MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

RIVNE STATE UNIVERSITY OF HUMANITIES

EDUCATIONAL AND PROFESSIONAL PROGRAM

"Applied mathematics"

The first level of higher education

DEGREE OF HIGHER EDUCATION Bachelor
BRANCH OF KNOWLEDGE 11 Mathematics and Statistics
SPECIALTY 113 "Applied Mathematics"
QUALIFICATIONS: Bachelor of Applied Mathematics, Specialist in the field of applied mathematics

APPROVED
by academic council of the Rivne State University of Humanities
Chairman of academic council of the RSHU

_____ prof. Postolovskyi R.M.
(protocol № 2 dated «27» February 2020)

Educational program is introduced with 01.09.2020

Rektor RSHU

_____ prof. Postolovskyi R.M.
(order № 40-01-01 dated 27.02.2020)

Rivne – 2020

PREFACE

The educational and professional program is developed on the basis of the Standard of Higher Education of Ukraine: the first (bachelor) level, the branch of knowledge “11 Mathematics and Statistics”, the specialty “113 Applied Mathematics” by the project group of the Rivne State University of Humanities composed of:

project team leader (guarantor of the educational program):
Moroz Igor, Ph.D., Associate Professor;
project team members:
Syaskyi Andrii, Doctor of Technical Sciences, Professor;
Shakhraichuk Mykola, Ph.D., Associate Professor.

1. Profile of educational program in specialty 113 "Applied Mathematics"	
1. General information	
Full name of higher educational institution	Rivne State University of Humanities
The degree of higher education and the name of the qualification in the language of the original	Bachelor of Applied Mathematics, Specialist in the field of applied mathematics
The official name of the educational program	Applied Mathematics
Type of diploma and the volume of the educational program	Bachelor's degree, unit / 120 credits ECTS / 1 years 10 months
Accreditation	Certificate of Accreditation (series НД №1889767). Validity period until 01.07.2027
Cycle / Level	NQF Ukraine - level 6, FQ-EHEA - first cycle, EQF-LLL - level 6
Prerequisites	General secondary education
Language (s) of teaching	Ukrainian
The term of the educational program	For the period of study (2020 - 2024)
Internet address for the placement of a description of the educational program	http://www.rshu.edu.ua/navchannia/osvitni-prohramy/bakalavr
2. The purpose of the educational program	
Formation of the personality of a specialist who is able to formulate, solve and generalize practical problems within the framework of professional activity using fundamental and special applied methods of mathematics and computer science and develop mathematical models, algorithms, create and exploit software.	
3. Characteristics of the educational program	
Subject area	**Objects of study and activity**: mathematical methods, models, algorithms and software intended for research, analysis, design of processes and systems in various specific subject areas. **Learning objectives**. Training of specialists capable of: – to formulate and to solve practical problems in professional activity using competences from fundamental and special mathematical and computer sciences; – to develop mathematical models, algorithms, create and exploit software. **The theoretical content of the subject area.** **Basic concepts** of applied mathematics: mathematical methods, algorithms, mathematical and computer simulations. **The concept** of applied mathematics is a description of the problem or problem by mathematical means, the construction of a mathematical model, the study and solving of a formalized problem using analytical or numerical mathematical methods and corresponding software, checking the adequacy and correctness of the model, interpreting and practical application of the results. **Principles** - application and development of mathematical methods, algorithms

	in scientific and practical spheres of activity. **Methods, techniques and technologies:** – applied mathematical methods and algorithms; – methods of solving scientific, technical and socio-economic problems with the help of specialized software; – information technologies for conducting computer simulation and computing experiment, intelligent data analysis. **Tools and equipment:** – computer, computer and information networks, specialized software.
Orientation of the educational program	Educational and professional
The main focus of the program	Emphasis on providing students with the necessary knowledge and skills for analyzing processes and systems, building relevant mathematical models and studying them using mathematical tools and modern software.
Features of the program	Multi-vector training of mathematical and computer modeling specialists.
4. Eligibility of graduates for employment and further education	
Eligibility for employment	**The acquired knowledge and skills allow you to work in positions:** 3434 Assistant mathematician, actuary 3119 Intern trainee 3119 Laboratory (Engineering) 3119 Technician (information protection sphere) 3491 Laboratory of the scientific division (other fields (branches) of scientific research) 3121 System Administration Technician 3121 Technician-programmer 3121 Specialist in Software Development and Testing 3121 Specialist in the development of computer programs 3121 IT Specialist 3121 Specialist in computer graphics and design 3114 Technique for configuring a computer system 3114 Technician of the computing (information-computing) center 3212 Technician (natural sciences)
Further education	Continuing education for obtaining a second (master's) level of higher education.
5. Teaching and evaluation	
Teaching and learning	- **Organizational forms of learning**: collective and integrative learning, etc. - **Learning technologies**: passive (explanatory and illustrative) active (problem, interactive, information-computer, self-developing, positional and contextual learning, technology cooperation).
Assessment	- **Types of control**: current, thematic, periodic, summary, self-control. - **Forms of control**: oral and written surveys, test control, laboratory and individual work protection, course work protection, production practice report, certification (defense of a thesis or a specialty examination). - **Assessment** of students' academic achievements is carried out on a four-level scale - excellent, good, satisfactory, unsatisfactory and verbal - credited, not credited.

6. Competencies of program	
Integral competence (IC)	
IC 1.	Ability to solve complex specialized problems and practical problems of applied mathematics in professional activity or in the process of learning, which involves the application of mathematical theories and methods and is characterized by complexity and uncertainty of the conditions.
General Competencies (GC)	
GC 1.	The ability to learn, acquire new knowledge, skills, including in in an area, other than professional.
GC 2.	The ability to apply the professional knowledge and the skills in practice.
GC 3.	The ability to generate new ideas, adapt flexibly to various professional situations, show creativity, initiative.
GC 4.	The ability to critically evaluate and rethink the accumulated experience (one's own and another's), to analyze one's professional and social activities.
GC 5.	The ability to carry out research activities, including analysis of problems, selection of research methods and methods, as well as assessment of the quality of results.
GC 6.	The ability for abstract thinking, analysis and synthesis.
GC 7.	The ability to work with information: to find, analyze and use information from various sources necessary for solving the professional problems.
GC 8.	Knowledge and understanding of the subject area, understanding of professional activities, the ability to use basic knowledge in the field of exact, natural, social, humanitarian and economic sciences in the professional activities.
GC 9.	The ability to effectively use computer and information technologies in the professional activities.
GC 10.	The ability to work in a team and mastery of interpersonal skills.
GC 11.	The ability to carry out industrial or applied activities in the international environment.
GC 12.	The ability to consciously define the goals in the professional and personal development, certainty and perseverance in relation to the tasks and responsibilities.
GC 13.	The ability to social and professional interaction and cooperation, to exercise their rights and obligations as a member of society; the awareness of the value of civil (free democratic) society and the need for its sustainable development, the rule of law, the human and civil rights and freedoms in Ukraine.
GC 14.	The ability to preserve and enhance the moral, cultural, scientific values and achievements of the 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 physical activity for outdoor activities and maintaining a healthy lifestyle.
GC 15.	The ability to communicate with representatives of other professional groups of different levels (with experts from other areas of knowledge / types of economic activity). The ability to design and manage projects.
Professional competencies (PC)	
	Activities using mathematical methods
PC 1.	The ability to use and adapt the mathematical theories, the methods and techniques to prove the mathematical statements and theorems.
PC 2.	The ability to mathematically formalize formulation of the problems.
PC 3.	The ability to choose and apply the mathematical methods to solve the practical problems of the research, modeling, analysis, design, management, forecasting, decision making.
	Activities involving information technology
PC 4.	The ability to develop the algorithms and data structures, the software and software documentation.
PC 5.	The ability to design the databases, information systems and resources.
PC 6.	The ability to work with the computer equipment, computer networks and the Internet in the

environment of modern operating systems using the standard office applications.

PC 7. The ability to operate and maintain the software for the automated and information systems for various purposes.

PC 8. The ability to use the modern technology for the programming and testing software.

PC 9. Ability to carry out the mathematical and computer modeling, the analysis and data processing, computational experiment, the solution of formalized problems using specialized software.

Organizational and management activities

PC 10. The ability to create the established reporting documents using the regulatory documents.

PC 11. The ability to organize the work of a team of performers, make the appropriate and economically sound organizational and managerial decisions, and ensure the safe working conditions.

Research activities

PC 12. The ability to search, systematic study and analysis of scientific and technical information, domestic and foreign experience associated with the use of the mathematical methods to study various processes, phenomena and systems.

PC 13. The ability to understand the statement of tasks formulated by the language of a particular subject area, to search and collect the necessary source data.

PC 14. The ability to formulate a mathematical statement of the problem, relying on the statement of the problem in the language of a particular subject area, and choose a method for solving it, which ensures the necessary accuracy and reliability of the result.

PC 15. The ability to participate in the preparation of scientific reports on research and development and in the implementation of the results of research and development.

PC 16. The ability for effective professional written and oral communication in the state language and one of the common European languages.

7 Program Learning Outcomes (PLO)

1. The demonstration of the knowledge and understanding of basic concepts, principles, theories of fundamental and applied mathematics, as well as their use in practice.
2. The mastery of the basic principles and methods of mathematical, complex and functional analysis, linear algebra and analytical geometry, the theory of differential and integral equations, in particular equations of mathematical physics, probability theory, mathematical statistics and random processes, numerical methods, optimization and data analysis methods.
3. The ability to formalize the tasks formulated by the language of a particular subject area; to formulate their mathematical formulation, build mathematical models and choose rational methods for their implementation; solve formulated problems by analytical and numerical methods, evaluate the accuracy and reliability of the results.
4. Performing of the mathematical description, analysis and synthesis of discrete objects and systems using the concepts and methods of discrete mathematics and theory of algorithms.
5. To be able to develop and use in practice methods related to the approximation of functional dependencies, numerical and graphical differentiation and integration, solving systems of algebraic, differential and integral equations, solving boundary value problems, and finding optimal solutions.
6. To carry out the analytical study of mathematical models of objects and processes for the existence and uniqueness of their solution.
7. To carry out research and find solutions to incorrect problems using The regularization methods.
8. To develop mathematical models of problems in the form of systems of differential equations using the method of analogies and dimensional theory.
9. To combine the mathematical and computer simulation methods with informal expert analysis procedures to find optimal solutions.
10. To build the algorithms effective for computational accuracy, stability, speed and consumption of system resources for the numerical study of mathematical models and solving practical problems.
11. To choose the rational methods and algorithms for solving mathematical problems of optimization, operations research, optimal control and decision making, data analysis.

12. To be able to apply the modern technologies of programming and software development, software implementation of the numerical and symbolic algorithms.
13. To solve the individual engineering problems and the tasks in interdisciplinary areas - sociology, economics, ecology and medicine.
14. To use in practice the specialized software products and computer mathematics software systems.
15. To identify the ability to learn and improve.
16. Be able to organize their activities and get results within a limited time.
17. The ability to work independently and in a team, to subordinate personal interests to a common goal.
18. To be able to collect, process, analyze and systematize scientific and technical information, while avoiding plagiarism.
19. The ability to effectively interact with others thanks to an understanding of oneself and others with the constant modification of mental states, interpersonal relationships and social conditions.
20. To collect and interpret relevant data and analyze the difficulties within their specialization to make judgments that reflect relevant professional social and ethical issues.
21. To demonstrate professional communication skills, including oral and written communication in the state language and in at least one of the common European languages.

8. Resource support	
Personnel support	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; who have a Ph.D. degree or a professor's degree - more than 25% .
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 **teaching-methodological** support	Information and educational and methodological support of the educational program for the training of specialists of specialty 113 Applied mathematics 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 Humanities and higher educational establishments and scientific institutions of Ukraine.
International Credit Mobility	On the basis of bilateral agreements between Rivne State University of Humanities and foreign educational institutions.
Teaching foreign applicants for higher education	Possible.

3. Form of certification of applicants for higher education

Certification of graduates of the educational program of specialty 113 Applied mathematics is carried out in the form of defence of the qualification bachelor's work and ends with the issuance of the document of the established sample on awarding it a bachelor's degree with the qualification: bachelor of Applied Mathematics.

The certification is carried out openly and publicly.

Forms of certification of	The certification of graduates of the educational and profes-

applicants for higher education	sional program "Applied Mathematics" of specialty 113 "Applied Mathematics" is carried out in the form of: – public defence of the bachelor's work.
Requirements for qualification work and its public defence	The qualification thesis is a scientific and research work of a higher education applicant, carried out at the final stage of obtaining the bachelor's degree in applied mathematics to establish compliance with the general and special competencies (results of studies) received by applicants for higher education.

6. The system of internal quality assurance in higher education

The Rivne State University of Humanities has a system for providing higher education institutions with quality education and higher education quality (internal quality assurance system), which provides for the following procedures and measures:

1) definition of principles and procedures for ensuring the quality of higher education;

2) monitoring and periodic review of educational programs;

3) the annual assessment of higher education graduates, scientific and pedagogical and pedagogical staff of a higher educational institution, and regular publication of the results of such assessments on the official website of the higher educational institution, on information stands and in any other way;

4) ensuring the professional development of pedagogical, scientific and scientific and pedagogical workers;

5) ensuring the availability of the necessary resources for the organization of the educational process, including the independent work of applicants for higher education for each educational program;

6) ensuring the availability of information systems for the effective management of the educational process;

7) ensuring publicity of information about educational programs, degrees of higher education and qualifications;

8) providing an effective system for preventing and detecting academic plagiarism in scientific works of higher education and higher education graduates;

9) other procedures and measures.

The system of providing higher education institutions with the quality of educational activity and the quality of higher education (the system of internal quality assurance) may, upon submission by the Rivne State University of Humanities, be assessed by the National Agency for the Quality Assurance of Higher Education or independent institutions accredited by it, for the assessment and quality assurance of higher education on the subject of its compliance with the requirements systems of quality assurance in higher education, approved by the National Agency for the Quality Assurance of Higher Education, and international standards and guidelines for quality assurance.

Guarantor of the educational program,
project team leader Associate Prof. I. P. Moroz