Ministry of Education and Science of Ukraine

V.N. Karazin Kharkiv National University

Educational-scientific_____program

(educational-professional / educational-scientific)

Pure mathematics (the English language of instruction)

(title of program)

Speciality_____111 Mathematics_____

(code, title of speciality)

Specialization _____

(title of specialization)

the second (Master of Science)___degree of higher education

(the first (Bachelor), the second (Master), the third (Ph.D.)

APPROVED

by Academic Council of V.N. Karazin
Kharkiv National University
date 30.05.2022 order №__9_____

Entered into force from the 2022/2023
academic year
by order № № 0208-1/207
dd. 09.06.2022
Vice-rector for scientific and pedagogical work

_____Oleksandr HOLOVKO
«____» _____ 2022

APPROVAL

of educational-scientific program

Mathematics

1.1. Scientific and Methodological Council of V.N. Karazin Kharkiv National University
minutes №_8_ dd. «__18__»___05_____2022.

Chairman of the Scientific and Methodological Council

Vice-rector for scientific and pedagogical work _____Oleksandr HOLOVKO

1.2. Scientific council of the school: minutes №__5_ dd. «_17__»___05_____2022.

Head of Scientific council of

School of Mathematics and Computer Sciences _____Hryhorii ZHOLTKEVYCH

1.3. Scientific and Methodological Commission of the Faculty of Mathematics and Informatics
minutes №_9_ dd. «_16_»_____05_____2022.

Head of Scientific

and Methodological committee of the Faculty_____ Olha ANOSHCHENKO

1.4 Department of Fundamental (Pure) Matehmatics :
minutes №_10_ dd. «__16__»___05____2022.

Head of Department of Fundamental (Pure) Mathematics _____Oleksandr YAMPOLSKIY

INTRODUCTION

Developed by the workgroup consisting of:

Name and surname	Position	Scientific degree, scientific title (by which department given)
Head of the workgroup		
Tamara Fastovska- **the garantor of the program Pure mathematics (the English language of instruction), speciality 111 Mathematics**	Associate Professor of Department of Fundamental Mathematics	Ph.D., associate professor, Department of Higher Mathematics.
Members of the workgroup		
Volodymyr Kadets	Professor of Department of Fundamental Mathematics	D.Sc., Professor, Department of Fundamental Mathematics.
Oleksandr Yampolskiy	Head of Department of Fundamental Mathematics	D.Sc., Professor, Department of Fundamental Mathematics.

The following requirements are taken into account:

1) The educational standart of the speciality: the standard of higher education is absent. Until the official standard of higher education at the Master's level is enacted the program corresponds to the **temporary standard** of V.N. Karazin Kharkiv National University approved by the Scientific Council on "_27_" ___06____ 2022 , minutes №_10__, implemented by order 06.07.2022 , minutes №_0208-1/262.

1. Profile of the educational program Pure mathematics (the English language of instruction) speciality 111 Mathematics

1 –General information	
Degree of higher education and qualification	Master of Science, Master in Mathematics
Official title of the educational program	Pure mathematics (the English language of instruction)
Type of diploma and the scope of the educational program	Diploma of Master of Science, single, 120 ECTS-credits, apprenticeship 1 year 9 months.
Accreditation availability	certificate of accreditation of specialty 111 Mathematics issued by the Ministry of Education and Science and Ukraine on 09/18/2017 series ND No. 2189565
Cycle/level	National Qualification Frame of Ukraine – level 7 , FQ-EHEA – the second cycle, EQF-LLL – level 7
Prerequisites	Diploma of Bachelor of Science
Language of instruction	English
Validity period	31/05/2024
Permanent web address of the educational program	V.N. Karazin Kharkiv National University School of Mathematics and Computer Sciences Department of Pure Mathematics http://math.univer.kharkov.ua/
2 – Aims of the educational program	
Forming and development of general and professional competences in applied mathematics, which contribute to the social stability and mobility of the graduate in the labour-market; gaining of higher professional education, which allows the graduate to perform successfully the functions and the regular tasks of a mathematician in various fields of human activity, national economy and production.	
3 – Characteristics of the educational program	
Subject area (area of knowledge, speciality, specialization (if applicable))	11 Mathematics and statistics, 111 Mathematics
Orientation of the educational program	Educational-scientific, academic. Guarantees the attainment of the complex of general and professional competences, essential for performance of professional tasks in the field of mathematics, specifically, fundamental grounding in mathematics and applied mathematics, fundamental skills in applied research.
Main focus of the educational program and specialization	Special education in the field of mathematics, which embraces fundamental grounding in mathematics, application of mathematical theories in scientific research, technics, information area. Keywords: applied mathematics, scientific research
Peculiarities	
4 – Work placement availability and further education aptitude	

Work placement availability	Types of economic activity (according to ДК 009:2010): 72.1 Scientific research and development 72.1 Research end experimental development in the natural sciences and engineering 72.19 Research end experimental development in other natural sciences and engineering 72.19 Research and experimental developments in other natural and technical sciences 85.31 Secondary education 85.32 Vocational education 85.41 Vocational education at the higher vocational school level 85.42 Higher education Professional titles of jobs (according to ДК 003:2010): 2121.1 Researcher (mathematics) 2121.2 Mathematician 2310.2 Lecturer 2320 Vocational school teacher; school teacher
Further education	Further education on the third (educational and research) level of higher education.
5 – Instruction and evaluation	
Instruction and training	The main approaches to education are competent, active, student friendly and problem oriented ones. Main methods of instruction are problematic, partially exploring and research ones. Instruction has the forms of lections, including interactive and multimedia lectures, seminars, self-preparation and research work. Design, graphic modeling and interactive communicative technologies of instruction are used.
Evaluation	Four-level and two-level, 100-score grading system by means of the following methods of monitoring with accumulation of scores: *current* (oral and written quiz), *interim* (tests), *final* (written tests, training records), *certification* (Master's thesis defence).
6 – Program competences	
Integral competence (ІК)	ІК01 – Ability for solving difficult mathematical and practical problems during professional activity or training process, which presupposes doing research and/or introducing innovations and is characterized by complexity and/or indeterminacy of conditions.
General competences (ЗК)	ЗК01 – Ability for abstract thinking, analysis and synthesis. ЗК02 – Ability to use knowledge in practice. ЗК03 – Knowledge and understanding of the subject area and professional activity. ЗК04 – Ability to do research at the correspondent level. ЗК05 – Ability to study and to gain contemporary knowledge. ЗК06 – Ability to find, to process, and to analyze information from various sources. ЗК07 – Team skills. ЗК08 – Ability to generate new ideas (creativity). ЗК09 – Ability to develop and to manage projects.
Special (professional, subject) competences (СК)	СК01 – Knowledge and understanding of fundamental methods and applications of algebra, mathematical logic, category theory; to have an idea of the axiomatic structure of mathematical theories. СК02 – Ability to formulate and prove mathematical statements,

	to make conclusions, to establish the correctness of the problems solutions and considerations. CK03 – Knowledge and understanding of fundamental methods of mathematical, complex, and functional analysis, geometry, topology, and ability to apply them to theoretical research and for solving applied problems. CK04 – To have an idea of applied problems that may be solved by means of contemporary mathematical methods, knowledge and understanding of methods of construction and qualitative and quantitative analysis of mathematical models of natural, engineering, economic, social objects and processes. CK05 – Ability to use available programming tools for computations, information search, publishing research. CK06 – Ability to choose appropriate mathematical tools and to use known theoretical notions and facts for solving research problems. CK07 – Ability to present and to arrange research, in particular, as research papers and conference talks. CK08 – Ability to put forward, formulate and prove new theoretical statements and to investigate the possibilities of their application to solving theoretical and applied problems. CK09 – Ability to do research and to formulate and solve new theoretical and applied problems, to develop innovative methods of their solving and analysis of results. CK10 – Orientation in new areas of mathematics, new developments and achievements.
7 – Program results of training	
	PH01. To know classification and the essence of modern global problems, approaches to their solution, their reflection on the Ukrainian realities. To be able to apply this knowledge and methodology to investigation of political, economic, social processes in Ukraine and in the world. PH02. To know the main types of linear partial differential equations, methods of investigation of their solutions. To be able to use these methods for investigation of elliptic, parabolic, second order hyperbolic equations, in particular, those arising in physical models, to use methods of approximate solutions. PH03. To know definitions, examples, main properties of groups, rings, fields, moduli, and linear spaces, their (homo)morphisms, categories and functors. To use these notions and methods in order to investigate algebraic objects in the problems from various mathematical areas and applications. PH04. To know basic notions and theorems of differential topology that concern smooth manifolds and mappings, tangent spaces, forms and integration, basic notions of Riemannian and metric geometry. To be able to investigate smooth manifolds and geometric structures on them and to use them in theoretical and practical problems. PH05. To know theorems and methods of modern topics of functional and complex analysis, in particular, basic facts about Banach and Hilbert spaces and operators in them, theory of Fourier series in Hilbert spaces and basic facts about Fourier transform, properties of holomorphic functions, zeros of entire functions, conformal equivalence of domains,

	the main theorems of complex analysis. To be able to investigate spaces and operators by the methods of functional analysis, various classes of functions by the methods of complex analysis. PH06. To know the statements of the main problems of modern control theory, basic methods of investigation of linear and some nonlinear controlled systems, Pontryagin maximum principle, methods of solving synthesis problems for linear systems by means of the controllability function method. To be able to use these methods, to construct mathematical models and to investigate them for simple applied problems of control theory. PH07. To demonstrate ability for self-study, to be able to organize activities and safe working environment. PH08. To demonstrate communication skills, ability to present research results at scientific seminars, team skills. PH09. To be able to use knowledge from the area of mathematics and other areas, to explore sources (including those in foreign languages), systemize and process information obtained, to make reviews and presentations at seminars, to use known information for obtaining new results, construction of examples, proof of new theorems and for construction and investigation of new mathematical models of objects and processes in the real world. To be able to present research in the form of a manuscript and to defend its content. PH10. To be able to use knowledge from mathematical theories for the statement of new problems, putting forward hypotheses, formulation and proof of new results and their analysis. PH11. To be able to organize own work and work of a team while doing research or realization of a project. PH12. To be able to find scientific information in modern sources, analize and compare results from different sources, to orientate oneself in contemporary scientific areas and their applications.
8 –Program realization resources	
Faculty	Meets the license requirements. All lecturers are staff members of V.N. Karazin Kharkiv National University and hold D.Sc. or Ph.D. degrees and/or academic titles in the corresponding specialities. Faculty undergoes retraining once in five years.
Equipment and facilities	Equipment, educational hardware (multimedia whiteboards, multimedia projectors, laptops, printers, scanners, personal computers with software) for formation of subject competences in educational process. Lecture-rooms, laboratories, computer rooms, student residential complex, canteens, Wi-fi spots, gyms are available.
Dataware	Official site of V.N. Karazin Kharkiv National University, unlimited Internet access, printed (Central Scientific Library of V.N. Karazin Kharkiv National University resources, repository, libraries of laboratories) and Internet resources (including Internet Education Center of V.N. Karazin Kharkiv National University); educational and working plans of courses and trainings (with explanatory notes), educational programs, sets of teaching resources, including lectures, practical tasks, tasks for self-preparation, tasks for current and final monitoring. Meets the license requirements, 100%.
9 – Academic mobility	
National credit	

mobility	
International credit mobility	As a part of the School of Mathematics and Computer Science of V.N. Karazin National University, the Department of Pure Mathematics is a member of **InterMaths** consortium – an internation joint Master program in the area of applied and interdisciplinary mathematics which is founded by • UAQ – University of L'Aquila (Italy) • BUT – Technical university of Brno (Czech Republic) • US – University of Silesia in Katowice (Poland) • LNU – I. Franko Lviv Naional University (Ukraine)
Instruction of international students	Foreign citizens are accepted on the basis of international contracts, on terms stated in these contracts, contracts between V.N. Karazin Kharkiv National University and foreign universities and organizations and individual contracts.

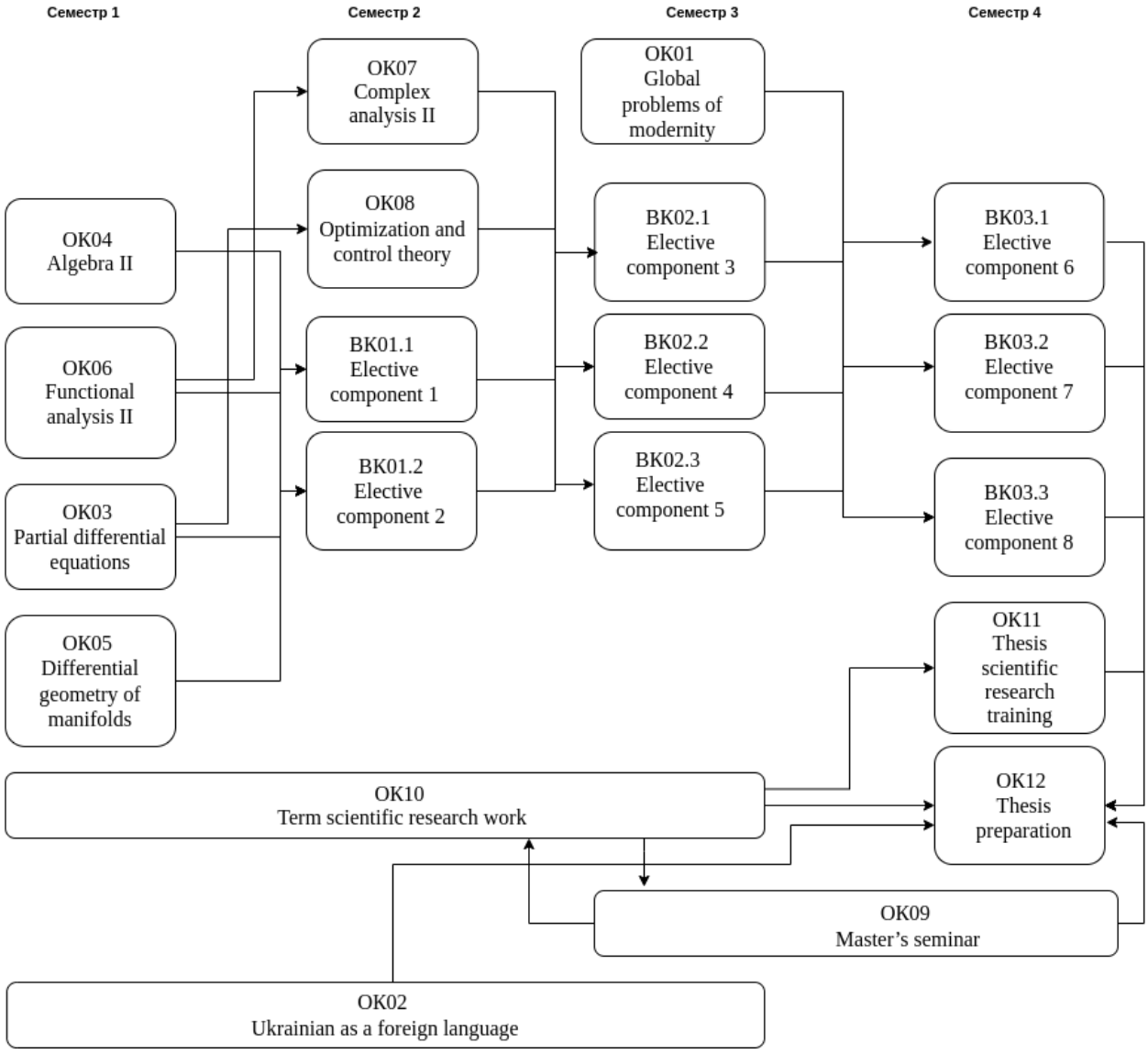
2. List of the components of the educational-research program and their logical order

2.1. List of the components of the educational-research program

Code of the course	Components of the educational program (courses, research projects (works), trainings, thesis)	Amount of credits	Grading
Compulsory components of the educational program			
1.1 Cycle of humanities and social and economic training			
OK01	Global problems of modernity	3	Two-level evaluation scale
OK02	Ukrainian as a foreign language	6	Four-level evaluation scale
1.2 Cycle of fundamental training			
OK03	Partial differential equations	6	Four-level evaluation scale
OK04	Algebra II	6	Four-level evaluation scale
OK05	Differential geometry of manifolds	6	Four-level evaluation scale
OK06	Functional analysis II	6	Four-level evaluation scale
OK07	Complex analysis II	5	Four-level evaluation scale
OK08	Optimization and control theory	5	Four-level evaluation scale
1.3 Cycle of professional and practical training			
OK09	Master's seminar	13	Two-level evaluation scale
OK10	Term scientific research work	14	Two-level evaluation scale
OK11	Thesis scientific research training	9	Two-level evaluation scale
OK12	Thesis preparation	6	Four-level evaluation scale

Code of the course	Components of the educational program (courses, research projects (works), trainings, thesis)	Amount of credits	Grading
Total compulsory components		**85**	
Elective components of the educational program (7 disciplines are selected according to the catalog of professional elective disciplines of the Faculty of Mathematics and Informatics with a total volume of 33 ECTS) **https://drive.google.com/drive/u/0/folders/1wTwwkHRtpf477JoHYsZ5_V-Bv34wkJmw**			
BK01.1	Elective component 1	4	Four-level evaluation scale
BK01.2	Elective component 2	4	Four-level evaluation scale
BK01.3	Elective component 3	5	Four-level evaluation scale
BK02.1	Elective component 4	5	Four-level evaluation scale
BK02.2	Elective component 5	5	Four-level evaluation scale
BK03.1	Elective component 6	4	Four-level evaluation scale
BK03.2	Elective component 7	4	Four-level evaluation scale
BK03.3	Elective component 8	4	Four-level evaluation scale
Total elective components		**35**	
TOTAL		**120**	

2.2. Structural logical scheme of the educational program



3. Form of certification of Master's candidates

Certification of master's candidates in the speciality has the form of defence of Master's thesis, which is a result of the **scientific research work** of a candidate. Certification is carried out by the Examining board, approve by an order of the President of V.N. Karazin Kharkiv National University. The Examining board makes a decision on awarding the Master's degree in mathematics according to educational-scientific program to a candidate and issues a state diploma.

Only students who performed successfully all requirements of educational plan are admitted to the certification.

Master's thesis is a completed consistent scientific research, which is an evidence of preparedness of a candidate to performing professional tasks using gained integral knowledge and skills. Analysis and applied investigation of mathematical problems are expected. Size and structure of Master's thesis is determined by the university. Theses undergo plagiarism checking, according to the procedure, determined by the education quality ensuring system. For the sake of persuasiveness and support of conclusions and suggestions, the talk of a candidate can have a form of a presentation with the use of multimedia equipment.

Certification is held publicly.

4. Matrix of correspondence of program competences to the components of the educational program

	ОК01 ОК02	ОК02	ОК03	ОК04	ОК05	ОК06	ОК07	ОК08	ОК09	ОК10	ОК11	ОК12
ІК01			+	+	+	+	+	+	+	+	+	+
ЗК01			+	+	+	+	+	+	+	+	+	+
ЗК02	+	+	+	+	+	+	+	+	+	+	+	+
ЗК03			+	+	+	+	+	+	+	+	+	+
ЗК04		+	+	+	+	+	+	+	+	+	+	+
ЗК05	+	+	+	+	+	+	+	+	+	+	+	+
ЗК06									+	+	+	+
ЗК07									+	+		
ЗК08									+	+		+
ЗК09		+							+	+	+	+
СК01				+								
СК02			+	+	+	+	+	+	+	+	+	+
СК03			+		+	+	+	+				
СК04			+					+	+	+	+	+
СК05									+	+	+	+
СК06									+	+	+	+
СК07									+	+	+	+
СК08			+	+	+	+	+	+	+	+	+	+
СК09									+	+	+	+
СК10									+	+	+	+

5. Matrix of maintenance of program results of training (РН) by correspondent components of educational program

	ОК01	ОК02	ОК03	ОК04	ОК05	ОК06	ОК07	ОК08	ОК09	ОК10	ОК11	ОК12
РН01	+											
РН02			+									
РН03				+								
РН04					+							
РН05						+	+					
РН06								+				
РН07										+	+	+
РН08		+							+		+	
РН09		+							+	+	+	+
РН10										+	+	+
РН11									+	+	+	+
РН12									+	+	+	+