

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

**EDUCATIONAL AND PROFESSIONAL PROGRAM  
"APPLIED MATHEMATICS"**

**The first level of higher education  
in specialty 113 Applied Mathematics  
Branch of knowledge 11 Mathematics and Statistics  
Qualification: Bachelor of Applied Mathematics, Specialist  
in the field of applied mathematics**

Approved by the Academic Council for the Rivne State University  
of Humanities  
Chairman of the Academic Council

\_\_\_\_\_ prof. Postolovskyi R.M.  
(Protocol No. 8 dated "29" 06 20 17)

The educational program is introduced with 01.09. 20 17.

The rector \_\_\_\_\_ prof. Postolovskyi R.M.  
(Order No. 158-01-01 dated "31" 08 20 17)

**LETTER OF AGREEMENT**  
**educational and professional program**

LEVEL OF HIGHER EDUCATION	first (bachelor)
SPECIALTY	113 "Applied Mathematics"
BRANCH OF KNOWLEDGE	11 "Mathematics and Statistics"
QUALIFICATION	Bachelor of Applied Mathematics, Specialist in Applied Mathematics

**Program developers:**

1. Syaskyi V.A., Ph.D., Associate Professor
2. Syaskyi A.O., Doctor of Technical Sciences, Professor
3. Moroz I.P., Ph.D., Associate Professor

**INPUT**

Department of the Informatics and Applied Mathematics

Protocol No. 1 dated January 29, 2017

Head of the Department \_\_\_\_\_ Prof. A. Ya. Bomba

**AGREED**

Academic Council of the Faculty of Mathematics and Informatics

Protocol No. 2 dated February 26, 2017

Chairman of the Academic Council \_\_\_\_\_ Associate Prof. M.I. Shakhraichuk

**APPROVED**

Academic Council of the Rivne State Humanitarian University

Protocol No. 4 dated April 26, 2017

Chairman of the Academic Council \_\_\_\_\_ Prof. R.M. Postolovskyi

## PREFACE

The educational and professional bachelor's program in the field of knowledge 11 "Mathematics and Statistics" in specialty 113 "Applied Mathematics" was developed as a temporary document before the introduction of the Standard of Higher Education at the appropriate level of higher education by the project group of the Rivne State Humanitarian University of Humanities composed of:

**project team leader (guarantor of the educational program):**

Syaskiyi Volodymyr, Ph.D., Associate Professor;

**project team members:**

Syaskiyi Andrii, Doctor of Technical Sciences, Professor;

Moroz Igor, Ph.D., Associate Professor.

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<b>1. Profile of educational program in specialty 113 "Applied Mathematics"</b>	
<b>1. General information</b>	
<b>Full name of higher educational institution</b>	Rivne State University of Humanities
<b>The degree of higher education and the name of the qualification in the language of the original</b>	Bachelor of Applied Mathematics, Specialist in Applied Mathematics
<b>The official name of the educational program</b>	Applied Mathematics
<b>Type of diploma and the volume of the educational program</b>	Bachelor's degree, unit / 240 credits ECTS / 4 years
<b>Accreditation</b>	Certificate of Accreditation (series HД № 1889767). Validity period until 01.07.2027
<b>Cycle / Level</b>	NRC Ukraine - level 6, FQ-EHEA - first cycle, EQF-LLL - level 6
<b>Prerequisites</b>	Complete secondary education
<b>Language (s) of teaching</b>	State (Ukrainian)
<b>The term of the educational program</b>	For the period of study (2017 - 2021)
<b>Internet address for the placement of a description of the educational program</b>	<a href="http://www.fmi-rshu.org.ua">www.fmi-rshu.org.ua</a>
<b>Internet address for the placement of a description of the educational program</b>	
<b>2. The purpose of the educational program</b>	
Formation of the personality of a specialist who is able to formulate, solve and generalize practical tasks in his professional activity using fundamental and special applied mathematical and computer science and develop mathematical models, algorithms, create and exploit software.	
<b>3. Characteristics of the educational program</b>	
<b>Subject area</b>	<ul style="list-style-type: none"> <li>➤ <b>Objects</b> of study and activity: mathematical methods, models, algorithms and software designed for studying, analyzing, designing processes and systems in a variety of specific subject areas.</li> <li>➤ Learning <b>Objectives</b>. Training of specialists capable: <ul style="list-style-type: none"> <li>– to formulate and solve practical tasks in professional activity using the competences of basic and special mathematical and computer sciences;</li> <li>– to develop mathematical models, algorithms, create and operate software.</li> </ul> </li> <li>➤ <b>The theoretical content of the subject area</b>. Basic <b>concepts</b> of applied mathematics: mathematical methods, algorithms, mathematical and computer simulation. The <b>concept</b> of applied mathematics is a description of a task 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. <b>Principles</b> - application and development of mathematical methods,</li> </ul>

	<p>algorithms in scientific and practical spheres of activity.</p> <p>➤ <b>Methods, techniques and technologies:</b></p> <ul style="list-style-type: none"> <li>– applied mathematical methods and algorithms;</li> <li>– methods of solving scientific and technical, socio-economic problems with the help of specialized software tools;</li> <li>– information technologies for computer simulation and computational experimentation, intellectual data processing.</li> </ul> <p>➤ <b>Tools and equipment:</b></p> <ul style="list-style-type: none"> <li>– computer, computer and information networks, specialized software.</li> </ul>
<b>Orientation of the educational program</b>	Educational and professional.
<b>The main focus of the program</b>	The emphasis is on providing students with the necessary knowledge and skills to analyze processes and systems, development appropriate mathematical models and their research using mathematical tools and modern software.
<b>Features of the program</b>	Multi-vector training of specialists in mathematical and computer modeling.
<b>4. Eligibility of graduates for employment and further education</b>	
<b>Eligibility for employment</b>	<p style="text-align: center;"><b><u>The acquired knowledge and skills allow to work in positions:</u></b></p> <p>3434 Assistant in mathematics, actuary  3119 Trainee researcher  3119 Laboratory assistant (engineering)  3119 Technician (sphere of information protection)  3491 Laboratory assistant of scientific division (other fields (branches) of scientific research)  3121 System administrator  3121 Technician-programmer  3121 Specialist in software development and testing  3121 Specialist in the development of computer programs  3121 Information technology specialist  3121 Specialist in computer graphics and design  3114 Technician of configuring a computer system  3114 The technician of the computing (information-computing) center  3212 Technician (natural science)</p>
<b>Further education</b>	Continuing of education for obtaining a second (master's) higher education level.
<b>5. Teaching and evaluation</b>	
<b>Teaching and learning</b>	<ul style="list-style-type: none"> <li>- organizational forms of training: collective and integrative learning, etc</li> <li>- teaching technology: passive (explanatory and illustrative); active (problem, interactive, informational and computer, self-developing, positional and context learning, technology of cooperation).</li> </ul>
<b>Assessment</b>	<ul style="list-style-type: none"> <li>- types of control: current, thematic, periodic, summary, self-control.</li> <li>- forms of control: oral and written surveys, test control, laboratory and individual work protection, course work protection, report on industrial practices, certification (defense of a thesis or a specialty examination).</li> <li>- assessment of students' academic achievements is carried out on a four-level scale - excellent, good, satisfactory, unsatisfactory and verbal - credited, uncredited.</li> </ul>
<b>6. Competencies of program</b>	
<b>Integral competence (IC)</b>	
IC 1. Ability to apply mathematical theories and methods to solving complex specialized problems and practical problems of applied mathematics, characterized by complexity and uncertainty of conditions, in professional activity or in the process of learning.	

### **General Competence (GC)**

- GC 1. Ability to learn, to acquire new knowledge, skills, including in the industry, other than professional.
- GC 2. Ability to apply professional knowledge and skills in practice.
- GC 3. Ability to flexibly adapt to different professional situations, to show creative approach, initiative.
- GC 4. Ability to critically evaluate and rethink the accumulated experience (own and foreign), to analyze their professional and social activity.
- GC 5. Ability to conduct research, including analysis of problems, the choice of method and methods of research, as well as evaluation of the quality of the results.
- GC 6. Ability to solve problems in professional activity on the basis of analysis and synthesis.
- GC 7. Ability to work with information: to find, evaluate and use information from various sources that is necessary for solving professional tasks.
- GC 8. Ability to use basic knowledge in the field of exact, natural, social, humanitarian and economic sciences in professional activity.
- GC 9. The ability to effectively use computer and information technologies in professional activity.
- GC 10. Ability to work in a team and to possess skills of interpersonal interaction.
- GC 11. Ability to carry out industrial or applied activity in the international environment.
- GC 12. Ability to consciously define goals in professional and personal development.
- GC 13. Ability to social and professional interaction and cooperation.
- GC 14. Ability to carry out professional activity in accordance with the requirements of sanitary-hygienic regime, occupational safety, safety and fire safety.

### **Professional competence (PC)**

- PC 1. Ability to use and adapt mathematical theories, methods and techniques for the proof of mathematical statements and theorems.
- PC 2. The ability to mathematically formalize the formulation of problems.
- PC 3. Ability to select and apply mathematical methods for solving practical problems of research, modeling, analysis, design, management, forecasting, decision making.
- PC 4. The ability to develop algorithms and data structures, software tools and software documentation.
- PC 5. Ability to design databases, information systems and resources.
- PC 6. Ability to work with computer equipment, computer networks and the Internet in the environment of modern operating systems using standard office applications.
- PC 7. Ability to exploit and maintain the software of automated and information systems of various purposes.
- PC 8. Ability to master modern software programming and testing technologies.
- PC 9. Ability to conduct mathematical and computer modeling, analysis and processing of data, computational experiment, solving formalized problems with the help of specialized software.
- PC 10. Ability to create documents of the established reporting using regulatory documents.
- PC 11. Ability to organize the work of the collective of performers, to make expedient and economically justified organizational and managerial decisions, to provide safe working conditions.
- PC 12. Ability to search, systematic study and analysis of scientific and technical information, domestic and foreign experience associated with the application of mathematical methods for the study of various processes, phenomena and systems.
- PC 13. Ability to understand the formulation of tasks articulated in the language of a particular subject field, to search and collect the necessary output data.
- PC 14. Ability to formulate the mathematical formulation of the problem, based on the statement in the language of the subject field, and choose the method of its solution, which provides the required accuracy and reliability of the result.
- PC 15. Ability to participate in the compilation of scientific reports on the research work carried out and the implementation of the results of research and development.
- PC 16. The ability to effectively professional written and oral communication in the state language and one of the most common European languages.

### 7 Program Learning Outcomes (PLO)

- PLO 1. Demonstrating knowledge and understanding of basic concepts, principles, theories and efficient innovation infrastructure foundation and applied mathematics, and use them in practice.
- PLO 2. Languages basic terms and methods of mathematical, complex and functional analysis, linear algebra and analytic geometry, theory of differential and integral equations, including equations of mathematical physics, probability theory, mathematical statistics and stochastic processes, numerical methods, methods of optimization and data analysis.
- PLO 3. Ability to formalize tasks formulated in a language of a certain subject area; to formulate their mathematical formulation, to build mathematical models and choose rational methods of their implementation; to solve the formulated problems by analytical and numerical methods, to evaluate the accuracy and reliability of the results.
- PLO 4. Perform mathematical description, analysis and synthesis of discrete objects and systems, using concepts and methods of discrete mathematics and theory of algorithms.
- PLO 5. Ability to develop and use practical algorithms associated with approximations functional dependencies, numerical and graphical differentiation and integration, solution of systems of algebraic, differential and integral equations, solution of boundary problems, search for optimal solutions.
- PLO 6 Investigate of analytical mathematical models objects and processes for the existence and uniqueness of their solution.
- PLO 7. Research and find solutions to incorrect tasks using the methods of regularization.
- PLO 8. Develop mathematical models of problems in the form of systems of differential equations with and using the method of analogies and the theory of dimension.
- PR9 9. Combining methods of mathematical and computer modelling of informal procedures expert analysis procedures to find optimal solutions.
- PLO 10. Construct algorithms for numerical research of mathematical models and solving of practical problems in terms of accuracy of calculations, stability, speed and cost of system resources.
- PLO 11. Choose rational methods and algorithms for solving mathematical problems of optimization, operations research, optimal control and decision-making analysis, data analysis.
- PLO 12 Ability to apply modern technologies of programming and software development, program realization of numerical and symbolic algorithms.
- PLO 13. Solve some engineering and technical problems and tasks in interdisciplinary areas - sociology, economics, ecology and medicine.
- PLO 14. Use in practical work specialized software products and software systems of computer mathematics.
- PLO 15. Identify the ability to self-study and improve.
- PLO 16. Ability to organize your own activities and get results within a limited time.
- PLO 17. Ability to work independently and in a team, subordinate personal interests to the general purpose.
- PLO 18. Ability to collect, process, analyse and systematize scientific and technical information while avoiding plagiarism.
- PLO 19. Ability to effectively interact with the environment through the understanding of oneself and others in the permanent modification of mental states, interpersonal relationships and conditions of the social environment.
- PLO 20. Gather and interpret relevant data and analyze the complexities within their specialization for reporting judgments that reflect relevant social and ethical issues.
- PLO 21. Demonstrate professional communication skills, including oral and written communication in the official language and at least one of the most common European languages.

### 8. Resource support

<b>Personnel support</b>	Conducting lectures on educational disciplines by scientific and pedagogical practitioners 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.
<b>Material and technical support</b>	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.
<b>Information and teach-</b>	Information and teaching-methodological support of the educational pro-

<b>ing-methodological support</b>	gram on training specialists in specialty 113 "Applied Mathematics" corresponds to licensing requirements, has relevant and meaningful content, is based on modern information and communication technologies.
<b>9. Academic mobility</b>	
<b>National Credit Mobility</b>	Regulated by the Resolution of the Cabinet of Ministers of Ukraine No. 579 "On Approval of the Regulations on the Implementation of the Right to Academic Mobility" of August 12, 2015.
<b>International Credit Mobility</b>	On the basis of bilateral agreements between Rivne State University of Humanities and foreign educational institutions.
<b>Teaching foreign applicants for higher education</b>	Possible.

### **3. Form of certification of applicants for higher education**

Certification of graduates of the educational program of specialty 113 «Applied mathematics» is conducted in the form of defences of a qualification degree work or takes of a complex examination on specialty and concluded with the issuance of the document of the established sample on awarding the degree of bachelor with qualification: a bachelor of applied mathematics.

The certification is carried out openly and publicly.

<b>Forms of certification of applicants for higher education</b>	Certification of graduates of the educational-professional program "Applied Mathematics" of specialty 113 "Applied Mathematics" is carried out in the form of: <ul style="list-style-type: none"> <li>– public defense of qualification degree work;</li> <li>– complex exam in specialty.</li> </ul>
<b>Requirements for qualification degree work and its public defense</b>	Qualification degree work is the educational work of a higher education student, which is carried out at the final stage of obtaining a bachelor's degree in Applied Mathematics for the purpose of establishing conformity of the general and special competencies (study results) obtained by applicants of higher education.
<b>Requirements for the certification exam (exams)</b>	A complex examination in the specialty is conducted orally. The complex examination in the specialty is conducted as a complex examination of the knowledge of the higher education graduates of the professionally oriented theoretical training for the cards, compiled in full accordance with the program of state attestation. Contents of the examination card of the complex examination in the field covers the material of specialized disciplines within their programs. The set of examination cards is approved and signed by the head of the department.

### **6. The system of internal quality assurance in higher education**

In Rivne State University of Humanities operates the system of providing higher education institutions with the quality of educational activities and the quality of higher education (internal quality assurance system) is in place, 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) annual assessment of higher education graduates, scientific and pedagogical and pedagogical staff of universities and regular publication of the results of such assessments on the university website, 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 number of 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) ensuring an effective system of preventing and detecting academic plagiarism in scientific works of higher education institutions and higher education graduates;
- 9) other procedures and measures.

The system of providing higher education institutions with the quality of educational activities and the quality of higher education may be assessed by the National Agency for the Quality Assurance of Higher Education or the independent institutions accredited by it for assessing and ensuring the quality of higher education on the subject of its compliance with the requirements for the system of quality assurance in higher education approved by the National the Agency for the Quality Assurance of Higher Education, and international standards and recommendations for the quality assurance of higher education.

Guarantor of the educational program,  
project team leader

Associate professor V. Syaskyi