BORYS GRINCHENKO KYIV UNIVERSITY

«APPROVED»

Decision of the Academic Council
Borys Grinchenko Kyiv University

23 March 2017, Protocol No.3

The Head of the Academic Council, Rector
Victor Ogneviuk

PROGRAMME OF STUDY

122.00.01 Informatics

Field of knowledge: **12 Information Technology**

Speciality: **122 Computer science**

Qualifications**:** **Bachelor of Computer Science**

Enacted since 01 September 2017
(Order No 348, 16 May 2017)

Kyiv – 2017

LETTER OF APPROVAL
Programme of Study

The Chair of Information Technology and Mathematical Disciplines

Protocol No. 1, 10 January 2017

The Head of the Chair _____ Oksana Lytvyn

The Academic Council of the Faculty of Information Technology and Management

Protocol No. 6, 15 March 2017

The Head of the Academic Council _____ Alla Mykhatska

The Head of the SMC of Standardization

and Quality Education _____ Olha Leontieva

___ _____ 2017

Vice-Rector on Scientific-Methodical

and Academic Affairs _____ Oleksii Zhyltsov

___ _____ 2017

SRL Education Internationalization

The Head _____ Olha Vyhovska

___ _____ 2017

Vice-Rector for Research

_____ Nataliia Vinnikova

___ _____ 2017

Preamble

The Standard of Higher Education is absent. It complies with the interim standard of Borys Grinchenko Kyiv University before to introduction officially approved Standard of Higher Education.

Developed by project group:

The Head of the Project Group (Guarantor of the Programme of Study):

Iryna Mashkina, PhD in Technical Sciences, Associate Professor, Associate Professor of the Chair of Information Technology and Mathematical Disciplines, Borys Grinchenko Kyiv University _____

The members of the Project Group:

Oleksandr Bushma, Doctor of Technical Sciences, Professor, Professor of the Chair of Information Technology and Mathematical Disciplines, Borys Grinchenko Kyiv University _____

Vladyslav Yaskevich, PhD in Technical Sciences, Associate Professor of the Chair of Information Technology and Mathematical Disciplines, Borys Grinchenko Kyiv University _____

Reviewers:

1. Valentyn Bagatskyi, Doctor of Technical Sciences, Professor, Leading Researcher of Glushkov Institute of Cybernetics of NAS of Ukraine
2. Oleksandr Radchuk, the Head of projects and programmes of the Education Department in Information Technology, BIONIC University.

Actualized:

Date of Review of the PS / Amendments to PS			
Signature: ____			

1. PROFILE OF THE PROGRAMME OF STUDY

Specialty: 122 Computer Science

(specialization: Programming/ Internet of Things)

1- General Information	
The full name of the higher education institution and the structural unit	Borys Grinchenko Kyiv University Faculty of Information Technology and Management
Degree of higher education and the name of qualification on the original language	Bachelor Bachelor of Computer Science
Official name of the programme of study	122.00.01 Informatics
Type of diploma and term of study according to the programme	Bachelor degree, unitary, 240 credits ECTS, term of study: 3 years 10 months
Availability of accreditation	Introduction in 2017
Cycle / Level	Level One (Bachelor)/ FQ-EHEA – cycle One, EQF LLL – level 6, HPK – level 7
Requirements:	Complete secondary education
Language (s) of teaching	Ukrainian
Validity of the programme of study	2022
Internet address of the permanent placement of the description of the programme of study	http://kubg.edu.ua
2 - The purpose of the programme of study	
- To prepare specialists who have the fundamental and professional knowledge and practical skills of work in Informatics and Information Technology with a special interest to special directions (Programming and Internet of Thing); - To prepare students to educational, scientific, methodical and organizational activity as teachers of Informatics in secondary school.	
3 - Characteristics of the programme of study	
Subject area	*Objects of study and/or activity:* - mathematical, information, simulation models of real actions, objects, systems, processes, data and knowledge provision; - models, methods, technologies for receiving, storing, processing and using information; - theory, analysis, development and evaluation of efficiency of

	algorithms and their software implementation; - methods and algorithms of operative multi-dimensional and intellectual analysis of data, development of intellectual systems, based on knowledge and technologies of accepting solutions; - high-productive computing, including parallel computing and big data; - information, technical and software of systems for different purposes; - models of subject areas and design methods and development of software of computer systems (*for specialization «Programming»)*; - mathematical, technical, program, information and organizational providing of the automation systems for collecting, transmitting and processing information in different fields and objects of automation, managing them and integration in information and technical systems with using modern microprocessor technology, special application software communications technology (*for specialization* «Internet of Things». *Learning objectives*: possessions of methodology and the achievements of physical and mathematical and applied science, implementation of mathematical bases, algorithmic principles in modeling, designing, development and following the hardware software of information systems, including intellectual systems of analysis and processing data; development new and improving existing systems in the field of Internet of Thing. *The theoretical content of the subject area:* modern models, methods, algorithms, technologies, processes and ways of receiving, representation, processing, analyzing, transmitting and collecting data in the information systems with the purpose their systematization and identification of necessary facts of information character. *Methods, techniques and technologies:* methods of mathematical modeling, computing of parameters, predicting of properties and behavior of the mathematical models on the base of empirical data; analysis of mathematical objects and structures; methodology of abstract thinking, analysis and synthesis; methods of scientific researches, methods of algebra, geometry, mathematical analysis, discrete mathematics, differential equations, probability theory and mathematical statistic, computing mathematics; information, hardware, software and communication technologies. *Instruments and equipment:* technologies of modeling and designing of information systems; distributed computing systems; computer networks; cloud technologies; database management systems; operating systems; environment of designing and software development; microprocessor embedded systems. *The proportion of the volumes of the general and professional components and optional parts:* <u>Obligatory part (180 credits, 75%)</u> - cycle of humanitarian training (28 credits ECTS, 840 hours);

	- cycle of disciplines of the nature and scientific (fundamental) training (38 credits ECTS, 1140 hours); - cycle of professional and practical training (73 credits ECTS, 2190 hours with writing of the course work on 2 study years, practical training on 1,2,4 study years); - cycle of disciplines of pedagogical training (41 credits ECTS, 2140 hours, with writing of the course work on 3 study year, practical training on 3,4 study years); Optional part – (60 credits, 25%): free choice disciplines/specialization; *Field academic and work practice share:* 60 credits ECTS (25%)
Orientation of the programme of study	Academic and professional programme with applied direction on the choice of specialization: Programming and Internet of Thing. The programme provides for the acquaintance with: - modern methods of effective access to information, its collection, systematization, storage and protection; - main paradigms for designing and developing of programme products and hard software for computerized system, including embedded system; - designing and administrating of computer networks, main protocols of the Internet; - designing and creating information and intellectual systems; - computer graphics, Web-design; - purposes and values of the general education in Informatics, traditional and innovative educational technologies of modern pedagogical science; - modern methodology of studying of Informatics in the school.
The main focus of the programme of study	general education in the field «Computer Science»; psychological and pedagogical training and developing knowledge, skills, other competences in the methods of teaching Computer Science at school. Additional specializations on choice: Programming / Internet of Things
Specific features of the programme	- the programme provides for the basic training in the field of Informatics with in-depth study within the chosen specialization; - the programme provides for theoretical and practical learning of main disciplines in the field of secondary education (Informatics), including academic and work pedagogical practice.
4 - Eligibility of graduates to employment and further studying	
Eligibility to employment	Graduates have an opportunity to work in the public and private IT-companies of Kyiv, Ukraine and European Union in these activity spheres: designing and development of the programme products, administrating of the computer networks, designing and creation information and intellectual systems, computer graphics, Web-design, development of built-in automated systems, tasting of software and systems of Internet of Thing, support of scientific researches, pedagogical activity. Graduates can work for the professions according to the National Classification of Professions ДК 003: 2010: 2131.2 – database administrator;

	2131.2 – data administrator; 2131.2 – access administrator; 2131.2 – system administrator 2131.2 – engineer on computer software; 2131.2 – engineer on automated systems of manufacture managing; 2132.2 – engineer-programmer; 2132.2 – programmer (data); 2132.2 – applied programmer; 2139.2 – computer application engineer; 2320 – teacher of secondary school; 3121.2 – specialist on development and testing of software; 3121.2 – specialist on development of computer programmes;	
Further learning	The opportunity to get education on the second (master) level for the master programmes in Computer Science, Information Technology, education (secondary and higher), interdisciplinary Master Programmes with IT component.	
5 – Teaching and assessment		
Teaching and studying	Based on the principles of sudent-centrism, individual and personal approach; they are implemented through studying on the base of researches, strengthening the practical orientation and creative direction in the form of combination of lectures, practical classes, independent, academic and research work, with using elements of distance learning, solving applied exercises, carry out projects, academic and work practices, course papers.	
Assessment	The accumulative ball-rating system, that provides for assessment of students for all kinds of classroom and extracurricular academic activity: current, modular and final controls; written examinations, testing, laboratory reports, presentations, tests, reports on practice, course work, complex examinations.	
6 - Programme competencies		
Integral competence	Abilities to solve complex specialized tasks and practical problems in the field of Computer Science or during the studying, that provides for implementation of the theories and methods of Computer Science, Information Technology, and it is characterized by complexity and uncertainty of conditions.	
General competence (GK)	**GK 1**	***The ability to solve problem comprehensively***. Understanding a current task; the ability to penetrate into the essence of process, problem, task, to reveal necessary characteristics, essential features, interconnections, to conduct analogues, to generalize, possession of a systematic, holistic approach to analysis and assessment of the situation and solution of the problem.
	GK 2	***Critical thinking.*** The ability to assess critically the received information, using of logic and rational considerations, full argumentation for assessment of the situation and accuracy chosen way of solving the tasks including the context.
	GK 3	***Creativity.*** Openness to new knowledge, ideas and technologies; the ability to produce non-standard

		ideas, approaches, to deviate from traditional problem-solving schemes.
	GK 4	***Management skills.*** The ability to organize your own activity and provide leadership functions in the group to achieve common goal; the ability to develop and manage the projects, set goals, take and implement decisions.
	GK 5	***Coordination with others.*** The ability and willingness to carry out the projects as one part of the group, to take responsibility for carrying out common works, skill of leading discussion, responsibly arguing your own opinion.
	GK 6	***Negotiating***. The ability to written and oral communications in the Ukrainian language and at least one of common European languages; the ability to express your opinion clearly, to be convincing, interpersonal skills, the ability to use effectively modern communication technologies.
	GK 7	***Emotional intelligence.*** Awareness of your own emotional state, self-control and self-regulation; self-respect and confidence; stress tolerance; general optimistic mood.
	GK 8	***Cognitive flexibility.*** The ability to acquire new knowledge and skills, integrate them with the existing ones; openness to apply knowledge in the wide range of possible work places in the everyday life, as well as for solving non-standard tasks; the ability to quickly switch from one thought to another.
	GK 9	***Client-orientation***. The ability to communicate effectively with the customer, to formulate a technical task, to develop the plan of its implementation, to assess and ensure the quality of done works, to represent the results of the work and justify the proposed solutions on the modern scientific, technical and professional level.
	GK 10	***Comparing judgments and making decisions.*** The ability to orientate in different views on the problem, to shape your own opinion, to be able to formulate the task, to choose responsibly the optimal solutions, to analyze and realize obtained result.
	GK 11	***World view and civic position.*** The ability to orientate in different views on the world and on your own part as professional in it, the ability to shape your own world view position; to realize social and cultural differences, to show tolerance to different cultures; understanding the principles of socio-political, cultural and economic development of Ukraine in the world community, realizing your own professional, social, civic role in these processes.
Professional competences of specialty (PC)	**PC 1**	The ability to mathematical and abstract thinking, formulating and researching of mathematical models, justification of the choice of methods and approaches for solving theoretical and applied tasks in the field of

		Computer Science, interpretation of the received results.
	PC 2	The ability to develop logical result, to use formal languages and models of algorithmic computing, designing, development and analysis of algorithms, assessment of their efficiency and complexity, solvability and insolvability of the algorithmic problems.
	PC 3	The ability to master modern technologies of the mathematic modeling of objects, processes and events, to develop computational models and algorithms of numeral solution of the tasks of mathematic modelling, taking into account errors of approximate numerical solution of professional tasks.
	PC 4	The ability to design and develop software, using different paradigms of the programming: structural, object-oriented, functional, logic, with appropriate models, methods and computing algorithms, data structures and control mechanisms.
	PC 5	The ability to organize computing processes in the information systems of different purposes, taking into account architecture, configuration, resultative indicators of operating system work and system software.
	PC 6	The ability to organize, configure and manage computer networks of different topologies, using network software.
	PC 7	The ability to apply methods and techniques of ensuring information security, to use special software of security of information resources.
	PC 8	The ability to implement high-efficiency computing on the base of cloud services and technologies, parallel and distributed computing during the development and operation of distributed systems of parallel information processing.
	PC 9	The ability to implement a multi-level computing model on the base of architecture of client-server, including database, data storages and knowledge bases.
	PC 10	The possession of system data and fundamental knowledge of base of computer graphics, the ability to build graphical objects, including three-dimensional ones, and creation of computer animation for effective implementation of the professional tasks.
	PC 11	The possession of completive knowledge, skills and other competencies (in psychology, pedagogy, mathematics, information science, techniques of teaching informatics, Ukrainian and worldview disciplines), that ensure the ability to organize and to conduct qualitatively studying and educational work in the student team.
	PC 12	The ability to apply modern educational technologies in the professional activity, willingness and ability to

		study positive experience by self-education, improving your own pedagogical
Additional professional competencies of specializations	**APC 1**	***For specialization «Programming».*** The possession of modern methods and technologies of program designing and program complexes, development of optimal decisions about storage of software. ***For specialization «Internet of Thing».*** The ability of designing, creating and programming systems of the Internet of Thing, implementation of information exchange between such devices.
	APC 2	***For specialization «Programming».*** The ability to apply methodology, technology and instrumental means to manage the life cycle processes of software systems, products and services in accordance with customer requirements. ***For specialization «Internet of Thing».*** The ability to develop software for interaction of consumers and smart devices with using computers, tablets and mobile phones.
	APC 3	***For specialization «Programming».*** The ability to implement intellectual data analysis, including the systems of making decision support. ***For specialization «Internet of Thing».*** The ability to use appropriate special software (system of automatized modeling and designing) in designing, creating and programming of the systems of Internet of Thing.
7 - Programme learning outcomes		
Knowledge and understanding	**PLOk 1**	Mathematical bases of Computer Science: continuous and discrete analysis, including infinitesimal ones, integral calculus, linear algebra, analytical geometry, differential equations, functional analysis, combinatorics, graph theory, Boolean algebra, probability theory, mathematical statistic, logic, computating methods.
	PLOk 2	The concepts of operation, models of operation, stage of developing the operation; classification of economic and mathematical models and methods; designing principles of organizational and technical systems and operations; methods of solving problems of linear, integer, nonlinear, stochastic, dynamic programming; specifics of construction and solution of multi-criteria tasks.
	PLOk 3	The basic concepts of the algorithmic theory, formal models of algorithms, functions, questions of calculability and solvability massive problems, concepts of time and space complexity of algorithms in solving computational tasks.
	PLOk 4	Structures of data and fundamental algorithms, methodology and instrumental means of objected and oriented analysis and designing.
	PLOk 5	Computer architecture, physical principles of its work,

		functions of operating systems (OS), software interface for application access to OS tools, languages of system programming and methods of programme development that cooperate with components of computer systems.
	PLOk 6	The features of different programming paradigms, principles, models, methods and technologies of designing and developing of programme products for different purposes.
	PLOk 7	Network technologies, architecture of computer networks, technologies of computer networks administration and appropriate software.
	PLOk 8	The principles, instrumental means, technologies of database creation and systems of their management.
	PLOk 9	The concepts of information security, principles of save information system designing, risks and attacks, computer networks security, methods of cryptography.
	PLOk 10	Architecture and software of highly productive parallel and distributed computational systems, numeral methods and means and algorithms for parallel structures.
	PLOk 11	The principles of didactics of information teaching, methods, techniques and means of organizing studying activity of students in learning Informatics, educational and organizational work in the educational institution.
	PLOk 12	The basics of computer graphics, including three-dimensional, the theory of color transfer, information visualization models (raster, vector, fractal and other).
Additionally for specializations	**APLOk 1**	***For specialization «Programming».*** Web and mobile application technology, cross-platform programming; ***For specialization «Internet of Thing».*** The principles of functioning and technologies of designing; embedded microprocessor systems; methods and approaches to their programming; computer-aided design systems;
	APLOk 2	***For specialization «Programming».*** The standards, methods, technologies and approaches of managing the life cycle processes of software systems, products and services of information technology; ***For specialization «Internet of Thing».*** The main types of interfaces and networks protocols that are used in the devices of the Internet of thing.
	APLOk 3	***For specialization «Programming».*** The methods and algorithms of operative analytical processing, intellectual data analysis. ***For specialization «Internet of Things».*** The basic physical principles of functioning of robotic systems of various types and purposes, technologies of their creation, modern trends in using of new materials and artificial intelligence for implementing the widest

		range of work functions.
Applying of knowledge and understanding	**PLOs 1**	To use affectively modern mathematical device in professional activity to solve theoretical and applied tasks;
	PLOs 2	To use formal algorithmic models and computing functions, to establish solvability, partial solvability and insolvability of algorithmic problems, design, to develop and analyze algorithms, to assess their efficiency and complexity;
	PLOs 3	To develop management decision about researched operation and implementation of this decision, to apply programme means in searching optimal decision of the management tasks;
	PLOs 4	To develop programme models of subject environments, to choose the programming paradigm from the positions of convenience and quality of application for realization of methods and algorithms of solving tasks in the field of Computer Science, to create reliable and effective software;
	PLOs 5	To use methods, technologies and instrumental means for designing and development client-server applications, to design conceptual, logical, physical models of databases, to develop and optimize requests;
	PLOs 6	To solve the issues of administration, affective application, security, diagnostics, restoration, monitoring and optimization of computer work, operating system and system resources of computer systems;
	PLOs 7	To choose configuration, type and structure of network, to set up, to administrate and to use computer networks;
	PLOs 8	To keep confidentiality, integrity and availability of information, to ensure authenticity, traceability and reliability of information;
	PLOs 9	To perform parallel and distributed computing, apply numerical methods and algorithms for parallel structures, programming parallel languages in development and operation parallel and distributed software;
	PLOs 10	Using appropriate software, to design graphic objects, edit images, including three-dimensional ones, create computer animation;
	PLOs 11	To plan studying of Informatics, using different organizational forms and means of studying, to identify the functions, purposes and objectives of studying of Informatics in the general education school, to prepare and conduct lessons of different types.
	PLOs 12	To create and use didactic means, in particular, computer-oriented ones, to develop computer programmes of study purposes, according to the set technical task.
	PLOs 13	To plan, organize and conduct extracurricular

		activities, subject groups, school subject contests, educational work with students and work with parents.
	PLOs 14	To communicate oral and written in the native language about professional issues, in particular, to submit complex information, to share an idea, to explain the essence of the problem (tasks), the approach of solution and the result; to read special literature in a foreign language, to find, analyze and use information from different reference sources.
	PLOs 15	To reproduce the historical development of Computer Science and IT, to know modern trends in Informatics; to analyze and forecast the influence of information technologies on society.
	PLOs 16	To follow the rules of the healthy way of life, to achieve results, to control your own physical and mental condition.
Additional for specializations	**APLOs 1**	***For specialization «Programming».*** To create Web- and mobile applications, using modern technologies and instrumental means; ***For specialization «Internet of Things».*** To design, build and programme simple electromechanical and robotic microprocessor systems for various tasks;
	APLOs 2	***For specialization «Programming».*** To use technologies and instrumental means of life cycle management of software, products and services of information technologies according to the requirements and restrictions of the customer, to prepare the project documentation (feasibility study, technical task, agreement, contract, etc.); ***For specialization «Internet of Thing».*** To design the Internet of Thing systems, to develop their software, using modern computer-aided design systems, data transferring and management technologies;
	APLOs 3	***For specialization «Programming».*** To use technologies OLAP, DataMining, TextMining, WebMining in intellectual multi-dimensional analysis of data; to solve professional tasks using the methods of classification, forecasting, cluster analysis, searching of the associative rules; ***For specialization «Internet of Thing».*** To create three-dimensional models taking into account the given technical characteristics (material, shape, operating conditions, etc.) and implement them in the products using 3D printing technologies.
8 – Resource support for the implementation of the programme		
Personnel Support	Staffing of the programme of study includes lecturer and professor posts of the chair of Information Technologies and Mathematic Disciplines of the Faculty of Information Technology and Management, that ensure 90% professionally-oriented disciplines. Faculty members of the Chairs, Foreign Languages (Faculty of Law and International Relationships), Philosophy (Faculty of History	

	and Philosophy), General, Aged and Pedagogical Psychology (Institute of Human Sciences), Physical Education and Sport Pedagogy (Faculty of Health, Physical Education and Sports) are involved in the teaching of special disciplines in accordance of their competence and experience. The practice-oriented nature of the programme of study provides a wide participation of specialist-trainees, corresponding directly to the programme, that strengthens the synergetic connect between theoretical and practical training. The head of the project group and academic staff who ensure its implementation, comply with the requirements, relevant to the Licensing Conditions for conducting education activity of education institutions.
Material and technical support	Sufficient number of specialized computer classes and laboratories equipped with computers, multimedia equipment complexes, modern technology and microprocessor system based on the main platforms (Arduino, RaspberryPi, Galileo, FormulaFlowcode), 3D-printer and scanner. All workplaces in the computer classes are connected to the Internet.
Information and educational methodological support	Using of the virtual, 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 with the Pamorskaya Academy in Slupsk (Poland), Vilnius University (Lithuania), Erasmus + CA1 Programme with Foggia University (Italy), University of Cadiz (Spain).
Studying of foreign higher education learners	According to license it is provided for the training of foreigners and stateless people.

II. The List of the Components of the Programme of Study and Their Logical Coherence

2.1 The list of the Component

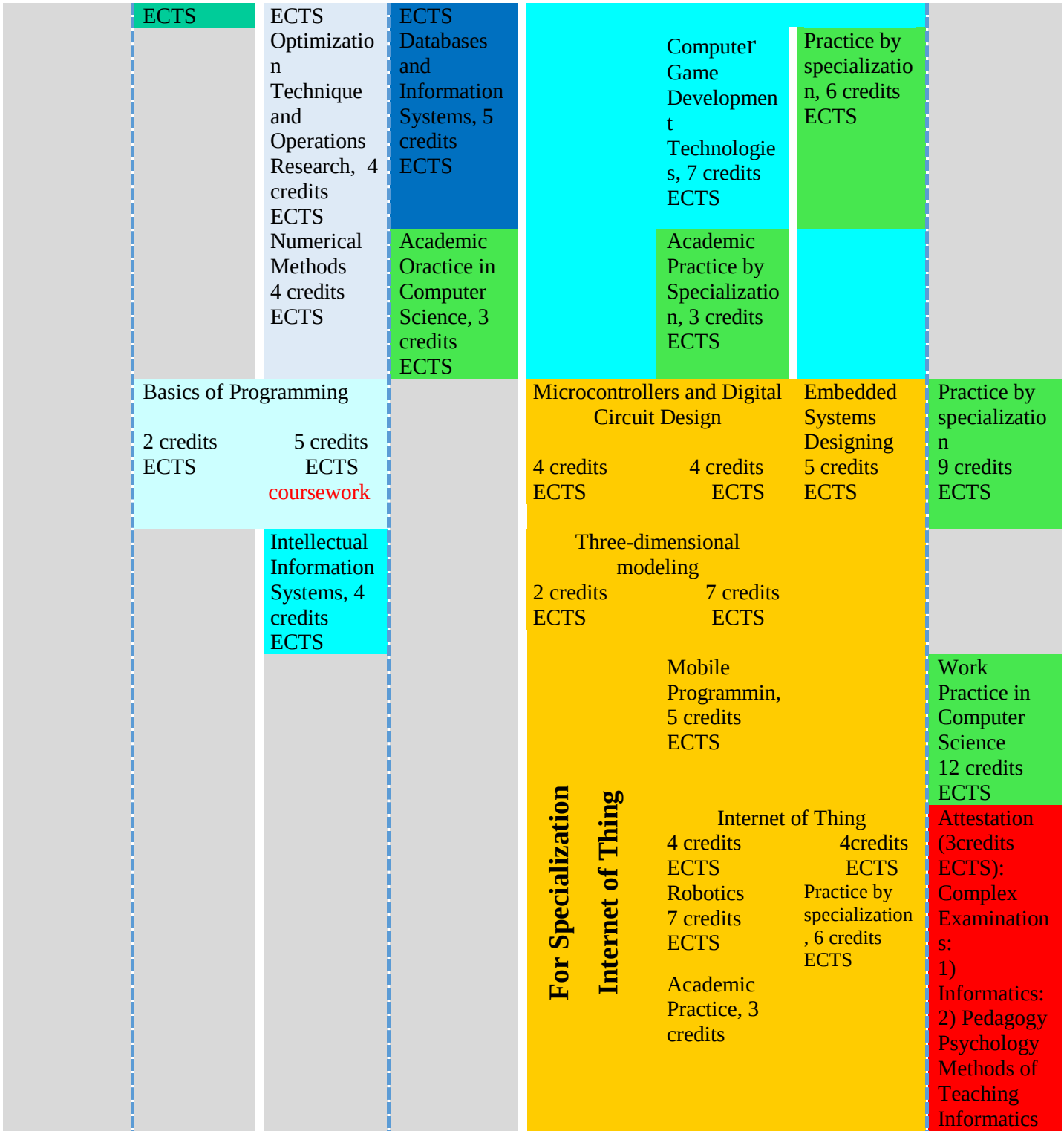
Code (acad. disc., pr., assess.)	Components of the Programme of Study (academic discipline, practice, degree paper)	Credits ECTS	The Form of the Final Control
1	2	3	4
Compulsory components of PS			
Formation of general competencies			
ОД3.01	University Studios	4	Credit
ОД3.02	Foreign Language	10	Credit, exam
ОД3.03	Physical Training	4	Credit, credit
ОД3.04	Ukrainian Studios	6	Exam
ОД3.05	Philosophical Studios	4	Exam
Formation of professional competencies			
ОДФ.01	Computer system architecture	5	Exam
ОДФ.02	Physical Processes in Computing Systems	5	Exam
ОДФ.03	Further Mathematics	17	
	Geometry	*4*	*Exam*
	Mathematical Analysis	*5*	*Exam*
	Algebra and Number Theory	*4*	*Exam*
	Differential Equations	*4*	*Exam*
ОДФ.04	Algorithms and Structures of Data	4	Exam
ОДФ.05	Discrete Mathematics	4	Exam
ОДФ.06	Basics of Programming, Coursework	7	Exam
ОДФ.07	Probability Theory and Mathematical Statistics	4	Exam
ОДФ.08	Numerical Analysis	4	Credit
ОДФ.09	Mathematical Logic and Theory of Computation	5	Exam
ОДФ.10	Intellectual Information Systems	4	Exam
ОДФ.11	Optimisation Technique and Operations Research	4	Credit
ОДФ.12	Computer Graphics	5	Exam
ОДФ.13	Parallel and Distributed Computing	4	Credit
ОДФ.14	Technologies of the Modern Computer Networks	4	Exam

ОДФ.15	Data Protection	4	Exam
ОДФ.16	Operating Systems and System Programming	5	Exam
ОДФ.17	Databases and Information System	5	Exam
ОДФ.18	Psychology	4	Credit
ОДФ.19	Pedagogy	5	Exam
ОДФ.20	Methods of Teaching Mathematics, coursework	8	Exam
Total amount of theoretical study:		135	-
Practice			
ОП.01	Academic (of Computer Science)	6	Credit, credit
ОП.02	Academic (pedagogical)	3	Credit
ОП.03	Field (pedagogical)	21	Credit, credit
ОП.04	Field (Computer Science)	12	Credit
Total amount of practice		42	-
Attestation			
ОА.1	Complex Examination in Informatics	1,5	
ОА.2	Complex Examination in Psychology, Pedagogy, Methods of Teaching Informatics	1,5	
Total amount of the compulsory components:		180	
Optional components of EP			
Optional block I (specialization «Programming»)			
ВДС.1.01	Programming	22	Exam
	Web-Programming	6	Exam
	Programming for Mobile Devices	6	Credit
	Decision Support System	5	Credit
	Cross-Platform Programming	5	Exam
ВДС.1.02	Intellectual Data Analysis	6	Exam
ВДС.1.03	Computer Game Development Technologies	7	Exam
ВДС.1.04	Software Development Technology	7	Credit, exam
ВП.1.01	Academic Practice of Specialization	3	Credit
ВП.1.02	Field Practice in Specialization	15	Credit, credit
Total amount by specialization		60	
Optional block II (specialization «Internet of Thing»)			
ВДС.2.01	Microcontrollers and Digital Circuit Design	8	Exam, exam
ВДС.2.01	Three-dimensional Modeling	9	Exam
ВДС.2.03	Mobile Programming	5	Credit

ВДС.2.04	Embedded Systems Designing	5	Exam
ВДС.2.05	Robotics	7	Exam
ВДС.2.06	Internet of Thing	8	Credit, exam
ВП.2.01	Academic Practice of Specialization	3	Credit
ВП.2.02	Work Practice of Specialization	15	Credit, credit
Total amount by specialization		60	
Optional block III (without specialization)			
	Choice from course catalogue	60	Credits, exams
Total amount of the optional components		**23**	
TOTAL AMOUNT OF THE PROGRAMME OF STUDY		**240**	

2.2 Structural Logical Scheme of the Programme of Study

Year of Study 1		Year of Study 2		Year of Study 3		Year of Study 4	
University Studios, 4 credits ECTS	Ukrainian Studios, 6 credits ECTS			Philosophical Studios, 4 credits ECTS			
Foreign language 5 credits ECTS 5 credits ECTS Physical training 2 credits ECTS 2 credits ECTS				Psychology, 4 credits ECTS Pedagogy, 5 credits ECTS Methods of Teaching Mathematics, 8 credits ECTS coursework			
Physical Processes in Computing Systems, 5 credits ECTS	Academic Practice of Computer Science, 3 credits	Computer Graphics, 5 credits ECTS		Academic Practice Pedagogical 3 credits ECTS		Work Pracrice pedagogical, 15 credits ECTS	Work Pracrice pedagogical, 6 credits ECTS
Computer System Architecture 5 credits ECTS		Parallel and Distributed Computing, 4 credits ECTS		Programming, 22 credits			
Further Mathematics		Technologies of the Modern Computer Networks, 4 credits ECTS		Web-Programming, 6 credits ECTS	Programming for Mobile Devices, 6 credits ECTS	Cross-Platform Programming 5 credits ECTS	Practice by specialization 9 credits ECTS
Geometry, 4 credits ECTS Mathematical Analysis 5 credits ECTS	Algebra and Number Theory, 4 credits ECTS	Differential equations, 4 credits ECTS	Information Protection, 4 credits ECTS	**Specialization Programming**	Decision Support System, 5 credits ECTS		
	Discrete Mathematics, 4 credits ECTS	Mathematical Logic and Theory of Computation, 5 credits ECTS	Information Protection, 4 credits ECTS		Intellectual Data Analysis, 6 credits ECTS		
	Algorithms and Structures of Data, 4 credits	Probability Theory and Mathematical Statistics, 4 credits	Operating Systems and System Programming, 5 credits		Software Development Technology 3 credits ECTS	5 credits ECTS	



III. Form of Attestation of Higher Educational Learners

Attestation of the graduates of the Programme of Study for the specialty 122 «Computer Science» is provided in the form of complex examination in Informatics and complex examination in Psychology, Pedagogy and Methods of Teaching Informatics and is finished by giving of the document of the state standard about confirming them the degree of Bachelor as well as professional qualification: Bachelor of Computer Science.

The attestation is performed openly and publicly.

IV. Matrix of the Programme Competence Compliance with the Programme Components

	ОДЗ.01	ОДЗ.02	ОДЗ.03	ОДЗ.04	ОДЗ.05	ОДФ.01	ОДФ.02	ОДФ.03	ОДФ.04	ОДФ.05	ОДФ.06	ОДФ.07	ОДФ.08	ОДФ.09	ОДФ.10	ОДФ.11	ОДФ.12	ОДФ.13	ОДФ.14	ОДФ.15	ОДФ.16	ОДФ.17	ОДФ.18	ОДФ.19	ОДФ.20	ВДС.1.01	ВДС.1.02	ВДС.1.03	ВДС.1.04	ВДС.2.01	ВДС.2.02	ВДС.2.03	ВДС.2.04	ВДС.2.05	ВДС.2.06
GK 1	●				●			●				●		●		●																			
GK 2					●			●				●		●		●																			
GK 3	●		●					●	●	●	●	●			●	●	●	●						●	●	●	●	●	●				●	●	●
GK 4	●		●																				●	●	●			●	●				●	●	●
GK 5	●	●	●																									●	●				●	●	●
GK 6		●		●																			●					●	●					●	●
GK 7			●																				●												
GK 8	●			●	●	●	●	●	●		●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
GK 9				●							●				●		●	●	●	●	●	●			●	●		●	●		●		●	●	●
GK 10	●	●			●			●	●		●			●		●										●								
GK 11	●	●	●	●	●																														
PC 1								●				●																							
PC 2									●					●		●		●																	
PC 3										●		●	●																						
PC 4											●				●			●																	
PC 5						●	●									●					●	●													
PC 6																		●		●															
PC 7																		●	●																
PC 8						●												●																	
PC 9																		●				●													
PC 10								●									●																		
PC 11				●	●																		●	●	●										
PC 12																								●	●										
APC 1						●	●				●															●		●	●	●			●	●	●

APC 2											●														●			●			●			●
APC 3																									●	●				●		●	●	●

V. Matrix of Providing Programme Learning Outcomes with the Relevant Programme Components

	ОДЗ.01	ОДЗ.02	ОДЗ.03	ОДЗ.04	ОДЗ.05	ОДФ.01	ОДФ.02	ОДФ.03	ОДФ.04	ЛЖФ.05	ОДФ.06	ЛДФ.07	ОДФ.08	ОДФ.09	ОДФ.10	ОДФ.11	ОДФ.12	ОДФ.13	ОДФ.14	ОДФ.15	ОДФ.16	ОДФ.17	ОДФ.18	ОДФ.19	ОДФ.20	ВДС.1.01	ВДС.1.02	ВДС.1.03	ВДС.1.04	ВДС.2.01	ВДС.2.02	ВДС.2.03	ВДС.2.04	ВДС.2.05	ВДС.2.06
PLOk 1					●			●		●		●	●	●																					
PLOk 2																●																			
PLOk 3														●																					
PLOk 4									●																										
PLOk 5						●	●														●														
PLOk 6											●				●			●																	
PLOk 7																			●																
PLOk 8																						●													
PLOk 9																				●															
PLOk 10																		●																	
PLOk 11	●	●																				●	●	●											
PLOk 12																	●																		
APLOk 1																										●				●	●	●			
APLOk 2																												●	●				●		●
APLOk 3																											●						●	●	●
PLOs 1									●		●		●	●	●																				
PLOs 2										●					●																				
PLOs 3																	●																		

	ОД3.01	ОД3.02	ОД3.03	ОД3.04	ОД3.05	ОДФ.01	ОДФ.02	ОДФ.03	ОДФ.04	ОДФ.05	ОДФ.06	ОДФ.07	ОДФ.08	ОДФ.09	ОДФ.10	ОДФ.11	ОДФ.12	ОДФ.13	ОДФ.14	ОДФ.15	ОДФ.16	ОДФ.17	ОДФ.18	ОДФ.19	ОДФ.20	ВДС.1.01	ВДС.1.02	ВДС.1.03	ВДС.1.04	ВДС.2.01	ВДС.2.02	ВДС.2.03	ВДС.2.04	ВДС.2.05	ВДС.2.06
PLOs 4											●				●			●																	
PLOs 5																			●	●		●													
PLOs 6					●	●															●														
PLOs 7																		●	●																
PLOs 8																				●															
PLOs 9																		●																	
PLOs 10																	●																		
PLOs 11																									●										
PLOs 12																							●	●	●										
PLOs 13																							●	●											
PLOs 14		●		●																															
PLOs 15	●			●	●																														
PLOs 16			●																																
APLOs 1																										●				●			●	●	
APLOs 2																												●	●			●			●
APLOs 3																											●				●				