MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

TERNOPIL VOLODYMYR HNATIUK NATIONAL PEDAGOGICAL UNIVERSITY

Rector   B. B. Buyak

EDUCATIONAL AND PROFESSIONAL PROGRAM

"Secondary Education (Computer Science)"

Second level of higher education

in the specialty 014 Secondary education

fields of knowledge 01 Education/Pedagogy

Ternopil - 2022

LETTER OF APPROVAL
of the educational and professional program

AREA OF EXPERTISE	01 Education/Pedagogy
SPECIALTY	014 Secondary education
SUBJECT SPECIALTY	014.09 Informatics
SECOND SUBJECT SPECIALTY	014.04 Secondary education (Mathematics)
SPECIALIZATION	-
LEVEL OF HIGHER EDUCATION	Second (master's) degree
DEGREE	Master
EDUCATIONAL QUALIFICATION	Master of Education, specialty 014 Secondary Education (Computer Science)
PROFESSIONAL QUALIFICATION	Teacher of computer science and mathematics, teacher of a vocational pre-university, higher education institution

AGREED

Chairman of the Scientific and
Methodological Council of
Ternopil Volodymyr Hnatiuk
National Pedagogical University
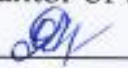_____ G. V. Tereshchuk
June 22, 2022

DEVELOPED AND RECOMMENDED
The working group of educational program
"Secondary Education (Computer Science)"
Ternopil Volodymyr Hnatiuk
National Pedagogical University

Project team leader
(guarantor of the educational program)
_____ O. Ya. Romanyshyna
June 22, 2022

PREFACE

Developed by the project team of the Department of Informatics and Methods of Teaching at Ternopil Volodymyr Hnatiuk National Pedagogical University:

1. Romanyshyna Oksana Yaroslavivna - Doctor of Pedagogical Sciences, Professor of the Department of Informatics and Methods of its Teaching *(Project Team Leader - guarantor of the educational program)*

2. Genseruk Halyna Romanivna - Candidate of Pedagogical Sciences, Associate Professor of the Department of Informatics and Methods of Teaching

3. Barna Olha Vasylivna - PhD in Pedagogy, Associate Professor of the Department of Informatics and Methods of Teaching

4. Balyk Nadiia Romanivna - Candidate of Pedagogical Sciences, Associate Professor of the Department of Informatics and Methods of Teaching

5. Leshchuk Svitlana Oleksiivna - Candidate of Pedagogical Sciences, Associate Professor of the Department of Informatics and Methods of Teaching

6. Bilanyk Iryna Bohdanivna - Doctor of Philosophy, specialty 0.14 "Secondary Education (Mathematics)", Assistant of the Department of Mathematics and Methods of Teaching

Project team members from stakeholders and employers:

1. Kryvokulskyi Liubomyr Yevstakhovych - methodologist, head of the Center for Informatics, Information and Communication Technologies and Distance Education of the Ternopil Regional Communal Institute of Postgraduate Pedagogical Education

2. Rybak Hryhorii Volodymyrovych - Director of the Ivanna Blazhkevych Ternopil Educational Complex "Secondary School of I-III Degrees - Economic Lyceum No. 9"

3. Zelenkevych Serhii Petrovych - Master's student of the Faculty of Physics and Mathematics, specialty 014.09 Secondary Education (Computer Science)

1. PROFILE OF THE EDUCATIONAL PROGRAM IN SPECIALTY 014 SECONDARY EDUCATION

(subject specialty 014.09 Secondary Education (Computer Science), second subject specialty 014.04 Secondary Education (Mathematics))

1 - General information	
Full name of the higher education institution and structural unit	Ternopil Volodymyr Hnatiuk National Pedagogical University, Faculty of Physics and Mathematics, Department of Informatics and Methods of its Teaching
Level of higher education	Second (master's) level
Degree of higher education	Master
Field of expertise	01 Education/Pedagogy
Specialty	014 Secondary education
Specialization (if any)	-
Official name of the educational program	**Educational and professional program "Secondary Education (Computer Science)"**
Educational qualifications	Master of Education
Qualification in the diploma	Degree of higher education - master's degree Specialty - 014 Secondary education Educational program - "Secondary Education (Computer Science)" Professional qualification - teacher of computer science and mathematics, lecturer at a higher education institution
Form of study	Institutional (full-time, part-time, distance); dual
Language(s) of instruction	Ukrainian
Cycle / level	NQF of Ukraine - level 7, FQ-EHEA - second cycle, QF-LLL - level 7
Type of diploma and scope of the educational program	Master's Degree, single, 90 ECTS credits, duration of study 1 year 4 months, during which higher education students must master academic disciplines, complete coursework, undergo practical training and certification
Background	A bachelor's or specialist's degree (in related specialties), confirmed by a state-issued document issued by a higher education institution. Admission conditions are determined by the "Rules of Admission to Ternopil Volodymyr Hnatiuk National Pedagogical University"
Availability of accreditation	National Agency for Higher Education Quality Assurance, Ukraine

	Certificate of accreditation in the field of study / specialty "Secondary Education (Computer Science)" Certificate No. 2096733 dated 15.03.2016. Valid until July 01, 2026.
Internet address of the permanent placement of the description of the educational program	https://tnpu.edu.ua/f-ziko-matematichniy-fakultet.php

2 - Objective of the educational program

Providing fundamental theoretical and practical training for specialists for:
− solving the problems of analysis and synthesis of complex systems based on the latest information technologies with the use of modern achievements in computer science;
− conducting scientific research using new information technologies in the development and management of complex objects based on information systems;
− conducting research, applied and pedagogical activities based on modern methodologies.

3 - Characteristics of the educational program

Subject area (field of knowledge, specialty, specialization)	Field of knowledge 01 Education/Pedagogy, Specialty 014 Secondary education, Subject specialties 014.09 Secondary education (Computer Science) and 014.04 Secondary education (Mathematics) *Objects of study and activity:* general and professional competencies of future teachers of computer science and mathematics, university teachers who ensure a quality educational process in general secondary education and higher education, competencies of specialists in the field of information technology. *Learning objectives*: training of specialists capable of solving complex specialized problems in the field of education, computer science and mathematics. *Theoretical content of the subject area*: basic knowledge of computer science (modern operating systems, algorithms and complexity theory, programming technologies, software development tools, Web technologies, basics of cybersecurity, cloud technologies) and mathematics (Selected issues of higher mathematics and mathematical statistics, etc.), presented at a sufficient level for the formation of integral, general and special competencies in computer science, mathematics and methods of teaching them (level of complete general secondary education and higher education). *Methods, techniques and technologies*: - methods of computer science; - mathematical methods; - methods of mathematical, information and computer modeling of professional activities; -

	programming technologies; - learning technologies; - information and communication technologies. *Tools and equipment*: library resources, including electronic ones; technical infrastructure necessary for the formation of professional competencies, computer and multimedia learning tools for training specialists in the field of information technology and mathematics, for the formation of experience in acquiring methods of teaching and upbringing, the ability to use tools and technologies for teaching students in general secondary education institutions; use of the bases of other institutions for pedagogical and scientific and pedagogical practices.
Orientation of the educational program	Educational and professional. The program includes in-depth fundamental training in computer science, humanitarian, psychological and pedagogical, special and scientific and practical training, taking into account the current state of computer science, and focuses on the current specialization, which can lead to further professional and scientific career: computer science (theoretical and applied), information and communication technologies in education, theory and methods of teaching computer science. The program is based on a thorough knowledge of the peculiarities of the information technology industry, taking into account its current state, and focuses on relevant specializations in which further professional and scientific careers are possible.
Main focus of the educational program and specialization	Higher education in computer science, methods of teaching computer science and mathematics.
Features of the program	The program provides for thorough practical training through mastering educational material, internships, individual practical and research tasks, ensures the exercise of the right of higher education students to freely choose academic disciplines; relevant types of practices and final certification.
4 - Suitability of graduates of the educational program for employment and further study	
Suitability for employment	Field of activity of graduates: educational institutions, research organizations, IT services of state and non-state-owned institutions. Primary positions and professional job titles according to **DK 003:2010:** 2139.1 Researcher (in the field of computing) 2310.2 Teacher of a higher education institution 2320 Secondary school teacher (specialty disciplines) 2320 (25157) Teacher of secondary educational institution 2320 Teacher of general secondary education institution 2351.2 Methodologist 2352 School inspector

	2352 Inspector-methodologist 2131.2 System administrator 2131.2 Computer software engineer 2132.2 Software engineer according to **ISCO-08**: 23 Teaching Professionals 233 Secondary Education Teachers 2330 Secondary Education Teachers High school teacher Secondary school teacher Other professionals in the field of education 1345 Heard teachers 1345 School principal 2320 Vocational education teachers 2351 Schools inspector 2359 School counselor
Further training	Possibility of continuing education at the third (educational and scientific) level (Doctor of Philosophy): postgraduate studies, doctoral programs in computer science (theoretical and applied); postgraduate education in related and other specialties; advanced training. Acquisition of additional qualifications in postgraduate and non-formal education.
5 - Teaching and assessment	
Teaching and learning	Approaches: student-centered learning, problem-based learning, e-learning in the Moodle system, self-study, research-based learning. Teaching is conducted in the form of: lectures (including multimedia and interactive lectures), seminars, practical classes with problem-solving, research laboratory work, individual research tasks, independent work based on electronic learning systems, consultations with teachers.
Evaluation	Academic achievement is assessed according to the national scale (excellent, good, satisfactory, unsatisfactory; passed, failed); 100-point scale and ECTS scale (A, B, C, D, E, FX, F). *Current control* - (individual and frontal oral questioning, written questioning, test control, essays, presentations, abstracts, current (module) test control), control works, essays. *The final control includes* oral and written examinations, exams and tests in the form of tests, defense of practice reports, and defense of term papers. *State certification is a* comprehensive qualification exam and master's thesis defense.
6 - Program competencies	
Integral competence	**IC**. The ability to solve complex problems and tasks in the field of education and computer science, which involves research, innovation and is characterized by uncertainty of conditions and requirements.

General competencies (GC)	GC 1. Mastery of oral and written communication technologies in the state and foreign languages, interpersonal skills and critical attitude to information obtained from various sources. GC 2. Ability to give an oral presentation and write an understandable article on the results of research, as well as on modern concepts in computer science for the general public (non-specialists). Ability to communicate with non-specialists using teaching skills. GC 3. Ability to think abstractly, critically and make constructive decisions based on established human values, logical arguments and verified facts. GC 4. Ability to conduct research, model and execute projects independently or in a team, motivate people and move towards a common goal. GC 5. Ability to adapt and act in a new situation, diagnose own states and feelings to ensure effective and safe professional activity, generate new ideas, take initiative, evaluate the results of their work. GC 6. Social activity, the ability to take civic responsibility for one's own digital footprint, to show tolerance to different opinions and views in a multicultural environment, to observe moral and ethical aspects of professional activity, academic integrity, and to adhere to ethical principles both in terms of professional honesty and in terms of understanding the possible impact of advances in computer science and information technology on the social sphere. GC 7. Ability to comprehend the subject area (ICT, education, computer science, mathematics, pedagogy) and the specifics of professional activity. GC 8. Ability to apply the acquired competencies in a wide range of possible places of employment and everyday life, development and forecasting of human existence, society and nature, spiritual culture. GC 9. Ability to actualize the need to realize one's own potential, design and implement individual educational trajectories of personal growth. GC 10. Ability to design centers of learning, education and development of students in the educational environment, taking into account the needs of inclusive education and to design a workspace in the IT field.
Professional competencies of the specialty (PC)	Deep knowledge and understanding (PC1). Ability to use information technology and the laws of computer science in combination with mathematical tools to describe natural phenomena. Ability to analyze the processes of design, development of software systems, databases, web applications,

hardware of computer information systems, computer networks in terms of fundamental, professional knowledge, as well as on the basis of appropriate mathematical methods. Ability to analyze and synthesize scientific, technical, natural science and general scientific information.

Problem solving (PC2). The ability to formulate, analyze and synthesize solutions to scientific problems at the abstract level by decomposing them into components that can be studied separately in their more and less important aspects.

Modeling skills (PC3). The ability to build appropriate models of information phenomena, to study them to obtain new conclusions and deepen understanding of these phenomena.

Mathematical skills (PC4). Ability to understand and skillfully use mathematical and numerical methods that are often used in computer science and information technology. Ability to use professionally specialized knowledge in the field of mathematical modeling of probability theory and mathematical statistics for statistical processing of experimental data and results in the field of computer science and information technology.

Computer skills (PC5). Professional knowledge of computers and information technologies. Ability to develop and implement computer programs (technologies) and use existing ones. Ability to design software systems, databases, web applications using appropriate software and computer hardware, to configure and administer computer networks, including educational computer networks, to determine the methodology for finding an effective technical solution.

Developed communication skills (PC6). Ability to communicate with colleagues in the field about scientific achievements both at the general and specialist levels, the ability to make oral and written reports, discuss scientific topics in native and English languages. Ability to effectively apply various theories in the field of communication. Ability to understand the ways of practical use of communication skills, effectively applying communication concepts. Understanding of the factors that positively or negatively affect communication and the ability to identify or take into account these factors in specific communication situations.

Research skills (PC7). Ability to conduct scientific research in the field of theory and teaching methods, computer science and information technology, to formulate (in the form of a presentation or report) new hypotheses and scientific problems in the field of computer science, to choose appropriate directions and appropriate methods for their solution, taking into account available resources. Ability to conduct experiments, as well as

	describe, analyze, process and critically evaluate experimental data. **Learning ability (PC8).** Ability to perceive new knowledge in the field of computer science and integrate it with existing knowledge. The ability to navigate at the specialist level in a particular narrow field of computer science, which lies outside the chosen specialization. Ability to master new areas in the field of computer science and information technology through independent study, using the acquired mathematical, fundamental and professional knowledge. Ability to perform a literature search for sources relevant to professional activities, the ability to critically evaluate them based on professional knowledge. Ability to engage in self-education. **Erudition in the field of computer science and information technology (PC9).** The ability to describe a wide range of tasks of maintenance and design of software systems, databases, web applications, computer networks, based on the theory and knowledge of information technology; this ability is based on a deep knowledge and understanding of a wide range of theories and trends in the field of computer science and information technology. Ability to think logically and algorithmically in the process of developing mathematical and software of information systems. Ability to use methods of observation, description, identification, classification of objects of informatization. **Teaching skills (PC10).** Ability to effectively apply basic pedagogical concepts, analyze the methods by which teaching methods are used in practice. Ability to mentor junior colleagues in improving teaching skills. Ability to effectively combine various technologies and learning tools (including e-learning, distance learning).

7 - Program learning outcomes

	PLO1. Knowledge and understanding related to the philosophical aspects of computer science as a science, in particular to the philosophy of computer science and fundamental problems of computer science. **PLO2**. Knowledge of the methodology of scientific knowledge as a conceptual basis for the professional activity of a science teacher, understanding the dynamics of the development of modern scientific theories that update the methodology of studying nature, society, and human. **PLO3.** Fundamental knowledge and understanding related to current areas of research in computer science, such as applied mathematics and computer science, systems theory and systems analysis, research methodology. The scope of this knowledge will be sufficient to successfully complete an internship in one of the research groups. **PLO 4.** Knowledge of general laws, mechanisms of formation and development of mental cognitive processes, properties, states and forms of human personality, peculiarities of personality formation in different age periods, factors of regulation of personality behavior, basics of social psychology of groups and collectives.

	PLO5. A thorough knowledge of various pedagogical theories and technologies that will allow graduates to successfully teach professional disciplines in educational institutions and critically analyze the literature in the field of teaching methods, understanding the peculiarities of organizing and managing educational activities in higher education. **PLO 6**. Knowledge of the content and principles of organization of educational activities in general secondary education institutions, the essence of designing curricula, textbooks, information and scientific and methodological materials in ICT disciplines. Modern ideas about the principles of determining the long-term goals and objectives of an enterprise operating in the field of computer science and information technology, organization of work of its units. **PLO7.** Sufficient knowledge in the field of educational measurement to apply monitoring and statistical technologies, successfully conduct research in the interests of the customer; **PLO8.** Thorough knowledge of various aspects of the use of ICT in professional activities and knowledge transfer: programming languages and paradigms, programming technologies, operating systems, system studies, system modeling, system analysis of information objects, modern Web technologies, cloud computing, robotics and the Internet of Things, information security and cybersecurity, e-learning and administration of educational systems. **PLO 9.** Ability to think abstractly and critically, make constructive decisions based on existing universal values, logical arguments and proven facts, a harmonious combination of ICT knowledge, teaching methods and a culture of pedagogical communication. **PLO 10.** The ability to work in a multicultural environment to ensure successful interaction in the field of science and education, mastery of oral and written communication technologies in the state and foreign languages in professional activities, information technology and critical attitude to social information. **PLO 11.** Ability to apply the theoretical, methodological and algorithmic foundations of information technology and mathematical apparatus in solving applied and scientific problems in the field of information systems and technologies. **PLO 12.** Ability to apply knowledge of standards, methods and tools for managing the life cycle processes of information systems, information technology products and services; mastery of software development technology in accordance with customer requirements, manage IT projects, perform system modeling, system analysis of information objects, decision-making, development of artificial intelligence methods and systems. **PO13.** Ability to apply the principles of organization and functioning of hardware of modern information processing systems for various purposes. **PLO 14.** Ability to design activities in the professional field, the ability to build and use models to describe objects and processes, to carry out their qualitative analysis; **PLO15.** Ability to commercialize the results of intellectual developments with the protection of owners' rights, to monitor and comprehensively evaluate the effectiveness of innovation activities of an enterprise operating in the field of computer science and information technology. **PO16.** Knowledge of the principles of structural and object-oriented programming, modern procedural-oriented languages, basic data structures

	and the ability to apply them in the programmatic implementation of algorithms for professional tasks.
	PLO 17. Ability to apply methods and tools for designing web applications, develop system software elements, develop and implement e-learning technologies and tools, create prototypes of robotic systems and the Internet of Things.
	PO18. Knowledge of the principles of teamwork; ability to work in a team and apply project management software systems.
	PLO 19. The ability to form a stable worldview, pluralism, political consciousness and culture; correct perception of contemporary problems of society, human existence, and spiritual culture.
	PLO 20. Ability to take an active life and civic position, share social responsibility for the activities of an enterprise operating in the field of computer science and information technology.
	PLO 21. The ability to effectively communicate, lead a healthy lifestyle, actualize one's own potential, design and implement individual educational trajectories of personal growth and self-improvement.
	PLO 22. Ability to conduct research on the latest processes of designing and maintaining software systems, databases, web applications, computer systems and computer networks, the ability to position the innovation and the company itself in the market operating in the field of computer science and information technology.
	PLO 23. Ability to identify new opportunities for the design and maintenance of software systems, databases, web applications, computer systems and computer networks equipment and new types of economic activity (business) and ensure their implementation in a highly dynamic and uncertain environment.
	PLO 24. The ability to apply soft skills and develop them in students in complex and unpredictable conditions, which requires the use of new approaches and forecasting.

8 - Resource support

Scientific and pedagogical staff	The qualitative composition of the academic staff who provide professional training under the educational and professional program meets the licensing conditions (in accordance with the current standards for the training of higher education applicants at the first (bachelor's) level of higher education (Resolution of the Cabinet of Ministers of Ukraine No. 1187 of December 30, 2015 (as amended by Resolution of the Cabinet of Ministers of Ukraine No. 365 of March 24, 2021) "Licensing conditions for the conduct of educational activities"). The educational process is provided by 12 scientific and pedagogical staff of the university departments: 4 of them are Doctors of Sciences, Professors; 8 are Candidates of Sciences, Associate Professors. Teachers who ensure the implementation of this program have the appropriate basic education, the required number of publications in Scopus, Web of science, professional journals, and actively participate in scientific and practical conferences of various levels (international, national, regional). All research and teaching staff, in accordance with the established schedules, undergo advanced training at higher education institutions and research institutes.
Material and technical support	The faculty's educational and material facilities consist of classrooms, training laboratories (equipped with modern computers and software), and methodological rooms, which are located in buildings that meet existing sanitary and fire safety standards.
Information and educational support	Use of the official university website (http://tnpu.edu.ua); electronic archive repository (http://dspace.tnpu.edu.ua/index.jsp?locale=uk); wireless Internet access points; electronic catalog of the virtual library

	(http://catalog.library.tnpu.edu.ua); scientific library, reading rooms, electronic resource server based on LMS Moodle and library resources of Ternopil Volodymyr Hnatiuk National Pedagogical University, author's developments of scientific and pedagogical staff, namely: textbooks and manuals with the stamp of the Ministry of Education and Science of Ukraine; textbooks and manuals with the stamp of the Ministry of Education and Science of Ukraine; textbooks and manuals with the stamp of the Ministry of Education and Science of Ukraine.
9 - Academic mobility	
National credit mobility	On the basis of bilateral agreements between Ternopil Volodymyr Hnatiuk National Pedagogical University and higher education institutions of Ukraine, in particular, with Drahomanov National Pedagogical University, Lesya Ukrainka Eastern European National University, Vasyl Stefanyk Precarpathian National University, Yuriy Fedkovych Chernivtsi National University, H. Skovoroda Kharkiv National Pedagogical University, and Khmelnytsky Humanitarian and Pedagogical Academy.
International credit mobility	According to TNPU agreements on international credit mobility, in particular ERASMUS+: Marmara University (11/20/2019 - 11/19/2024); Shenyang Normal University (11/29/2018 - 11/28/2023), Humanitas University (Sosnovets) (27.11.2018 - unlimited); The Vienna University of Education (11/27/2017 - 11/27/2020), Kujawsko-Pomeranian University of Technology (Bydgoszcz) (27.10.2014 - unlimited); University of Linguistics in Czestochowa (10/27/2014 - unlimited); Victor Frankel Higher Pedagogical School of Carinthia (06.02.2009 - 01.07.2020). http://tnpu.edu.ua/about/pidrozdily/partners.php
Training of foreign students for higher education	Possible after taking a course in Ukrainian

2. LIST OF COMPONENTS OF THE EDUCATIONAL AND PROFESSIONAL PROGRAM
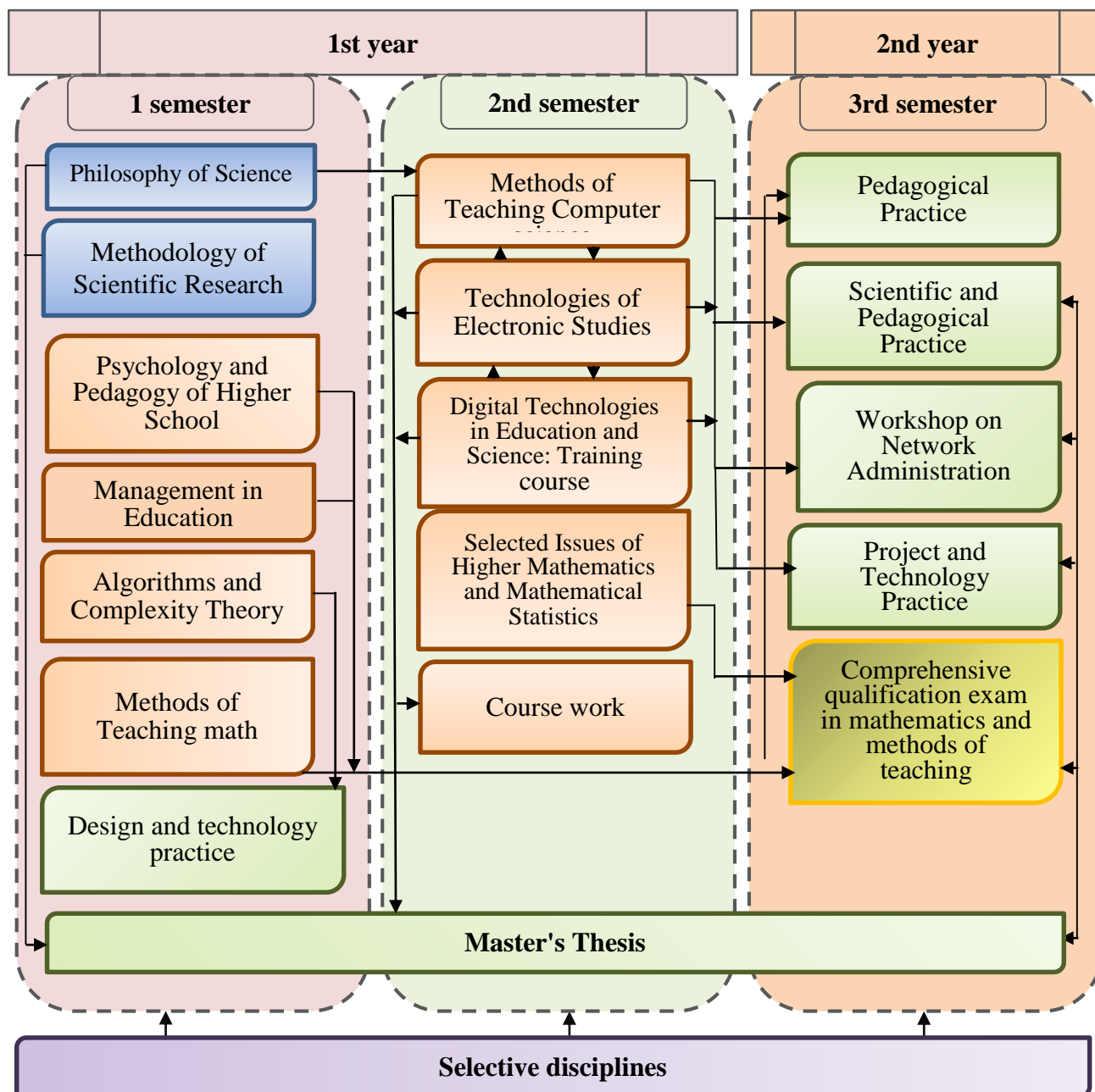
AND THEIR LOGICAL SEQUENCE

2.1. List of components of the educational and professional program

Academic discipline code	Components of the educational program (academic disciplines, coursework, internships, qualification work)	ECTS credits	Form of final control
2.1. Mandatory components of the EP			
2.1.1. Compulsory general education disciplines			
ZO.01	Philosophy of Science	3	Examination
ZO.02	Methodology of Scientific Research	3	Credit
	Total	**6**	
2.1.2. Compulsory academic disciplines of professional training			
PO.01	Psychology and Pedagogy of Higher School	3	Examination
PO.02	Management in Education	3	Test, exam
PO.03	Algorithms and Complexity Theory	3	Examination
PO.04	Methodology of Teaching Information Technologies	3	Examination
PO.05	Technologies of Electronic Studies	3	Credit
PO.06	Digital Technologies in Education and Science: Training Course	3	Credit
PO.07	Methodology of Mathematics Teaching	4	Examination
PO.08	Selected Issues of Higher Mathematics and Mathematical Statistics	6	Credit
PO.09	Term Paper in Computer Science and Methodology of Teaching Information Technologies	3	Credit
	Total	**31**	
2.1.3. Practical training			
PP.01	Pedagogical practice	6	Exam
PP.02	Research Practice	9	Examination
PP.03	Workshop on Network Administrator	3	Credit
PP.04	Project and Technological Practice	6	Credit
PP.05	Master's Thesis	6	Protection
	Total	**30**	
2.1.4. Certification			
A.01	Comprehensive qualification exam	1	Examination
	Total	**1**	
	Total amount of mandatory components	**68**	

2.2 Selective components of the EP		
2.2.1. Selective disciplines of general training		
Selective components*.		Credits
Total	**4**	
2.2.2 Selective disciplines of professional training		
Selective components*.		Credits
Total	**18**	
Total volume of selective components	**22**	
TOTAL VOLUME OF THE EDUCATIONAL AND PROFESSIONAL PROGRAM	**90**	

*Elective components (disciplines) from the university-wide catalog of selective general education disciplines and the catalog of elective professional training disciplines of the educational program, as well as disciplines from other educational programs or other levels of higher education of TNPU / other higher education institutions under external or internal academic mobility programs.

2.2. Structural and logical diagram of the educational and professional program

1st year		2nd year	
1 semester	**2nd semester**	**3rd semester**	

1 semester
- Philosophy of Science
- Methodology of Scientific Research
- Psychology and Pedagogy of Higher School
- Management in Education
- Algorithms and Complexity Theory
- Methods of Teaching math
- Design and technology practice

2nd semester
- Methods of Teaching Computer science
- Technologies of Electronic Studies
- Digital Technologies in Education and Science: Training course
- Selected Issues of Higher Mathematics and Mathematical Statistics
- Course work

3rd semester
- Pedagogical Practice
- Scientific and Pedagogical Practice
- Workshop on Network Administration
- Project and Technology Practice
- Comprehensive qualification exam in mathematics and methods of teaching

Master's Thesis

Selective disciplines

3. FORM OF CERTIFICATION OF HIGHER EDUCATION APPLICANTS

Form of certification of higher education applicants	Certification of higher education students is the establishment of compliance of the level and scope of knowledge, skills and competencies of a higher education student enrolled in an educational program with the requirements of higher education standards. Certification of applicants for higher education in the specialty 014 Secondary Education (subject specialties 014.09 Secondary Education (Informatics) and 014.04 Secondary Education (Mathematics)) is carried out in the form of a comprehensive qualification examination, defense of master's thesis and ends with the issuance of documents of the established sample on awarding a master's degree with the assignment of qualifications: Master of Education. Teacher of Informatics and Mathematics, teacher of a higher education institution. The certification is carried out openly and publicly.
Requirements for qualification work	The master's qualification work is performed by the applicant independently under the supervision of a supervisor and involves solving a complex specialized task or practical problem in the field of computer science and/or mathematics, methods of teaching computer science; aims to apply certain theories and methods of computer science and mathematics, methods of teaching computer science. The qualification work should be characterized by originality, uniqueness and uniqueness of the provisions put forward with a clear justification of the research methodology. The material must contain strong and convincing evidence in favor of the chosen concept, its justification, a comprehensive analysis of the issues under discussion, the author's original reasoning for solving the problem, supplemented by general scientific and special methods of scientific knowledge. The work should be characterized by internal unity and reflect the results of the development on the chosen topic. The qualification work must not contain academic plagiarism, falsification and fabrication; it must be checked for plagiarism. The qualification work is published on the official website of TNPU or in the TNPU repository. Requirements for public defense (demonstration) The defense of the master's thesis takes place in the form of a report by the applicant in the presence of members of the examination committee. The prerequisite for admission to the defense of the master's thesis is its preliminary defense at the scientific and methodological seminar of the department, testing of research results and main conclusions at scientific conferences, methodological seminars, etc. It is advisable to publish abstracts, articles in the student and master's bulletins of TNPU, in Ukrainian and foreign professional scientific journals. The report should be accompanied by a demonstration of the graphic part in the form of a presentation with handouts.
Requirements for public protection (demonstration)	The defense of qualification work takes place at open meetings of the examination committee. The procedure for the examination committee meeting and the defense schedule are approved by the university order and communicated to students in advance. The approval for admission to the defense must be signed by the supervisor and then signed by the head of the department. Within the period stipulated by the regulatory documents, the HE applicant must submit the following materials to the executive secretary of the examination committee: master's thesis;

	feedback from the supervisor and reviewers; his/her academic record; a CD with electronic materials. During the report, the applicant must use a developed presentation containing illustrative materials to clearly demonstrate the main points of the work. The report ends with the formulation of conclusions, where the master's student clearly defines the main results of the work, makes a comparison with known analogues and talks about the prospects for further development in this area, the practical application of the results. After the report, the HE applicant answers the questions of the members of the examination committee, which allow to determine the level of his/her professional training and erudition in general. Questions are asked orally and recorded in the minutes of the meeting. The student must give a reasoned answer to all questions. After answering the questions, the supervisor's feedback and review of the qualification work are read out. The applicant responds to the reviewer's comments. With the permission of the chairman of the examination committee, the participants present at the meeting may speak. After the public defense of the work, the examination committee discusses the results of the defense at a closed meeting and makes a decision on the evaluation of the work. When evaluating the report of a HE applicant, first of all, attention is paid to how fluent and confident he/she is in the material under study, modern terminology, and whether he/she can report independently, without the text of the report. It is important that the speaker be able to explain the materials in tables, graphs, figures, and diagrams confidently and reasonably.
Requirements for the certification/unified state qualification exam(s)	The certification exam is aimed at verifying the achievement of the learning outcomes defined by the Professional Standard and the educational program. Requirements for the structure and/or special conditions of the certification examination(s) shall be specified, if any. Requirements for the Unified State Qualification Exam are established by law.

Internal quality assurance of higher education

Internal support system quality of higher education	An internal quality assurance system is in place, which includes the following procedures and measures: − defining the principles and procedures for ensuring the quality of higher education; − monitoring and periodic review of educational programs; − ensuring the availability of the necessary resources for the organization of the educational process, including the independent work of students; − ensuring the availability of information systems for effective management of the educational process; − Ensuring publicity of information on educational programs, degrees of higher education and qualifications; − Ensuring compliance with academic integrity by employees of higher education institutions and higher education students, including the creation and operation of an effective system for the prevention and detection of academic plagiarism. The system of ensuring the quality of educational activities and the quality of higher education at the request of the higher education institution is

	evaluated by the National Agency for Quality Assurance in Higher Education or its accredited independent institutions for evaluation and quality assurance of higher education for its compliance with the requirements for the quality assurance system of higher education approved by the National Agency for Quality Assurance in Higher Education and international standards and recommendations for quality assurance in higher education. Regulated by the Regulations on the Internal Quality Assurance System at Volodymyr Hnatiuk Ternopil National Pedagogical University, approved by the Academic Council of the University, Minutes No. 7 of 23.02.2016, as amended and supplemented by the Academic Council of the University, Minutes No. 12 of 25.05.2021, put into effect by Rector's Order No. 128-p of 25.05.2021.
Principles and procedures for ensuring the quality of education	The principles and procedures for ensuring the quality of higher education at TNPU are presented in the following regulatory documents: - Regulations on the Organization of the Educational Process of Ternopil Volodymyr Hnatiuk National Pedagogical University: http://tnpu.edu.ua/about/public_inform/upload/20 19/Polozhennia_pro_orhanizatsiiu_osvitnoho_pro tsesu.pdf - Regulations on the organization and conduct of student internships: http://tnpu.edu.ua/about/public_inform/upload/20 17/Polozhennia_pro_orhanizatsiiu_ta_provedenni a_praktyk_studentiv.pdf - Regulations on Academic Mobility of Higher Education Students and Academic Staff. Regulations on the implementation of the right to academic mobility: http://tnpu.edu.ua/about/public_inform/upload/20 17/Polozhennia_pro_poriadok_realizatsii_prava_ na_akademichnu_mobilnist.pdf - Regulations on the system of internal quality assurance of education http://tnpu.edu.ua/about/public_inform/upload/20 19/Polozhennia_pro_systemu_vnutrishnoho_zabezpechennia%20yakosti.pdf - Regulations on the Center for Education Quality Assurance: http://tnpu.edu.ua/about/public_inform/upload/V chena_rada%2018- 19/ Regulations%20on%20the%20Center%20for%20Education%20Quality %20Assurance.pdf
Monitoring and periodic review of educational programs	The mechanism for creating and periodically reviewing the EP is laid down in the "Regulations on the Development and Support of Educational Programs": https://tnpu.edu.ua/about/public_inform/upload/2021/Polozhennia_pro_ro zroblennia_i_suprovodzhennia_osvitnikh_prohram_u_TNPU.pdf The EP Support Group monitors the labor market, organizationally supports the process of training higher education students throughout the entire period of study, analyzes its relevance, compliance with current regulations, recommendations of the Ministry of Education and Science of Ukraine, requirements of employers and the student community, and, if necessary, develops changes to curricula and other documentation. Proposals for improving the EP are provided by the Program Council as an advisory body to the EP guarantor, established by the Commission for Internal Quality Assurance of Education of the Faculty of Arts. Regulations on the Internal Quality Assurance System at Volodymyr Hnatiuk Ternopil National Pedagogical University, approved by the

	Academic Council of the University, (as amended), approved by the Academic Council of the University, Minutes No. 12 of 25.05.2021.
Annual evaluation of higher education students, scientific and pedagogical employees of higher education institutions and regular publicizing the results of such assessments on the official website, on information stands and in any other method	A mechanism for evaluating the achievements of applicants for scholarships has been introduced; evaluation of academic staff based on ratings of research, methodological and organizational work and rating of teachers based on the results of a questionnaire of applicants. It is enshrined in the following regulatory documents of TNPU: - Regulations on the Rating Assessment of Higher Education Applicants at Ternopil Volodymyr Hnatiuk National Pedagogical University: http://tnpu.edu.ua/about/public_inform/upload/2 017/Polozhennia_pro_reitynhove_otsiniuvannia_ zdobuvachiv_vyshchoi_osvity.pdf; - Procedure for forming a rating of persons studying at the expense of the state (local) budget: http://tnpu.edu.ua/about/public_inform/upload/2 017/Polozhennja_pro_form_reytyngu_derzhbjud zhet.pdf; - Rules for Awarding Scholarships at Ternopil Volodymyr Hnatiuk National Pedagogical University http://tnpu.edu.ua/about/public_inform/upload/2 018/Pravyla_pryznachennja_stypendij_.pdf ; - Regulation on the rating assessment of professional activity of scientific and pedagogical workers: http://tnpu.edu.ua/about/public_inform/upload/2 019/Polozhennia_pro_reitynhove_otsiniuvannia_ profesiinoi_diialnosti_naukovo_pedahohichnykh _pratsivnykiv.pdf; The results of the evaluation and rating are published on the TNPU website: http://tnpu.edu.ua/about/pidrozdily/monitoring/R ezultaty_monitorynhovykh_doslidzhen_za_2018 -2019_rr..pdf
Professional development of scientific and pedagogical, teaching and research staff	It is regulated by the Regulations on advanced training (internship) of pedagogical and scientific-pedagogical workers, approved by the Academic Council of the University, Protocol No. 1 of August 30, 2019, put into effect by the order of the rector No. 180-p of September 2, 2019. Work is underway to strengthen the practical component of advanced training of teaching staff in the system of postgraduate and non-formal education, in particular, through internships at enterprises, institutions, organizations within Ukraine and abroad, participation in international projects, grant programs, and training in certification programs. TNPU has developed and is implementing a professional development program for teachers: http://tnpu.edu.ua/about/public_inform/upload/20 19/Programa_profesijnoho_rozvytku_vykladachi v.pdf
Availability of necessary resources for the organization of the educational process	Applicants of the Acting program are provided with the necessary resources (material base, teaching and methodological and information support, distance learning platform Moodle). Measures are being taken to improve the organization of independent work of applicants of various forms of education, including through constant monitoring, updating of discipline courses, and the distance learning platform Moodle. TNPU has: - Regulations on the organization of students' independent work: http://tnpu.edu.ua/about/public_inform/upload/20 17/Polozhennia_pro_samostiinu_robotu_studenti v__.pdf ; - Regulations on Distance Learning at Ternopil Volodymyr Hnatiuk National Pedagogical University: http://tnpu.edu.ua/about/public_inform/upload/2 018/Polozhennia_pro_dystantsiine_navchannia.p df

	- Regulations on the electronic teaching and methodological complex of the discipline http://tnpu.edu.ua/about/public_inform/upload/2 019/Polozhennia_pro_elektronnyi_navchalno_m etodychnyi_kompleks_navchalnoi_dystsypliny.p df
Ensuring the observance of academic integrity by employees of higher education institutions and higher education students, including the creation and operation of an effective system for the prevention and detection of academic plagiarism in the scientific works of employees of higher education institutions and higher education students	TNPU has one: - Regulations on the Prevention and Detection of Plagiarism and Other Academic Dishonesty in the Educational and Research Work of Higher Education Students: http://tnpu.edu.ua/naukovarobota/public%20information/Plag%20zdobyv .p df; - Regulations on Prevention and Detection of Plagiarism and Other Types of Academic Dishonesty in the Educational, Methodological and Research Work of Employees: http://tnpu.edu.ua/naukovarobota/public%20information/Plagiat%20praci v n.pdf. TNPU has a Permanent Commission on Ethics and Academic Integrity to prevent plagiarism in educational activities: http://tnpu.edu.ua/about/public_inform/upload/V chena_rada%2018- 19/ Commission%20on%20academic%20virtue.jpg All applicants for higher education in the specialty 026 Performing Arts and academic staff who ensure the implementation of the EP sign a declaration of academic integrity. Qualification works of higher education applicants are checked for plagiarism in the MOODLE system.
Other procedures and activities	TNPU has one: - Institutional model of the system of internal quality assurance of education: http://tnpu.edu.ua/about/pidrozdily/monitoring/I nstytutsiina_model_systemy_vnutrishnoho_zabe zpechennia_jakosti_TNPU.pdf ; - Program of measures to ensure the quality of education: http://tnpu.edu.ua/about/public_inform/upload/2 019/Programa_zakhodiv_iz_zabezpechennia_ya kosti_osvity.pdf

4. MATRIX OF CORRESPONDENCE OF PROGRAM COMPETENCIES TO THE COMPONENTS OF THE EDUCATIONAL PROGRAM

	IR	ZK1	ZK2	ZK3	ZK4	ZK5	ZK6	ZK7	ZK8	ZK9	ZK10	FC1	FC2	FC3	FC4	FC5	FC6	FC7	FC8	FC9	FC10
ZO.01	+			+																	
ZO.02	+	+	+	+	+	+	+					+	+				+	+	+		
PO.01	+			+			+	+		+							+				+
PO.02	+			+			+	+			+										
PO.03	+											+	+	+	+				+	+	
PO.04	+		+							+	+								+		+
PO.05	+							+			+					+					+
PO.06	+							+			+					+			+		
PO.07	+		+		+	+		+									+				
PO.08	+											+	+			+			+	+	
PO.09	+			+	+				+	+	+								+		
PP.01	+		+							+	+		+						+		+
PP.02	+		+							+	+							+	+		+
PP.03	+											+	+	+						+	
PP.04	+											+	+	+		+	+			+	
A.01	+											+		+	+						
A.02	+											+	+		+	+	+			+	

5. MATRIX OF PROVIDING PROGRAM LEARNING OUTCOMES (PLOS) WITH RELEVANT COMPONENTS OF THE EDUCATIONAL PROGRAM

	PR1	PR2	PR3	PR4	PR5	PR6	PR7	PR8	PR9	PR10	PR11	PR12	PR13	PR14	PR15	PR16	PR17	PR18	PR19	PR20	PR21	PR22	PR23	PR24
ZO.01	+								+										+	+				
ZO.02		+	+								+			+								+		
PO.01				+	+														+		+			
PO.02					+					+										+				
PO.03			+					+			+					+								
PO.04					+		+		+					+							+			+
PO.05						+											+							
PO.06					+	+			+															
PO.07									+					+				+			+			+
PO.08			+				+	+																
PO.09						+	+					+			+		+							+
PP.01					+			+						+							+			
PP.02									+		+			+							+			
PP.03						+		+							+			+						
PP.04								+																
A.01									+		+													
A.02		+	+						+		+											+	+	

6. List of regulatory documents on which the educational program is based

1. Law of Ukraine "On Higher Education" [Electronic resource]. URL: http://zakon5.rada.gov.ua/laws/show/1556-18.

2. National Qualifications Framework, approved by the Resolution of the Cabinet of Ministers of Ukraine of 23.11.2011 No. 1341 (as amended) [Electronic resource].URL: http://zakon0.rada.gov.ua/laws/show/1341-2011-п.

3. Licensing conditions for the implementation of educational activities, approved by the Resolution of the Cabinet of Ministers of Ukraine of December 30, 2015 No. 1187 (as amended by the Resolution of the Cabinet of Ministers of Ukraine of March 24, 2021 No. 365) [Electronic resource].URL: https://zakon.rada.gov.ua/laws/show/365-2021-%D0%BF#Text

4. Classifier of professions DK 003:2010 [Electronic resource]: National Classifier of Ukraine: Order of the State Committee of Ukraine for Technical Regulation and Consumer Policy of 28.07.2010 No. 327 / State Committee of Ukraine for Technical Regulation and Consumer Policy. URL: https://hrliga.com/docs/327_KP.htm.

5. ECTS User's Guide [Electronic resource]. 2015. URL: http://erasmusplus.org.ua/en/news/1162-ects-user-guide-2015-in-english-and-ukrainian-languages-are-available-in-e-format.html

6. Standards and guidelines for quality assurance in the European Higher Education Area (ESG) - K.: TS LLC, 2015. 32 p.URL: https://www.britishcouncil.org.ua/sites /default/files/standards-and-guidelines_for_qa_ in_the_ehea_2015.pdf

7. Methodological recommendations for the development of higher education standards, approved by the order of the Ministry of Education and Science of Ukraine of 01.06.2017 No. 600 (as amended by the order of the Ministry of Education and Science of Ukraine of 30.04.2020 No. 584). URL: https://mon.gov.ua/ua/npa/pro-unesennya-zmin-do-.
   metodichnih-rekomendacij-shodo-rozroblennya-standartiv-vishoyi-osviti-1

8. Development of educational programs: methodological recommendations / by V.M. Zakharchenko, V.I. Lugovoy, Yu. Rashkevich, Zh.V. Talanova; edited by V.G. Kremen. Kyiv: Priorities Research and Development Center, 2014. 120 c. URL:
   http://ibhb.chnu.edu.ua/uploads/files/metodrada/Rozroblennya_osv_program.pdf

9. Regulations on Accreditation of Educational Programs for the Training of Higher Education Applicants (Order of the Ministry of Education and Science of Ukraine dated 11.07.2019 No. 977 URL: https://zakon.rada.gov.ua/laws/show/z0880-19#Text

10. Recommendations for the application of criteria for assessing the quality of the educational program / Approved by the National Agency for Quality Assurance in Higher Education on November 17, 2020: / Ukrainian Educational Publishing Center "Orion" LLC. Kyiv, 2020. 66 c.

11. Recommendations for the experts of the National Agency for the accreditation of educational programs of the third level of higher education (Annex to the "Methodological Recommendations for the experts of the National Agency for the application of the Criteria for assessing the quality of educational programs"). URL: https://naqa.gov.ua/wp- content/uploads/

12. To the heads of higher education institutions: Letter of the Ministry of Education and Science of Ukraine dated 28.04.2017 No. 1/9-239. URL: https://pstu.edu/wp-content/uploads/2019/01/

Guarantor of the educational program   O.Romanyshyna

The program is approved at a meeting of
the Department of Department of Informatics
and Methods of its Teaching
Protocol № 11 dated 01.06.2022
Head of the Department of Department of
Department of Informatics
and Methods of its Teaching   H. Henseruk

The program is approved by the Academic
Council of the Faculty of Physics and Mathematics
Protocol № 9 dated 21.06.2022
Chairman of the Academic Council of the Faculty   M. Hromiak

The educational program is recommended for implementation by the Academic
Council of Ternopil Volodymyr Hnatiuk National Pedagogical University

Protocol № 13 dated 28.06.2022
Academic Secretary of the University   V. Hevko