

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

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

**The second (master's degree) level of higher education  
in specialty 113 Applied Mathematics**

**Branch of knowledge 11 Mathematics and Statistics**

**Qualification: a master's degree of applied mathematics. Specialist  
in the field of applied mathematics. Teacher 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. 1 dated "31" January, 2019 )

The educational program is introduced with 01.09. 2019 .

The rector \_\_\_\_\_ prof. Postolovskyi R.M.  
(Order No. \_\_\_\_\_ dated "      " 2019 )

## LETTER OF AGREEMENT

### educational and professional program

LEVEL OF HIGHER EDUCATION	second (master's degree)
SPECIALTY	113 "Applied Mathematics"
BRANCH OF KNOWLEDGE	11 "Mathematics and Statistics"
QUALIFICATION	Master's degree of applied mathematics. Specialist in the field of applied mathematics. Teacher of 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, 2019

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

#### AGREED

Academic Council of the Faculty of Mathematics and Informatics

Protocol No. 1 dated January 30, 2019

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

#### APPROVED

Academic Council of the Rivne State Humanitarian University

Protocol No. 1 dated January 31, 2019

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

## PREFACE

The educational and professional master's degree 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):**

Syaskyi Andrii, Doctor of Technical Sciences, Professor;

**project team members:**

Syaskyi Volodymyr, Ph.D., Associate 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>	The second level of higher education Master's degree of applied mathematics. Specialist in the field of applied mathematics. Teacher of 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>	Master's degree, unit / 90 credits ECTS / 1 year 5 months
<b>Accreditation</b>	Certificate of Accreditation (series УД №18001457). Validity period until 01.07.2023
<b>Cycle / Level</b>	NRC Ukraine - level 8, FQ-EHEA - second cycle, EQF-LLL - level 7
<b>Prerequisites</b>	Availability of a bachelor's degree, an educational qualification level of a specialist
<b>Language (s) of teaching</b>	Ukrainian
<b>The term of the educational program</b>	For the period of study (2019 - 2021)
<b>Internet address for the placement of a description of the educational program</b> <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>2. The purpose of the educational program</b>	
To provide training of highly qualified specialists in the field of mathematics in specialty 113 Applied Mathematics, capable of solving complex specialized problems and practical problems of science and technology on the basis of attracting mathematical modeling and modern information technologies.	
<b>3. Characteristics of the educational program</b>	
<b>Subject area ( branch of knowledge, specialty)</b>	BRANCH OF KNOWLEDGE 11 "Mathematics and Statistics" SPECIALTY 113 "Applied Mathematics"
<b>Orientation of the educational program</b>	Educational and professional
<b>The main focus of the program</b>	General education in the field 11 Mathematics and statistics on specialty 113 Applied Mathematics. Emphasis on the ability to solve scientific and technical applied problems through the use of a system of mathematical methods and computer facilities. Key words: mathematical and computer modeling of natural, technical, economic-social systems and processes; system analysis; optimization and optimal control; nonlinear dynamics; mathematical methods of identification and recognition, software development.
<b>Features of the program</b>	Ensuring the passage of practice in research and production enterprises and IT companies
<b>4. Eligibility of graduates for employment and further education</b>	

<b>Eligibility for employment</b>	<p>Master in specialty 113 "Applied Mathematics" can hold such positions:</p> <ul style="list-style-type: none"> <li>– Mathematician (Applied Mathematics) (2121.2).</li> <li>– Mathematical Analyst in Operations Research (2121.2).</li> <li>– Analyst of operating and application software, computer systems (2131.2).</li> <li>– Engineer for scientific and technical information (2433.2).</li> <li>– Computer Software Engineer (2131.2).</li> <li>– Software and multimedia analyst (2131.2).</li> <li>– Computer Communications Analyst (2131.2).</li> </ul> <p>Teacher of high schools (2310.2).</p>
<b>Further education</b>	The possibility of continuing education on the program of the third (educational and scientific) level of higher education.
<b>5. Teaching and evaluation</b>	
<b>Teaching and learning</b>	<p>Student-centered learning, self-learning, technology of problem-oriented and differentiated learning, technology of intensification and individualization of learning, technology of programmed learning, information technologies, technology of developmental learning, credit transfer system of training organization, e-learning in Moodle system, study-based learning.</p> <p>Teaching takes place in the form of lectures, multimedia lectures, interactive lectures, seminars, practical classes, laboratory workshops, self-study, individual lessons, consultations, production and pre-diploma practice, preparation of master's works.</p>
<b>Assessment</b>	<p>Types of control: current, thematic, periodic, final, self-control.</p> <p>Forms of control: oral and written surveys, test tasks, including computer testing, laboratory reports, presentations, practice reports, defense of master's work.</p>
<b>6. Competencies of program</b>	
<b>Integral competence (IC)</b>	
IC 1. The ability to solve complex specialized problems and practical problems of science, technology, economics and social sphere, which implies application of certain theories and mathematical methods and is characterized by complexity and uncertainty of conditions.	
<b>General Competence (GC)</b>	
<p>GC 1. Ability to think, analyze and synthesize.</p> <p>GC 2. Ability to apply knowledge in practical situations.</p> <p>GC 3. Ability to plan and manage time.</p> <p>GC 4. Knowledge and understanding of the subject area and understanding of professional activity.</p> <p>GC 5. Ability to communicate in a foreign language.</p> <p>GC 6. Skills in the use of information and communication technologies.</p> <p>GC 7. Ability to conduct research at the appropriate level.</p> <p>GC 8. Ability to learn and master modern knowledge.</p> <p>GC 9. Ability to search, process and analyze information from various sources.</p> <p>GC 10. Ability to generate new ideas (creativity).</p> <p>GC 11. Ability to identify, put and solve problems.</p> <p>GC 12. Ability to make informed decisions.</p> <p>GC 13. Ability to work in a team.</p> <p>GC 14. Ability to communicate with representatives of other professional groups of different levels (with experts from other fields of knowledge / types of economic activity).</p> <p>GC 15. Ability to design and manage projects.</p> <p>GC 16. Ability to demonstrate initiative and entrepreneurship.</p> <p>GC 17. Ability to assess and ensure the quality of work performed.</p>	

<b>Professional competence (PC)</b>	
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 formalize the formulation of the problem, to choose and apply mathematical and instrumental methods for solving practical problems of research, analysis, design, and making optimal decisions.
PC 3.	Ability to design algorithms of structure and databases, software data management, information systems, to master the latest programming technologies, to improve algorithmic thinking style.
PC 4.	Ability to use computer technology, computer networks and the Internet, operating systems, office applications, cloud systems, modern programming languages.
PC 5.	Ability to operate and maintain the software of automated systems used in the workplace math.
PC 6.	Ability to choose the optimum, adjust and upgrade the hardware and software of automated systems of different purposes for their own needs.
PC 7.	Ability to develop, debug and test the software.
PC 8.	Ability to plan and conduct necessary calculations for mathematical and computer modeling and solving formalized tasks with the help of specialized software.
PC 9.	Ability to analyze, detect and independently correct possible algorithmic errors after carrying out numerical experiments during mathematical and computer modeling for solving formalized problems with the help of specialized software.
PC 10.	Ability to create technical documentation, documents of established reporting, use of legal documents.
PC 11.	Ability to make feasible and economically sound 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 a task, formulated in the language of a certain subject area, to search and collect the necessary output data.
PC 14.	The ability to formulate a mathematical statement of the problem, based on the statement in the language of the subject field and to choose the appropriate method of its solution.
PC 15.	Ability to conduct research of various processes, phenomena and systems using mathematical methods and specialized software, to carry out computational experiments, processing, analysis and interpretation of the obtained results.
PC 16.	Ability to participate in the compilation of scientific reports on performed research and implementation of the results of research and development.
PC 17.	Ability to organize the division of responsibilities of team members in the compilation of scientific reports on the research work carried out and in the implementation of the results of research and development.
<b>7 Program Learning Outcomes (PLO)</b>	
1.	Specialized conceptual knowledge gained in the process of training 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.
2.	Critical understanding of problems in learning and / or professional activities and within subject areas.
3.	Formalization of practical tasks; the formulation of their mathematical formulation and the choice of rational decision method; methods of solving the problems by analytical and numerical methods, estimating the accuracy and reliability of the obtained results.
4.	Knowledge of the rules of mathematical description, analysis and synthesis of discrete objects and systems, using concepts and methods of mathematical calculations related to the approximation of functional dependences, numerical differentiation and integration, solving systems of algebraic, differential and integral equations, solving boundary tasks, search for optimal solutions.

5. Knowledge of methods for the development of complex mathematical models in the form of systems of differential equations using the method of analogies, dimension theory, etc., the methods of research of the developed models of objects and processes on the subject of existence and uniqueness of their solution, methods of research and finding solutions of incorrect tasks, using methods of the theory of dynamical systems.
6. Knowledge of combinations of methods of mathematical and computer modeling with informal expert analysis procedures for finding optimal solutions.
7. Knowledge of methods for constructing efficient calculations accuracy, stability, speed and cost of system resources of algorithms for numerical study of mathematical models and solving complex problems.
8. Knowledge of modern programming technologies and software development, program realization of numerical and symbolic algorithms in solving engineering problems and problems in interdisciplinary fields - sociology, economics, ecology and medicine.
9. Knowledge of the methodology of automated design of complex objects and systems.
10. Knowledge of legal aspects of intellectual property protection; criminal liability for violation of intellectual property rights; systems for preventing and detecting academic plagiarism.
11. Knowledge of new technologies, techniques and paradigms; achievements of domestic and foreign science; organization of innovation activity at the enterprise; bases of production management.
12. Knowledge of the requirements for scientific publication; rhetoric; toolkit for designing and demonstrating scientific results.
13. Knowledge of means of ensuring information security and data integrity in accordance with the solved task.
14. Apply the conceptual knowledge gained during the training and / or professional activity at the level of the latest achievements, in innovative activities, in particular in the context of research work. Present their own and well-known scientific results of production and technological activities.
15. Apply and develop fundamental and interdisciplinary knowledge to substantiate and make managerial and technical decisions for the successful resolution of professional tasks.
16. To solve complex practical problems and problems requiring updating and integration of knowledge in conditions of incomplete / insufficient information and contradictory requirements, to formulate their mathematical formulation; choose rational analytical and / or numerical methods and algorithms for solving mathematical problems of optimization, operations research, optimal control and decision making; evaluate the accuracy and reliability of the results.
17. Apply the rules of mathematical description, analysis and synthesis of discrete objects and systems using the concepts and methods of mathematical calculations related to the approximation of functional dependences, numerical differentiation and integration, the solution of systems of algebraic, differential and integral equations, the solution of boundary tasks, search for optimal solutions.
18. To develop complex mathematical models in the form of systems of differential equations using the method of analogies, dimension theory, etc., to study the developed models of objects and processes on the subject of existence and uniqueness of their solution, to investigate and find solutions of incorrect problems by means of the methods of the theory of dynamical systems.
19. Combine methods of mathematical and computer modeling with informal expert analysis procedures to find optimal solutions under incomplete / inadequate information or conflicting requirements.
20. To construct algorithms for numerical research of mathematical models and solving complex practical problems in terms of accuracy of calculations, stability, performance and cost of system resources.
21. To have modern technologies of programming and development of software, program realization of numerical and symbolic algorithms for solving engineering problems and problems in interdisciplinary fields - sociology, economics, ecology and medicine.

22. Use methodologies for automated design of complex objects and systems.
  23. Own the legal aspects of intellectual property protection; criminal liability for violation of intellectual property rights; systems for preventing and detecting academic plagiarism.
  24. To use new technologies and methods, achievements of domestic and foreign science, in innovation activity at the enterprise; production management.
  25. To prepare scientific articles, scientific and technical reports; apply them to the development and integration of systems, products and services of information technology.
  26. Apply hardware and software information security and integrity of data in information systems in accordance with the tasks to be solved.
  27. Reporting to specialists and non-specialists of information, ideas, problems, decisions and own experience in the field of professional activity.
  28. Ability to effectively formulate a communication strategy.
  29. Management of complex actions or projects, responsibility for decision making in unpredictable conditions.
  30. Responsibility for the professional development of individuals and / or groups of persons.
- Ability to further education with a high level of autonomy.

#### **8. Resource support**

<b>Personnel support</b>	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% .
<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 teaching-methodological support</b>	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**

<b>National Credit Mobility</b>	On the basis of bilateral agreements between Rivne State University of Humanities and higher educational establishments and scientific institutions of Ukraine.
<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 carried out in the form of defence of the qualification master's work or the complex of the qualification examination on the specialty and ends with the issuance of the document of the established sample on awarding it a master's degree with the qualification: master of Applied Mathematics, specialist in the field of Applied Mathematics, teacher of Applied Mathematics.

The certification is carried out openly and publicly.

<b>Forms of certification of applicants for higher education</b>	The certification of graduates of the educational and professional program "Applied Mathematics" of specialty 113 "Applied Mathematics" is carried out in the form of: — public defence of the master's work;
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	— qualification examination.
<b>Requirements for qualification work and its public defence</b>	Graduate work is the educational work of a higher education student, which is carried out at the final stage of obtaining a Master's degree in Applied Mathematics, a specialist in applied mathematics, a teacher of Applied Mathematics for 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 qualification examination is conducted orally. The qualification examination in the specialty is conducted as a complex examination of the knowledge of the higher education graduates of the professionally-oriented theoretical training on the cards drawn up in full compliance with the state certification program. The content of the qualification exam passes 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**

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

Professor A.O. Syaskyi