

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE  
RIVNE STATE UNIVERSITY OF HUMANITIES

EDUCATIONAL AND PROFESSIONAL PROGRAM

«Computer sciences»

The first level of higher education

DEGREE OF HIGHER EDUCATION Bachelor

BRANCH OF KNOWLEDGE 12 «Information technology»

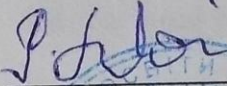
SPECIALTY 122 «Computer sciences»

QUALIFICATIONS: bachelor of computer science, expert in the  
field of computer science

APPROVED

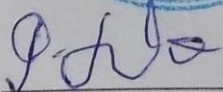
by academic council of the Rivne State  
University of Humanities

Chairman of academic council of the RSHU

 prof. Postolovskyi R.M.  
(protocol № 7 dated «29» August 2019)

Educational program is introduced  
with 01.09.2019

Rektor RSHU

 prof. Postolovskyi R.M.  
(order № 166-01-01 dated 30.08.2019)

## **I. Preamble**

Educational and professional program of bachelor in specialty 122 «Computer sciences» was developed in accordance with the standard of higher education in Ukraine of the first (bachelor) level of branch of knowledge 12 «Information technology» (approved and enacted by order of the Ministry of Education and Science of Ukraine from 10.07.2019 № 962) project group of Rivne state university of humanities.

### **Project team leader(educational program guarantor):**

Sinchuk Alesia Mikhailovna, Ph.D. (Candidate of Technical Sciences), associate professor of the department of informatics and applied mathematics.

### **Project group members:**

Petrivskyi Yaroslav Borysovyh, Ph.D. (Doctor of Technical Sciences), professor.

Siaskyi Volodymyr Andriiovych, Ph.D. (Candidate of Technical Sciences), associate professor.

This program can not be fully or partially reproduced, replicated and distributed without the permission of Rivne State University of Humanities.

## II. General characteristics

<b>LEVEL OF HIGHER EDUCATION</b>	first (bachelor)
<b>DEGREE OF HIGHER EDUCATION</b>	Bachelor
<b>BRANCH OF KNOWLEDGE</b>	12 «Information technology»
<b>SPECIALTY</b>	122 «Computer sciences»
<b>Restrictions on forms of study</b>	no
<b>Educational qualification</b>	Bachelor of Computer Sciences
<b>Qualification in a diploma</b>	The degree of higher education – Bachelor Specialty – 122 «Computer sciences»
<b>Description of the subject area</b>	<p><i>Object(s) of study and/or activity:</i></p> <ul style="list-style-type: none"> <li>– mathematical, informational, simulation models of real phenomena, objects, systems and processes, subject areas, data representation and knowledge;</li> <li>– methods and technologies for obtaining, storing, processing, transmitting and using information, intellectual data analysis and decision making;</li> <li>– theory, analysis, development, evaluation of efficiency, implementation of algorithms, high-performance computing, including parallel computing and large data.</li> </ul>

	<p><i>Learning objectives:</i> training of specialists capable of conducting theoretical and experimental research in the field of computer science; apply mathematical methods and algorithmic principles in the modeling, design, development and maintenance of information technology; carry out the development, implementation and maintenance of intelligent systems for analysis and data processing of organizational, technical, natural and socio-economic systems.</p> <p><i>Theoretical content of the subject area:</i> modern models, methods, algorithms, technologies, processes and methods for receiving, representing, processing, analyzing, transmitting, storing data in information systems.</p> <p><i>Methods, methods and technologies:</i> mathematical models, methods and algorithms for solving theoretical and applied problems that arise during the development of information systems; modern technologies and programming platforms; methods of collecting, analyzing and consolidating distributed information; technologies and methods of designing, developing and ensuring the quality of components of information systems; methods of computer graphics and data visualization technology; technology knowledge engineering, CASE-technologies for modeling and designing information systems;</p> <p><i>Tools and Hardware:</i> CASE-technology for modeling and designing information systems; distributed computing systems; computer networks; cloud technologies, database management systems, operating systems.</p>
<b>Academic and professional rights of graduates</b>	They have the right to continue their education at the second (master's) level of higher education. Attainment of additional qualifications in the system of postgraduate education.

### III. The volume of ECTS credits required for the degree of Bachelor of higher education

The volume of the bachelor's educational program in the specialty 122 "Computer Science" is: on the basis of a junior bachelor 120 ECTS credits.

For the educational bachelor's degree on the basis of a junior bachelor's degree (educational qualification level "junior specialist"), the higher education institution has the right to admit and reissue no more than 120 ECTS credits received in the framework of the previous educational program for the preparation of a junior bachelor (junior specialist) in specialties within the branch, and not more than 60 ECTS credits received as part of the previous educational program for the preparation of a junior bachelor (junior specialist) in other specialties.

At least 50% of the educational program should be aimed at ensuring general and special (professional) competencies in the specialty defined by the standard of higher education.

### IV. Graduate Competency List

<b>Integral competence</b>	Ability to solve complex specialized tasks and practical problems in the field of computer science or in the learning process, provides for the application of theories and methods of information technology and is characterized by complexity and uncertainty of conditions.
<b>General competences</b>	<ol style="list-style-type: none"><li>1. Ability to think, analyze and synthesize abstract.</li><li>2. Ability to apply knowledge in practical situations.</li><li>3. Knowledge and understanding of the subject area and understanding of professional activity.</li><li>4. Ability to communicate in the state language both orally and in writing.</li><li>5. Ability to communicate in a foreign language.</li><li>6. Ability to learn and master modern knowledge</li><li>7. Ability to search, process and analyze information from various sources.</li><li>8. Ability to generate new ideas (creativity).</li><li>9. Ability to work in a team.</li><li>10. Ability to be critical and self-critical</li><li>11. Ability to make informed decisions.</li></ol>

	<p>12. Ability to assess and ensure the quality of work performed.</p> <p>13. Ability to act ethically.</p> <p>14. Ability to exercise their rights and obligations as a member of society, to recognize the values of a civil (free democratic) society and the need for its sustainable development, the rule of law, human and civil rights and freedoms in Ukraine.</p> <p>15. Ability to preserve and enhance the moral, cultural, scientific values and achievements of society based on an understanding of the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and in the development of society, engineering and technology, to use various types and forms of motor activity for outdoor activities and maintaining a healthy lifestyle.</p>
<p>Special (specialty, subject) competencies</p>	<p>SC1. Ability to mathematically formulate and investigate continuous and discrete mathematical models, justify the choice of methods and approaches for solving theoretical and applied problems in computer science, analysis and interpretation</p> <p>SC2. Ability to detect statistical patterns of undetermined phenomena, application of computational intelligence methods, including statistical, neural and fuzzy data processing, machine learning and genetic programming.</p> <p>SC3. Ability to think logically, draw logical conclusions, use formal languages and models of algorithmic calculations, design, develop and analyze algorithms, evaluate their efficiency and complexity, solvability and insolubility of algorithmic problems for adequate modeling of subject areas and creation of software and information systems .</p> <p>SC4. Ability to use modern methods of mathematical</p>

modeling of objects, processes and phenomena, to develop models and algorithms for numerical solution of mathematical modeling problems, to take into account the errors of approximate numerical solving of professional problems.

SC5. Ability to formally describe tasks of operations research in organizational, technical and socio-economic systems of different purpose, to determine their optimal solutions, to build models of optimal management in view of changes in economic situation, to optimize the processes of management in systems of different purpose and level of hierarchy.

SC6. The ability to think systematically, to apply systematic analysis methodology to investigate complex problems of various types, to formalize and solve systemic problems that have conflicting goals, ambiguities, and risks.

SC7. Ability to apply theoretical and practical foundations of modeling methodology and technology to study the characteristics and behavior of complex objects and systems, perform computational experiments with the processing and analysis of results.

SC8. Ability to design and develop software using different programming paradigms: generalized, object-oriented, functional, logical, with appropriate models, calculation methods and algorithms, data structures and control mechanisms.

SC9. Ability to implement a tiered computing model based on client-server architecture, including databases, knowledge, and data warehouses, to perform distributed processing of large datasets across clusters of standard servers to meet the computing needs of users, including cloud services.

	<p>SC10. Ability to apply methodologies, technologies and tools to manage the life cycle of information and software systems, products and services of information technology in accordance with customer requirements.</p> <p>SC11. Ability to data mining based on computational intelligence methods including big and poorly structured data, to process them promptly and to visualize analysis results in the process of solving application problems.</p> <p>SC12. Ability to provide the organization of computing processes in information systems for various purposes, taking into account the architecture, configuration, performance indicators of operating systems and system software.</p> <p>SC13. The ability to develop networked software that operates on different topologies of structured cabling systems uses computer systems and data networks and analyzes the quality of computer networks.</p> <p>SC14. Ability to apply information security methods and tools, to develop and exploit specialized software to protect the information resources of critical information infrastructure objects.</p> <p>SC15. Ability to analyze and functionally model business processes, construct and put into practice functional models of organizational-economic and production-technical systems, methods of risk assessment of their design.</p> <p>SC16. Ability to implement high-performance computing based on cloud services and technologies, parallel and distributed computing in the development and operation of distributed parallel processing systems information.</p>
--	---

**V. The normative content of the preparation of higher education applicants, formulated in terms of the learning outcomes**



- PR1. To apply knowledge of the basic forms and laws of abstract-logical thinking, the basics of the methodology of scientific knowledge, forms and methods of extraction, analysis, processing and synthesis of information in the subject area computer science.
- PR2. To use modern mathematical apparatus of continuous and discrete analysis, linear algebra, analytical geometry, in professional activity for solving the problems of theoretical and of application character in the process of designing and realization of informatization objects.
- PR3. Use knowledge of the laws of random phenomena, their properties and operations over them, models of random processes and modern software environments for solving statistical problems data processing and forecasting models.
- PR 4 Use methods of computational intelligence, machine learning, neural networking and fuzzy data processing, genetic and evolutionary programming to solve recognition tasks, forecasting, grading, identifying controls, and more.
- PR5. Design, develop and analyze algorithms for solving computational and logical problems, evaluate the efficiency and complexity of algorithms based on the use of formal models of algorithms and calculated functions.
- PR6. To use methods of numerical differentiation and integration of functions, solving of ordinary differential and integral equations, features of numerical methods and possibilities of their adaptation to engineering problems, to have skills of software implementation of numerical methods.
- PR7. Understand the principles of modeling of organizational and technical systems and operations; to use methods of operations research, solving single- and multiply criteria optimization problems of linear, integer, nonlinear, stochastic programming.
- PR8. Use the methodology of system analysis of objects, processes and systems for the tasks of analysis, forecasting, management and design of dynamic processes in macroeconomic, technical, technological and financial objects.

- PR9. To develop software models of subject environments, to choose a programming paradigm from the standpoint of convenience and quality of application for the implementation of methods and algorithms for solving problems in the field of computer science.
- PR10. Use client-server application development tools, design conceptual, logical and physical database models, develop and optimize queries for them, create distributed databases, repositories and showcases, knowledge bases, including on cloud services, using web programming languages.
- PR11. Have the skills of managing the life cycle of software, products and services of information technologies in accordance with the requirements and limitations of the customer, be able to develop project documentation (feasibility study, technical assignment, business plan, agreement, contract).
- PR12. Apply methods and algorithms of computational intelligence and data mining in the tasks of classification, forecasting, cluster analysis, finding associative rules using software tools to support multidimensional data analysis based on technologies DataMining, TextMining, WebMining.
- PR13. Be able to design user interfaces of information and artificial intelligence systems using computer graphics, animation and design technologies.
- PR14. Knowledge of system programming languages and application development methods that interact with computer system components, know networking technologies, computer network architectures, have practical computer network administration technology and their software.
- PR15. To apply knowledge of methodology and CASE-tools for designing complex systems, methods of structural analysis of systems, object-oriented design methodology in the development and research of functional models of organizational, economic and industrial systems..
- PR16. Understand the concept of information security, the principles of secure software design, and ensure the security of computer networks in the context of incompleteness and uncertainty of the source data.

PR17. Perform parallel and distributed computations, apply numerical methods and algorithms for parallel structures, parallel programming languages for the development and operation of parallel and distributed software.

### VI. Certification forms of applicants for higher education

<b>Certification forms of applicants for higher education</b>	Certification is carried out in the form of protection of qualification work
<b>Requirements for qualification work</b>	<p>Qualification work should include theoretical, systems engineering or experimental research of a complex specialized task or practical problem in the field of computer science, characterized by complexity and uncertainty of conditions and requires the application of information technology theories and methods.</p> <p>There should not be academic plagiarism, falsification and fabrication in the qualification work.</p> <p>Qualification work should be published on the official website of the university or its structural unit, or in the repository of a higher education institution.</p>

### VII. Requirements for the existence of an internal quality assurance system for higher education

Rivne State University of Humanities operates the system of quality assurance of educational activity and quality of higher education (Center for Quality of Education), which provides for the implementation of such procedures and activities:

- 1) determination of principles and procedures for ensuring the quality of higher education;
- 2) monitoring and periodic review of educational programs;
- 3) annual assessments of applicants for higher education, scientific and pedagogical and pedagogical workers of a higher educational institution and the regular publication of the results of such evaluations on the official website of a higher educational institution, on information stands and in any other way;
- 4) providing advanced training for pedagogical, scientific and scientific-pedagogical staff;
- 5) ensuring the availability of the necessary resources for organizing the educational process, including the independent work of students, for each educational program;

- 6) ensuring the availability of information systems for the effective management of the educational process;
- 7) ensuring publicity of information on educational programs, degrees of higher education and qualification;
- 8) the development of the practice of academic virtue, in particular, the provision of an effective system to prevent and detect academic plagiarism in the scientific work of employees of higher educational institutions and applicants for higher education;
- 9) other procedures and activities.

The quality assurance system of higher education and quality (Higher Education Quality Center), as submitted by the RSUH, is evaluated by the National Higher Education Quality Agency or by accredited independent higher education quality assurance agencies for compliance with the requirements of the approved higher education quality assurance system, the National Agency for the Quality Assurance of Higher Education, and international standards and recommendations for the quality assurance of higher education.