

**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. 1 dated "31" January, 2019)

The educational program is introduced with 01.09. 2019.

The rector _____ prof. Postolovskyi R.M.
(Order No. _____ dated "____" _____ 20 ____)

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 the field 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 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):

Syaskyi Volodymyr, Ph.D., Associate Professor;

project team members:

Syaskyi Andrii, Doctor of Technical Sciences, Professor;

Moroz Igor, Ph.D., Associate Professor.

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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 / 240 credits ECTS / 4 years
Accreditation	Certificate of Accreditation (series HД №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 (2019 - 2023)
Internet address for the placement of a description of the educational program	www.fmi-rshu.org.ua
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	<p>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. 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.</p> <p>Learning objectives. Training of specialists capable of:</p> <ul style="list-style-type: none"> – 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. <p>The theoretical content of the subject area.</p> <p>Basic concepts of applied mathematics: mathematical methods, algorithms, mathematical and computer simulations.</p> <p>The concept of applied mathematics is a description of the problem or problem</p>

	<p>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.</p> <p>Principles - application and development of mathematical methods, algorithms in scientific and practical spheres of activity.</p> <p>Methods, techniques and technologies:</p> <ul style="list-style-type: none"> – 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. <p>Tools and equipment:</p> <ul style="list-style-type: none"> – 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. Multi-vector training of mathematical and computer modeling specialists.
4. Eligibility of graduates for employment and further education	
Eligibility for employment	<p>The acquired knowledge and skills allow you to work in positions:</p> <p>3434 Assistant mathematician, actuary</p> <p>3119 Intern trainee</p> <p>3119 Laboratory (Engineering)</p> <p>3119 Technician (information protection sphere)</p> <p>3491 Laboratory of the scientific division (other fields (branches) of scientific research)</p> <p>3121 System Administration Technician</p> <p>3121 Technician-programmer</p> <p>3121 Specialist in Software Development and Testing</p> <p>3121 Specialist in the development of computer programs</p> <p>3121 IT Specialist</p> <p>3121 Specialist in computer graphics and design</p> <p>3114 Technique for configuring a computer system</p> <p>3114 Technician of the computing (information-computing) center</p> <p>3212 Technician (natural sciences)</p>
Further education	Continuing education for obtaining a second (master's) level of higher education.
5. Teaching and evaluation	
Teaching and learning	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - Types of control: current, thematic, periodic, summary, self-control. - Forms of control: oral and written surveys, test control, laboratory and

	<p>individual work protection, course work protection, production practice report, certification (defense of a thesis or a specialty examination).</p> <p>- Assessment of students' academic achievements is carried out on a four-level scale - excellent, good, satisfactory, unsatisfactory and verbal - credited, not credited.</p>
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 Competence (GC)	
GC 1.	Ability to think, analyze and synthesize.
GC 2.	Ability to apply knowledge in practical situations.
GC 3.	Ability to plan and manage time.
GC 4.	Knowledge and understanding of the subject area and understanding of professional activity.
GC 5.	Ability to communicate in a foreign language.
GC 6.	Skills in the use of information and communication technologies.
GC 7.	Ability to conduct research at the appropriate level.
GC 8.	Ability to learn and master modern knowledge.
GC 9.	Ability to search, process and analyze information from various sources.
GC 10.	Ability to generate new ideas (creativity).
GC 11.	Ability to identify, put and solve problems.
GC 12.	Ability to make informed decisions.
GC 13.	Ability to work in a team.
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).
GC 15.	Ability to design and manage projects.
GC 16.	Ability to demonstrate initiative and entrepreneurship.
GC 17.	Ability to assess and ensure the quality of work performed.
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 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.

7 Program Learning Outcomes (PLO)

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

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	Information and educational and methodological support of the educational program for the training of specialists of specialty 113 Applied mathematics

support	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 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.

Forms of certification of applicants for higher education	The certification of graduates of the educational and professional program "Applied Mathematics" of specialty 113 "Applied Mathematics" is carried out in the form of: <ul style="list-style-type: none"> — public defence of the master's work; — qualification examination.
Requirements for qualification work and its public defence	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.
Requirements for the certification exam (exams)	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

Associate Prof. V.A. Syaskyi

