MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

RIVNE STATE UNIVERSITY OF HUMANITIES

EDUCATIONAL –AND PROFESSIONAL PROGRAM

«Computer sciences»

The first level of higher education

for the specialty 122 «Computer sciences»

areas of knowledges 12 «Information technologies»

Qualification: 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. Postolovskyy R.M.
(protocol № 8 dated «20» june 2017)

ogram is introduced
with "31"_____ 2018
Rektor RSHU
_____ prof. Postolovskyy R.M.
(order № 158-01-01 dated «31» august 2017)

Rivne - 2017

PREFACE

Educational professional bachelor's program in specialty 122 «Computer sciences» was developed for the introduction as the Standard of higher education at the appropriate level of higher education by the project team of the Rivne State University of Humanities composed of:

Project team leader(educational program guarantor):
Klimyuk Y. E., Ph.D. (Candidate of Technical Sciences), associate professor of the department of informatics and applied mathematics;

Project team members:
Bomba A. J., Ph.D. (Doctor of Technical Sciences), professor, Head of the department of informatics and applied mathematics;
Gavrilyuk V. I., Ph.D. (Candidate of Technical Sciences), associate professor of the department of informatics and applied mathematics;
Shinkarchuk N. V., Ph.D. (Candidate of Technical Sciences), associate professor of the department of information and communication technologies and methods of teaching informatics.

1. Profile of educational program in specialty 122 "Computer Science"

1 – General information	
Full name of higher educational institution and structural unit	Rivne State University of Humanities; Faculty of Mathematics and Informatics; Department of Informatics and Applied Mathematics
The degree of higher education and the name of the qualification in the language of the original	Bachelor Bachelor of Computer Sciences, specialist in computer science
The official name of the educational program	Computer Sciences
Type of diploma and the volume of the educational program	Bachelor's degree. Unitary. 240 credits ECTS / 4 years
Availability of accreditation	Certificate of Accreditation series НД № 1889769. Valid until July 1 2027 p. Order by MES №658, from 27.04.2017 p.
Cycle / Level	NQF of Ukraine – 6 level, FQ-EHEA – first cycle, EQF-LLL – 6 level
Prerequisites	Availability of educational qualification level "Junior Specialist"
Teaching language(s)	Ukrainian language
The duration of the educational program	Prior to the introduction of the higher education standard but not more than 5 years
Internet address of the permanent description of the educational program	www.fmi-rshu.org.ua
2 – The purpose of educational program	
Training of specialists capable: to apply modern mathematical methods, models, algorithms and software for studying and analyzing processes and systems in various subject areas; to solve complex specialized tasks in professional activity, which involves the application of mathematical theories, fundamental and applied methods of analysis and synthesis, and characterized by complexity and uncertainty of conditions; to carry out, on the basis of scientific and mathematical principles, the design, analysis, verification, validation, implementation and maintenance of computer software, using different machine languages; Be prepared for the successful mastering of more complex programs for researchers and developers of information management systems, artificial intelligence systems, IT project management, information technology design, technology for automated design of microsystems, system design.	
3 – Characteristics of the educational program	
Subject area (area of knowledge, specialty, specialization (if available))	12 «Information Technology» 122 «Computer Science» *The object of the study* is methods, models, algorithms and software that are intended for research, analysis, designing of phenomena, processes and complex systems in the subject areas related to the development, maintenance and operation of computer information systems, in particular: • mathematical, informational, simulation models of real phenomena, objects, systems and processes; • data representation models and knowledge models; • models, methods and technologies for obtaining, storing

	processing, transmitting and using information; • theory, analysis, development, evaluation of efficiency, implementation of algorithms; • methods and algorithms of operational multidimensional and intellectual data analysis and decision making; • high-performance computing, including parallel computing and large data; • system analysis of objects and processes of computerization; • models of subject areas and methods of constructing intelligent systems based on knowledge and decision-making technologies; • methods and algorithms for recognizing sensory signals, sounds, images and images; • mathematical provision of automated information and management systems, and information support of the life cycle of industrial products, software systems and complexes, decision support systems; • mathematical and software process automation project work, data visualization technology; • linguistic, informational and software systems for various purposes. . *Objects and means of professional activity:* • programs and software components of information systems; • languages and systems of programming of business applications; • tasks for modification, optimization and development of business applications; • tools for documenting, describing, analyzing and modeling information and communication processes in information systems; • tools for project management; • standards and methods of organization management, accounting and reporting at enterprises; • standards and methods of information interactions of systems; • design and development of information technologies in the market infrastructure; • development of cloud-based web services, cloud storage, cloud-based offices for education, science and business; • development of algorithmic and software of distributed systems and parallel computing; • development of intelligent decision support information systems; • monitoring and management of virtual infrastructures. *Learning objectives:* training specialists able to apply mathematical foundations, algorithmic principles in modeling, design, development and maintenance of information systems and technologies; to develop, implement and maintain intelligent systems for analysis and data processing in organizational, technical, natural and socio-economic systems.

	Theoretical content of the subject area: modern models, methods, algorithms, technologies, processes and methods for receiving, representing, processing, analyzing, transmitting, storing data in information systems in order to systematize them and identify the necessary facts of information nature. *Methods, techniques and technologies:* mathematical models, methods and algorithms for solving theoretical and applied problems that arise when developing information systems; modern technologies and programming platforms; methods for collecting, analyzing and consolidating distributed information; technologies and design methods, development and quality assurance of the component information systems; methods of computer graphics and data visualization technologies; technology of knowledge engineering. *Tools and Hardware:* CASE-technology for modeling and designing information systems; distributed computing systems; computer networks; cloud technologies, database management systems, operating systems.
Orientation of the educational program	Educational and professional for bachelor, based on readiness to acquire knowledge, to form skills and abilities in computer sciences, mathematical and computer simulation of processes and systems of various nature, problems of forecasting, designing, optimization, system analysis and decision making, analysis and the synthesis of data and knowledge, etc.
The main focus of the educational program and specialization	General education in specialty 122 "Computer Science", as well as the ability to analyze, systematize and generalize existing information in decision-making tasks, transform complex tasks into simple ones and solve them using a mathematical apparatus. Key words: programming, information systems, computer networks, system analysis, mathematical modeling, intellectual systems, software engineering.
Features of the program	Multi-vector training of specialists in computer simulation, development and operation of information systems of various purposes. The educational program is developed taking into account the experience of training computer science specialists at leading domestic and foreign universities and training of scientific personnel from related specialties in the system of institutes of the National Academy of Sciences of Ukraine and national research universities, as well as many years of experience in training specialists specializing in «Informatics».
4 – Eligibility of graduates for employment and further training	
Suitability for employment	Specialists in computer science have the necessary knowledge for designing information systems, networks and computer programs. Own the means of information technology; computer simulation of control systems; computer systems design, computer intelligent decision making systems. Bachelor is trained as a broad-profile specialist to participate in a variety of fields requiring basic knowledge in mathematics, physics, computer science, natural sciences, humanities and socio-economic disciplines. The specialist is focused on solving problems of analysis and synthesis of complex systems on the basis of the latest information technologies, using modern achievements of fundamental and engineering sciences. Bachelor in specialty 122 "Computer Science" can be involved in the following types of economic activity (according to the State

	Classifier of the types of economic activity of the SC 009:2010): **62.01 Computer programming:** • development of standard software: creation, issue and sale (sale, rental and (or) licensing) of system software packages, service and gaming programs; • development of custom software (custom) and adaptation of software packages to specific user needs; • software development and provision of appropriate advice; **62.02 Advice on informatization:** • provision of services for system analysis, programming and maintenance, as well as specialized services in the field of informatization, not belonging to other groups; **62.03 Activities on management of computer equipment:** • Providing advice on the type and configuration of computer hardware and software utilization: analyzing user information needs and finding the most optimal solutions; **62.09 Other activities in the field of information technology and computer systems:** • Providing advice on software development and assistance in the technical aspects of computer systems; **63.11 Processing data, placing information on the Web-sites and related activities:** • operation on a long-term basis of computer equipment belonging to other users; • providing data in a specific order or sequence by selecting them or directly accessing data (automated data management); • providing a place on the web; • processing data using user software or their own software; • complete processing, preparation and data entry; • search the web; • publication of any information on the Internet; • development of web pages; • database creation online; • Creation of directories, address lists, etc.; • activity associated with portals on the web. Specialists in computer science are capable of performing the following professional work (by the State Classifier of professions SC 003:2010) and may hold primary positions: • 3114 Technician of computer systems configuration; • 3114 Technician of the computing (information and computing) center; • 3119 Trainee researcher; • 3119 Laboratory assistant; • 3119 Technician in the field of information security; • 3121 System Administrator; • 3121 Technician-programmer; • 3121 Information Technology Specialist; • 3121 Specialist in computer graphics and design; • 3121 Specialist in software development and testing; • 3121 Specialist in the development of computer programs;

	• 3132 Specialist in telecommunication engineering; • 3132 Operator of radio and telecommunication equipment; • 4112 Operator of machines for word processing and similar professions; • 4112 Operator of information and communication networks; • 4112 Computer set operator; • 4112 Computer imposition operator; • 4112 Operator of copying and duplicating machines; • 4112 Text stacker; • 4112 Encoder; • 4113 Data collection operator; • 4113 Operator of Information and Software Processing; • 4114 Operator of counting machines; • 4114 Data entry operator in ECM (CM).
Further training	НРК – 7 рівень, FQ-EHEA – другий цикл, EQF LLL – 7 рівень.
5 Teaching and assesment	
Teaching and learning	• organizational forms of training: *collective and integrative learning, etc.;* • learning technology: *passive (explanatory and illustrative); active (problem-oriented, interactive, informational and computer, self-developing, positional and context learning, technology of cooperation).* Teaching and learning is carried out in the form of: lectures, multimedia lectures, interactive lectures, practical classes, laboratory classes, independent studies, individual classes, consultations, preparation of course and diploma work, training through laboratory and industrial practices, etc
Assesment	• *types of control*: current, thematic, periodic, final, self-control; • *forms of control:* oral and written surveys, test control, laboratory and individual work protection, course work protection, defense of the report on industrial practice, certification (defense of the thesis or examination on specialty)*;* • *evaluation of student achievements is carried out* on a four-point scale - excellent, good, satisfactory, unsatisfactory and verbal - credited, not credited.
6 – Program competencies	
Integral competence	Здатність розв'язувати складні спеціалізовані задачі та практичні проблеми у різноманітних предметних областях професійної діяльності або у процесі навчання, що передбачає застосування математичних теорій та методів і характеризується комплексністю та невизначеністю умов.
General competences (GC)	1. Ability to think, analyze and synthesize abstract. 2. Ability to apply knowledge in practical situations. 3. Knowledge and understanding of the subject area and understanding of professional activity. 4. Ability to communicate in the state language both orally and in writing. 5. Ability to communicate in a foreign language. 6. Skills in the use of information and communication technologies. 7. The ability to conduct research at the appropriate level. 8. Ability to learn and master modern knowledge. 9. Ability to search, process and analyze information from various

	sources. 10. Ability to be critical and self-critical. 11. Ability to adapt and act in a new situation. 12. Ability to generate new ideas (creativity). 13. Ability to identify, put and solve problems. 14. Ability to make informed decisions. 15. Ability to work in a team. 16. Skills of interpersonal interaction. 17. Ability to communicate with representatives of other professional groups of different levels (with experts from other branches of knowledge / types of economic activity). 18. Ability to design and manage projects. 19. Safety skills. 20. Ability to assess and ensure the quality of work performed. 21. Determination and persistence on the tasks and duties taken.
Professional competence of the specialty (PC)	1. Ability to solve applied tasks in the field of protected information and telecommunication technologies and systems. Ability to design information systems, including a formal description of their structure and conduct business process simulation 2. Ability to design the architecture of the system, implementation, integration of information systems. 3. Ability to automate designing on the basis of modern CAD / CAM / CAE systems and modern IT technologies. 4. Ability to implement methods, algorithms, simulation technologies for studying the characteristics and behavior of complex objects in the process of designing information systems. 5. Ability to design and develop operational models and carry out operational studies in the process of analysis and synthesis of information systems of various purposes. 6. Ability to use modern computer technologies for system, functional, design and technological design of complex objects and systems. 7. Develop methodological and normative documents, proposals and implement measures on the implementation of developed projects and programs. 8. Ability to solve problems of scalability, support remote components and interaction of different software platforms in distributed corporate information systems enterprise level. 9. The ability to detect previously unknown knowledge necessary for decision making in various areas of professional activity and store them in data warehouses. 10. Ability to develop plans and programs for organizing innovation in the enterprise, assess innovation and technological risks in the implementation of new technologies, organize training and training of employees of units in the field of innovation activities and coordinate the work of personnel in the integrated solution of innovation problems. 11. Ability to provide protection and assessment of the value of intellectual property objects. 12. Ability to organize work to improve the scientific and technical knowledge of workers; to organize the development of creative initiative, the implementation of the achievements of domestic and foreign science, technology, the use of best practices, ensuring the

	effective work of the unit, enterprises. 13. Ability to provide knowledge of standards, methods and tools for managing the processes of the life cycle of information systems, products and services of information technology. 14. Ability to publicly present their own and well-known scientific results of production and technological activities. 15. Ability to use methods of mathematical and algorithmic modeling in solving theoretical and applied problems. 16. Ability to pass the result of the conducted physical-mathematical and applied research in the form of concrete recommendations, formulated in terms of the subject area of the phenomenon studied. 17. Ability to apply and develop fundamental and interdisciplinary knowledge, including modern methods of discrete mathematics, probabilistic-statistical methods, mathematical methods of operations research, artificial intelligence, mathematical and algorithmic modeling, substantiation and acceptance of managerial and technical solutions for successful solving of professional tasks. 18. Ability to participate in the work of research seminars, conferences, symposiums, presentation of their own scientific achievements, preparation of scientific articles, scientific and technical reports. 19. Ability to process general scientific and technical information, bring it to the problem-task form, analysis and synthesis of information. 20. Ability to solve applied tasks in the field of protected information and telecommunication technologies and systems.
7 – Program learning outcomes	
	1. Specialized conceptual knowledge gained in the process of learning and / or professional activity at the level of the latest achievements, which are the basis for original thinking and innovation, in particular in the context of research work, a critical understanding of problems in teaching and / or professional activities, and on the boundary between substantive industries. 2. Theoretical and practical bases of the methodology of system analysis, CASE-technology for the design of information and software systems, modern methods of mathematical and computer modeling, data visualization. 3. Methods and approaches for designing the architecture of information systems, programming languages and modern technologies for the development of information systems, CAD / CAM / CAE systems for automated design and modern IT technologies, methodologies for automated design of complex objects and systems, basic methods for analyzing requirements and software design. 4. Theoretical and practical bases of methodology and modeling technology in the process of research, design and operation of information systems, products, services of information technologies, other objects of professional activity. 5. General methodological principles of construction of operating models, main stages and essence of operational research and their ability to apply them in the analysis and synthesis of information systems of various purposes and in the tasks of organizational and economic management.

	6. Types of reporting of the subject area of informatization and automation, requirements for scientific publications and rhetoric, tools for designing and demonstration of scientific results. 7. Knowledge of architecture and standards of component models, communication tools and distributed computing, concepts of data warehouses, methods for their prompt processing. 8. Legal aspects of intellectual property protection; criminal liability for violation of intellectual property rights; systems for preventing and detecting academic plagiarism, means of ensuring information security and data integrity in accordance with the solvable problem 9. Knowledge of new technologies, techniques and paradigms; achievements of domestic and foreign science; bases of production management and organization of innovative activity at the enterprise. 10. Ability to solve complex problems and problems requiring updating and integration of knowledge, often under conditions of incomplete / insufficient information and contradictory requirements, research and / or innovation activities. 11. Skills to apply the principles of system analysis of objects and automation processes, the use of state and international standards in the field of information technology in the design and development of information systems, their architecture, information and software, the use of CASE tools during design and modeling of business- processes and software development of information systems. 12. Ability to apply CAD / CAM / CAE systems of automated designing and modern IT technologies, to model systems and processes, conditions and behavior of complex informatization objects in the process of designing information systems and technologies. 13. Ability to develop operational models and carry out operational research in the process of analysis and synthesis of information systems of various purposes, possession of modern technologies for the automation of the design of complex objects and systems, products and services of information technology, modern paradigms and programming languages. 14. Skills to solve the problem of scalability, support of remote components and interaction of different software platforms in distributed corporate information systems at the enterprise level, application of technology of work with data warehouses, their analytical processing and intelligent analysis to ensure the reliable operation of information systems. 15. To develop plans and programs of organization of innovative activity at the enterprise; to evaluate innovative and technological risks when introducing new technologies; organize training and training of the employees of the units in the field of innovation activity and coordinate the work of the personnel in the complex decision of innovative problems. 16. To provide protection and assessment of the value of objects of intellectual activity; to be responsible for academic plagiarism. 17. To organize work on improving the scientific and technical knowledge of workers; to organize the development of a creative initiative, the implementation of the achievements of domestic and

	foreign science, technology, the use of excellence, which ensure the effective work of the unit, enterprise; select users to learn information systems. 18. Skills of presentation of own and well-known scientific results of production and technological activities, preparation of scientific articles, scientific and technical reports, their application in the development and integration of systems, products and services of information technology. 19. Ability to apply and develop fundamental and interdisciplinary knowledge to substantiate and make managerial and technical decisions for the successful resolution of professional tasks. 20. Ability to use hardware and software information security and integrity of data in information systems, mathematical methods of substantiation and adoption of managerial and technical solutions that are adequate to the conditions in which the objects of information processing function. 21. A clear and unambiguous statement of their own conclusions, as well as knowledge and explanations that justify them, to specialists and non-specialists, in particular to the persons who study. 22. Use of foreign languages in professional activities. 23. Decision-making in complex and unpredictable conditions requiring new approaches and forecasting. 24. Responsibility for the development of professional knowledge and practice, assessment of the strategic development of the team. 25. Ability to further education, which is largely autonomous and independent.
8 – Resource support for program implementation	
Кадрове забезпечення	Conducting lectures on educational disciplines by scientific and pedagogical workers of the corresponding specialty having a degree and / or academic rank and working at their main place of work is more than 50% of the number of hours determined by the curriculum..
Material and technical support	Material and technical support meets the licensing requirements for providing educational services in the field of higher education and is sufficient to ensure the quality of the educational process..
Information and educational-methodical support	Informational and teaching-methodological support of the educational program for the training of specialists in specialty 122 Computer science meets the licensing requirements and is sufficient to ensure the quality of the educational process.
9 – Academic mobility	
National credit mobility	On the basis of bilateral agreements between Rivne State University of Humanitaries and higher educational establishments and scientific institutions of Ukraine..
International Credit Mobility	On the basis of bilateral agreements between Rivne State Humanities University and foreign educational institutions.
Training of foreign applicants for higher education	Possible.

3. Form of certification of applicants for higher education

Attestation of the student is carried out by an examination commission on completion of studies at educational level for establishment of actual accordance of level of preparation to the requirements of the educational program. The student will be certified according to the system of programmatic results of studies, that is determined in the educational program of training the specialist. Form of attestation: defense of bachelor diploma work or state examination.

Diploma work provides for realization of analysis and theoretical development (design and research of processes and objects) of actual questions, problems in the corresponding field of knowledge. List of themes of diploma works from speciality is determined by a graduation department at the beginning of an academic year. The subjects of diploma works must be directly related to the generalized object of activity of specialist of corresponding educational level. The list of themes is approved by the rector's before the pre-diploma practice. Students have the right to offer the own theme of diploma work for consideration.

Supervisors of diploma works can be professors, associate professors, senior teachers of graduation department, and also leading specialists in productive sphere of corresponding industry.

Attestation of graduates of baccalaureate is carried out by the examination commission. The representatives of employers and their associations can be included, in accordance with the position about the examination commission, approved by academic council RSHU.

6. The system of the internal providing of quality of higher education

The system of providing quality of educational activity and higher education (the system of internal providing activity) by the higher educational establishment functions in Rivne State University of Humanities and it foresees the realization of such procedures and measures:

1) determination of principles and procedures of providing quality of higher education;

2) realization of monitoring and periodic revision of the educational programs;

3) an annual assessment of graduates scientific and pedagogical employees of a higher educational establishment and regular promulgation of the results of such assessments are on the official web site of the higher educational establishment, on informative stands and in any other way;

4) providing certification training of pedagogical, research and scientific and pedagogical employees;

5) providing availability of necessary resources for the organization of educational process, including individual work of graduates on every educational program;

6) providing availability of informative systems for effective educational process control;

7) providing publicity of information about the educational programs, degrees of higher education and qualification;

8) providing the effective system of preventing and revealing academic plagiarism in scientific works of higher educational establishments employees and their graduates;

9) other procedures and measures.

The system of providing quality of educational activity and quality of higher education by higher educational establishment (system of the internal providing quality) can after presentation the Rivne State University of Humanities be assessed by the National agency in providing quality of higher education or independent establishments of assessment and providing quality of higher education accredited by it in the accordance with the system requirements providing qualities of higher education, which are approved by the National agency in providing quality of higher education, and with the international standards and recommendations for providing quality of higher education.

Guarantor of the educational program,
the project group leader associate professor Klimyuk Yu.E.