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

EDUCATIONAL-PROFESSIONAL PROGRAM

Information Systems Software

The first (Bachelor's) level

specialty		**126 Information systems and Technologies**
branch knowledge	**of**	**12 Information Technologies**
qualification		**Bachelor of Information Systems and Technologies**

APPROVED by Academic Council
Chairman of the Academic Council
NTU "KhPI"

_____ L.L. Tovazhniansky

«____» _____ 20_____.
protocol №__ from «___» _____ 2019.

The educational program is put into action
Rector _____ Ye.I. Sokol
(Order № __ from «___» _____ 2019)

NTU "KhPI"
Kharkiv 2019

LETTER OF APPROVAL

of educational and professional program

Level of higher education	The first (bachelor's) level
Branch of knowledge	12 Information Technologies
Specialty	121 «Information Systems and Technologies»
Specialization	126-01 «Information Systems Software»
Qualification	Bachelor of Information Systems and Technologies

APPROVED
Scientific-methodical committee on the specialty "Information systems and technologies"
Head of the committee

_____ N..V. Sharonova

«____»_____201_ .

RECOMMENDED
Methodical Council of NTU "KhPI"
Deputy Chairman of the methodical council

_____R.P. Migushchenko

«____»_____201_ .

AGREED
Head of the Department of Software Engineering and Management Information Technologies
_____M.D. Godlevsky

«____»_____201_ .

AGREED
Dean of the Faculty of Computer sciences and software engineering

_____M.M. Malko

«____»_____201_ .

APPROVED AND PROVIDED

By the order of the rector of the National Technical University "Kharkiv Polytechnic Institute" from «_____» _____20___ . № _____.

PREFACE

The educational program (EP) for the training of bachelors in the specialty 126 – Information systems and technologies is a temporary normative document, which summarizes the content of education, that is, reflects the goals of education and training, determines the position of a specialist in the structure of the state economy and the requirements for its competencies and other socially important features and qualities.

Introduced by the National Technical University "Kharkiv Polytechnic Institute" as a temporary document for the introduction of the standards of higher education in Ukraine.

Developed by a working group of the Department of Software Engineering and Management Information Technologies of the Faculty of Computer Science and Software Engineering of the National Technical University "Kharkiv Polytechnic Institute", consisting of:

1. Doctor of Technical Sciences, Professor N.V. Sharonova is the head of the department of Intelligent Computer Systems, the head of the project group (guarantor of the educational program).
2. Doctor of Technical Sciences, Professor N.F. Khayrova – Professor of the Department of Intelligent Computer Systems.
3. Candidate of Technical Sciences, Associate Professor O.Yu. Cherednichenko – Assistant Professor of Software Engineering and Management Information Technologies.

Reviews of external stakeholders:

1. Nix Solutions Company
2. Telesens Company
3. Sigma Company

Developed by a working group

Chairman of the working group:

Sharonova N.V., Doctor of Technical Sciences, Professor, Head of the Department of Intelligent Computer Systems of the National Technical University "Kharkiv Polytechnic Institute" _____

Members of the working group:

Khayrova N.F., Doctor of Technical Sciences, Professor, Professor of the Department of Intelligent Computer Systems of the National Technical University "Kharkiv Polytechnic Institute" _____

Cherednichenko O.Yu., Candidate of Technical Sciences, Associate Professor, Associate Professor of the Software Engineering and Management Information Technologies Department of the National Technical University "Kharkiv Polytechnic Institute" _____

1. Profile of the educational program in the specialty number 126 - Information systems and technologies (in the specialization "Information Systems Software"

1 – General information	
Full name of higher educational institution and structural unit	National Technical University "Kharkiv Polytechnic Institute", Faculty of Computer Sciences and Software Engineering, Department of Software Engineering and Management Information Technologies
Degree of higher education and the name of the qualification	Bachelor Educational qualification: Bachelor of Information Systems and Technologies Qualification in a diploma: a Bachelor of Information Systems and Technologies
The official name of the educational program	Information Systems Software
Type of diploma and volume of educational program	Bachelor's degree, single, 240 ECTS credits, term of training 4 years
Availability of accreditation	
Cycle / Level	NRC Ukraine - level 6, FQ-EHEA-first cycle, EQF LLL-6 level
Preconditions	Complete secondary education, an educational degree of a junior bachelor in related (or other specialties) in accordance with the conditions and rules of admission.
Teaching language	Ukrainian, Russian, English
The duration of the educational program	
Internet address of the permanent description of the educational program	http://asu.kh.ua/
2 – The goal of the educational program	

The combination of high-level professional training with the formation of a scientific outlook and providing a broad outlook in the social, humanitarian, fundamental and information systems and technologies. The achievement of the stated goal is based on the principles of continuity and individualization of learning, the fundamental and integrity of knowledge, practical orientation and awareness of the place of the received competencies, symbiosis of scientific and system approaches, etc.	
3 – Characteristics of the educational program	
Subject area (branch of knowledge, specialty, specialization)	Branch of knowledge: 12 Information Technologies Specialty: 126 - Information systems and technologies
Orientation of the educational program	The educational-professional bachelor program is designed for students who seek to become specialists in the field of engineering and science in the direction of computer science and information technology. The main advantage of the bachelor program is to focus on the formation of the broadest scientific and technical outlook of the future professional.
The main focus of the educational program and specialization	**General:** - familiarization with modern methods of effective access to information, its collection, systematization and preservation; – the main paradigms of software design and development of computerized systems; – methods of planning the life cycle of software and developing a resource management model; – the main protocols of the Internet, models of Internet-services; – methods of designing information WEB-resources with the integration of external data and software products, using methods of information security. **Special:** – ensuring the preparation and obtaining deep knowledge for the effective use of new information and communication technologies in various subject areas of industry, education, IT companies; – gaining permanent skills in the use of modern communication technologies, virtualization

	technologies, storage and processing of large amounts of data in the development of modern information systems used in innovation activities of enterprises and business structures; – gaining decision-making skills based on the methods of modern management theory of complex systems and objects of management using computational intelligence technologies. Key words: software, information systems, information technologies
Features of the program	Research and solution of complex problems in the field of computer sciences, information technologies and research and innovation activity, analysis of existing modern information technologies. Focusing on partnership with domestic and foreign educational and scientific institutions, private sector, academics and practitioners, participation in international programs to improve the quality of education.
4 – Eligibility of graduates to employment and further training	
Suitability for employment	Professional activity as a software engineer; engineer-developer; system developer; database developer; web-developer; system administrator; information systems maintenance engineer; specialist in the development and testing of software. Graduates can work in professions according to the National Classification of Professions DK 003: 2010: 2131.2 Database Administrator 2131.2 Data Administrator 2131.2 Access Administrator 2131.2 System Administrator 2131.2 Computer Software Engineer 2132.2 Software engineer 2132.2 Developer (database) 2131.2 Software and multimedia analyst 2132.2 Application developer 2139.2 Computer Engineer 2149.2 Research engineer 3121.2 IT Specialist 3121.2 Specialist in Software Development and Testing

	3121.2 Specialist in Software development 3121.2 Specialist in computer graphics (design)
Further training	A student who has been trained in this curriculum and received a Bachelor's degree may continue to study in the universities of Ukraine and abroad for a Master's degree in the branch of knowledge "Information Technologies" or related.
5 – Teaching and evaluation	
Teaching and learning	The teaching process involves the use of such learning techniques as: problem-oriented lectures, laboratory works, practical classes, work in small groups, seminar-discussions, brain storms, presentations that develop communication and leadership skills, independent work with literature sources, generalization skills ; mixed forms of learning using distance-based platforms of online courses.
Evaluation	The academic performance assessment of knowledge and skills of students is carried out in the form of current and summative assessment. Assessment of students' knowledge is carried out according to the modular rating system. Current assessment involves knowledge, skills and abilities of students at lectures, laboratory, practical and seminar sessions, and during individual training tasks and modular test works assessment. The summative assessment is carried out in the form of examinations, credits and final certification. The summative assessment of knowledge in the form of an exam is made in written form. A student of higher education is considered to be admitted to the final examination in the disciplines of the educational program, if he has completed all types of work provided by the curriculum in this discipline. The summative assessment in the form of a differentiated credit is based on the results of the current assessment (the sum of the marks obtained by the results of the current assessment) without the submission of additional forms of assessment. The assessment of applicants for higher education is based on the results of examinations and differentiated credits for each semester.
6 – Program competencies	

Integral competence	Ability to solve specialized tasks and practical problems in the field of IST in the course of professional activity or in the process of training.
General competencies	GR 1 Ability to maintain written and oral communication, ability to logically correctly, reasonably and clearly build oral and written language, readiness to use one of the foreign languages. GR 2 Have the fundamentals of historical thinking, have an idea of history as a science, its place in the system of humanities, know historical sources. Understand the driving forces and laws of the historical process, the main stages in the history of mankind and their chronology, be able to analyze historical events and trends, to participate responsibly in the political life of society. GR 3 Have an idea about originality of philosophy, its place in culture, scientific, philosophical and religious overview of the universe, the essence, purpose and meaning of human life, forms and methods of scientific knowledge. GR 4 Understand the essence of culture, its place and role in human life and society, have an understanding of the forms of culture, their origin and development, the creation of cultural norms and values, the mechanisms of preservation and transfer of them as a socio-cultural experience, know the main achievements in various fields of cultural practice. GR 5 Ability to demonstrate basic knowledge in the field of natural sciences and readiness to use the methods of fundamental sciences for solving general engineering and professional problems. GR 6 Ability and readiness to possess the basic methods, methods and means of obtaining, evaluating, preserving, processing and using information from various sources that are necessary for solving scientific and professional tasks. GR 7 Ability and readiness to understand and analyze economic problems and social processes, to be an active subject of economic activity.

	GR 8 Ability to master the basics of human interaction with the techno sphere, identify and study the risks of reliability of the system "Man as a living environment". GR 9 Have information about the unity of all ecological systems of the biosphere, methods of detecting changes in environmental indicators under the influence of human activity. GR 10 Ability to understand the role of science in the development of civilization and the interaction of science and technology.
Professional competencies	**Specialty** PC 1 Ability to analyze subject areas (domains), formulate requirements, identify, classify and describe tasks, find methods and approaches to their solution. PC 2 Ability to participate in the design of IST, including simulation (formal description) of structure, behavior and processes of operation. PC 3 Ability to develop architectures, modules and components of software systems. PC 4 Knowledge and understanding of the specifications, standards, rules and recommendations in the professional field, the ability to assess the degree of validity of their application, the ability to adhere to them in the implementation of the processes of the life cycle of information systems. PC 5 Ability to apply and develop fundamental and interdisciplinary knowledge for the successful solving of tasks for the development, implementation and maintenance of information systems. PC 6 Ability to prepare and present documentation and guidance materials on information systems and technologies. PC 7 Ability to develop, implement and coordinate the processes, phases and iterations of the life cycle of information systems and information technologies based on effective models and software development approaches. PC 8 Ability to substantially choose and develop tools for the development and maintenance of information systems.

	PC 9 Ability to algorithmic and logical thinking. PC 10 Ability to formulate and provide software quality requirements in accordance with requirements, specifications and standards. PC 11 Ability to analyze, select and apply methods and tools for ensuring information security. PC 12 Ability to provide technical support and training for software users. PC 13 Ability to accumulate, process and organize professional knowledge on the creation and maintenance of information systems and the recognition of the importance of lifelong learning. PC 14 Ability to implement the process of system integration, apply standards and procedures for managing change to maintain the integrity of the overall functionality and reliability of the information system. PC 15 Ability to apply methods of management of economic, human and technical resources in the process of development of IST. PC 16 Ability to assess and take into account the economic, social, technological and environmental factors affecting the professional activities of the graduate.
7 – Program training results	
Program results of training in general preparation	RTg 1 Know and possess skills and abilities of language activity, ability to communicate in the field of professional activity with colleagues and experts of subject areas. RTg 2 Know the basics of historical thinking, have an idea of the sources of historical knowledge and how to work with them. RTg 3 Know the scientific, philosophical and religious overview of the universe, the essence of the purpose and meaning of human life, have an idea of the originality of philosophy. RTg 4 Know the conditions for the formation of a person, freedom, responsibility for preserving life, nature, culture, moral obligations of man in relation to others and himself, about spiritual values, their significance in creativity and everyday life. RTg 5 Know and use the methods of fundamental sciences for solving and professional tasks.

	RTg 6 Know the basics of developing and using modern operating systems, basic office software tools, be able to use application software packages in accordance with their professional activities. RTg 7 Know the essence of the main economic categories, the scientific basis and ways of increasing production, saving resources. RTg 8 Know the legislative and normative basis of the state on the basis of occupational safety and health, as well as international standards in this area. RTg 9. Know the legal protection of the natural environment, to be able to carry out instrumental measurements of the numerical values of normalized indicators of the state of the environment and the production environment. RTg 10 Know the structure, forms and methods of scientific knowledge and their evolution, to understand the value of scientific rationality and its historical types. RTg 11 Know the basics of staff safety and the population from accidents, catastrophes, monitoring the conformity of production processes with the requirements of environmental protection systems and life safety. RTg 12 Know about basic means, forms and methods, principles of physical education and basics of health.
Program results of training for professional preparation	**By specialty** RT 1 Ability to analyze problems with the development of information systems software. RT 2 Understand, analyze, purposefully search and choose the resources and knowledge necessary for the solution of professional tasks to the information resource in the framework of the modern achievements of science and technology. RT 3 Know and be able to use methods and tools for collecting, formulating and analyzing information system requirements. RT 4 Know and be able to apply information processing, storage and data transmission technologies. RT 5 Conduct pre-project survey of the subject area, system analysis of the design object. RT 6 Know, understand and apply effective approaches to designing information systems.

	RT 7 Select the source data for the design, guided by formal descriptions of requirements and modeling. RT 8 Know, understand and apply in practice the fundamental concepts and basic principles of the operation of language, instrumental and computational means of information systems and technologies. RT 9 Be able to apply component development techniques, highlighting interfaces and implementations and interactions between modules, subsystems and components. RT 10 Know, understand the basic processes, phases and iterations of the life cycle of information systems. RT 11 Know, understand and apply appropriate mathematical concepts, methods of domain, system and object-oriented analysis and mathematical modeling for software development. RT 12 Ability to demonstrate the processes and results of professional activity by developing presentations, reports. RT 13 Have the skills to participate in team development, approval, registration and release of all types of software documentation. RT 14 Be able to calculate the economic efficiency of software systems. RT 15 Apply in practice instrumental software tools for object-oriented, system and domain analysis, design, testing, visualization, measurement and documentation of software. RT 16 Motivatedly choose programming languages for solving the tasks of development and maintenance of information systems. RT 17 Analyze, evaluate and choose instrumental and computational means and technologies, algorithmic and software solutions for solving IST tasks. RT 18 Know and apply methods of developing algorithms, software design, and data and knowledge structures. RT 19 Know and have skills of realization of basic algorithms and structures of software data.

	RT 20 Know and be able to apply technology and design and developing techniques. **By specialization** RT 21 Know, understand and apply modern approaches to assess and ensure software quality. RT 22 Know and be able to apply methods of software verification and validation. RT 23 Know, understand, analyze, choose, apply means of ensuring information security and integrity of data in accordance with application tasks being solved and software systems created. RT 24 Know, understand and apply professional standards and other normative and legal documents in the field of information systems and technologies. RT 25 Know the code of professional ethics, understand the social significance and cultural aspects of the IST and adhere to them in professional activities. RT 26 Ability to use information and communication technologies in communication, exchange, collection, analysis, processing of information.
8 – Program training results	
Personnel support	Meets staff requirements on ensuring the implementation of educational activities in the field of higher education in accordance with the current legislation of Ukraine (Resolution of the Cabinet of Ministers of Ukraine "On Approval of Licensing Conditions for the Educational Activities of Educational Institutions" of December 30, 2015, No. 1187, Appendix 12)
Material and technical providing	Complies with technological requirements on the material and technical providing of educational activities in the field of higher education in accordance with the current legislation of Ukraine (Resolution of the Cabinet of Ministers of Ukraine "On approval of Licensing conditions for conducting educational activities of educational institutions" dated December 30, 2015, No. 1187, Appendix 13)
Information and initial-methodical providing	Corresponds to the technological requirements for educational, methodological and informational providing of educational activities in the field of higher education in accordance with the current legislation of Ukraine (Resolution of the Cabinet of Ministers of

	Ukraine "On approval of licensing conditions for the educational activities of educational institutions" dated December 30, 2015, No. 1187, Annexes 14- 15)
9 – Program training results	
National Credit Mobility	On the basis of bilateral agreements between the National Technical University "Kharkiv Polytechnic Institute" and higher educational institutions of Ukraine
International Credit Mobility	On the basis of bilateral agreements between the National Technical University "Kharkiv Polytechnic Institute" and University Paris 13, Poznań University of Economics
Education of foreign applicants	Possible after studying the course of the Ukrainian language

2. List of components of the educational-professional program and their logical consistency

2.1 List of components of EP

Code n / a	Educational components of the program	Number of credits	Form of final control
1	2	3	4
Compulsory components of EP			
CC 1	History of Ukraine	3	Exam
CC 2	Ukrainian language	3	Exam
CC 3	Foreign language	12	Credit, and exam in the last semester
CC 4	Philosophy	3	Exam
CC 5	History of Ukrainian Culture	3	Exam
CC 6	Fundamentals of economic theory	3	Credit
CC 7	Physics	4	Exam
CC 8	Linear algebra	4	Exam
CC 9	Mathematical analysis	9	Exam
CC 10	Probability theory	5	Exam
CC 11	Mathematical statistics	4	Exam
CC 12	Ecology	3	Credit
CC 13	Physical Education	12	Credit
CC 14	Economics and organization of development of software	3	Exam
CC 15	Architecture of calculating systems	4	Exam
CC 16	Algorithms and data structures	3	Credit

CC 17	Operating Systems	4	Credit
CC 18	Databases	8	Credit, and exam in the last semester
CC 19	Fundamentals of web technologies	4	Exam
CC 20	Simulation of complex systems	5	Exam
CC 21	Algorithmization and programming	12	Exam
CC 22	Computer Mathematics	13	Credit, and exam in the last semester
CC 23	History of science and technology	3	Credit
CC 24	Fundamentals of occupational safety and health	3	Exam
CC 25	Administration of information systems	8	Credit, and exam in the last semester
CC 26	Operations Research	8	Credit, and exam in the last semester
CC 27	Network Technology	3	Exam
CC 28	Object-Oriented Programming	8	Credit, and exam in the last semester
CC 29	Fundamentals of information systems design	4	Exam
CC 30	Fundamentals of enterprise IT infrastructure	4	Credit
CC 31	Fundamentals of business analysis	5	Exam
CC 32	The theory of decision making	6	Exam
CC 33	Pre-diploma internship	6	
CC 34	Diploma project	3	
CC 35	Attestation	3	
	Total number of compulsory components	188	
Sample components of EP			
Sample set 1			
SS 1.1	Modern intelligent automated information processing systems	9	Credit, and exam in the last semester
SS 1.2	Fundamentals of security of information systems	5	Exam
SS 1.3	Methods of processing empirical data	4	Exam
SS 1.4	Quality and software testing	8	Credit
SS 1.5	Fundamentals of business process modeling	8	Credit
SS 1.6	Web Application Development	6	Exam
Sample set 2			
SS 2.1	Software modeling and analysis	5	Credit

SS 2.2	Fundamentals of software project management	4	Exam
SS 2.3	Architecture and software design	11	Exam
SS 2.4	.NET technology stack	4	Exam
SS 2.5	Quality and Software Testing	8	Credit
SS 2.6	Models and methods of soft calculations	5	Credit
SS 2.7	Knowledge-oriented models and software development technologies	3	Exam
Students' free choice disciplines			
SD 1	Sample discipline 1 (5 semester)	4	Credit
SD 2	Sample discipline 2 (6 semester)	4	Credit
SD 3	Sample discipline 3 (7 semester)	4	Credit
	Total number of sample components:	52	
	Total NUMBER OF THE EDUCATIONAL PROGRAM:	240	

2.2 Structural-logical scheme of EP

Semester	Contents of educational activity
1	CC 1, CC 3, CC 7, CC 8, CC 9, CC 13, CC 21, CC 22
2	CC 2, CC 3, CC 9, CC 13, CC 15, CC 16, CC 21, CC 22
3	CC 3, CC 4, CC 10, CC 13, CC 17, CC 18, CC 22, CC 28
4	CC 3, CC 5, CC 6, CC 11, CC 13, CC 18, CC 26, CC 27, CC 28
5	CC 13, CC 19, CC 23, CC 25, CC 26, CC 29, SS 1.2, SD 1
6	CC 12, CC 13, CC 24, CC 25, CC 30, SS 1.3, SS 1.6, SS 2.3, SS 2.4, SD 2
7	CC 31, CC 32, SS 1.1, SS 1.4, SS 1.5, SS 2.1, SS 2.5, SS 2.6, SD 3
8	CC 14, CC 20, CC 33, CC 34, CC 35, SS 1.1, SS 1.4, SS 1.5, SS 2.2, SS 2.5, SS 2.7

3. Form of attestation of applicants for higher education

Attestation of graduates in the higher educational program of specialty number 126 – Information systems and technologies is carried out in the form of bachelor's qualification thesis defense and ends with the issuance of a standard-issue document of awarding him a Bachelor's Degree with a qualification: a Bachelor of Information Systems and Technologies.

The attestation is carried out openly and publicly.

4. Matrix of compliance of program competencies to the components of the educational program

	GC 1	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	PC 6	PC 7	PC 8	PC 9	PC 10	PC 11	PC 12	PC 13	PC 14	PC 15	PC 16
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	GC 1	GC 2	GC 3	GC 4	GC 5	GC 6	GC 7	GC 8	GC 9	GC 10	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	PC 8	PC 9	PC 10	PC 11	PC 12	PC 13	PC 14	PC 15	PC 16

CC-30											•													•	•
CC-31											•												•		
CC-32														•											•
CC-33												•	•		•					•					
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CC-35												•	•		•										
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SD 1																									
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5. Matrix providing program training results for the corresponding components of the educational program

	RTø -1	RTø -2	RTø -3	RTø -4	RTø -5	RTø -6	RTø -7	RTø -8	RTø -9	RTø -10	RTø -11	RTø -12	RT-1	RT -2	RT -3	RT -4	RT -5	RT -6	RT -7	RT -8	RT -9	RT -10	RT -11	RT -12	RT -13	RT -14	RT -15	RT -16	RT -17	RT -18	RT -19	RT -20	RT -21	RT -22	RT -23	RT -24	RT -25	RT -26
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	RTσ-1	RTσ-2	RTσ-3	RTσ-4	RTσ-5	RTσ-6	RTσ-7	RTσ-8	RTσ-9	RTσ-10	RTσ-11	RTσ-12	RT-1	RT-2	RT-3	RT-4	RT-5	RT-6	RT-7	RT-8	RT-9	RT-10	RT-11	RT-12	RT-13	RT-14	RT-15	RT-16	RT-17	RT-18	RT-19	RT-20	RT-21	RT-22	RT-23	RT-24	RT-25	RT-26
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CC-35															•					•		•			•													
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SD 3																																						

Head of the graduation department _____ M.D. Godlevsky

(signature) (last name)

Head of the project team (guarantor of the educational program) _____ N.V. Sharonova

(signature) (last name)