and Psychology of Higher School 4 ECTS Credits	
Choice from the Catalogue of Courses 8 ECTS Credits	Methodology of teaching of professional disciplines 4 ECTS Credits	
	Choice from the Catalogue of Courses 6 ECTS Credits	
	Preparation of Master Degree Paper 4,5 ECTS Credits	

III. Form of Attestation of Higher Educational Learners

The graduate students majoring in Speciality 122 "Computer Science" get attestation in the form of degree paper defense. The attestation results in issuing them the document of the state standard issued to confirm that they are awarded with the degree and education qualification of Master of Computer Science

The attestation is performed openly and publicly.

IV. Matrix ofcorrespondence of Programme Competence to Programme Components

	EC 1	EC 2	EC 3	EC 4	EC 5	EC 6	EC 7	EC 8	EC 9-1	EC 9-2	EC 10	EC 11	EC 12
GC1			+	+	+	+	+	+	+	+	+	+	+
GC 2			+		+	+						+	+
GC 3	+		+		+	+	+		+	+	+	+	+
GC 4					+			+	+		+	+	
GC 5	+				+		+	+	+				
GC 6	+							+				+	
GC 7									+		+	+	
GC 8		+	+	+	+	+	+	+	+	+	+	+	+
GC 9	+	+			+		+	+				+	
GC 10		+	+	+	+	+	+	+	+	+	+	+	+
PC1	+	+	+		+			+				+	+
PC 2			+	+				+					
PC 3				+	+							+	+
PC 4				+	+		+	+				+	+
PC 5			+			+	+						+
PC6					+	+	+					+	+
PC 7					+			+		+	+	+	+
PC 8	+	+			+							+	
PC 9	+								+	+	+		+
PC 10	+								+	+	+		+

V. The matrix of correspondence of Educational Program results to the relevant components of the curriculum

	EC 1	EC 2	EC 3	EC 4	EC 5	EC 6	EC 7	EC 8	EC 9-1	EC 9-2	EC 10	EC 11	EC 12
PRk-1			+	+									
PRk -2				+	+	+		+				+	
PRk -3		+			+			+				+	+
PRk -4			+			+	+						+
PRk -5		+				+	+					+	+
PRk -6					+			+				+	+
PRk -7		+			+		+						
PRk -8	+							+	+	+	+	+	
PRk -9	+								+	+	+		+
PRk-10	+	+										+	+
PLOs -1			+	+	+	+	+					+	+
PLOs -2			+	+	+	+						+	+
PLOs -3			+	+	+							+	+
PLOs -4					+	+	+	+				+	+
PLOs -5					+	+		+				+	
PLOs -6	+	+										+	
PLOs -7									+	+	+		+
PLOs -8		+							+	+	+		+
PLOs -9									+	+	+		
PLOs -10	+											+	