NAO "KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY
named after K.I. SATPAYEV"

Mining and Metallurgical Institute named after O.A. Baikonurov
«Mine Surveying and Geodesy» department

EDUCATIONAL PROGRAM

8D07306 "Geospatial digital Engineering"

Code and classification of the field of education: 8D07 Engineering, Manufacturing and Civil engineering
Code and classification of training areas: 8D073 Architecture and Civil engineering
Group of educational programs: D123 Geodesy
NRK Level: 8
ORC Level: 8
Duration of training: 3 years
Volume of credits: 180

Алматы 2022

NAO "KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY
named after K.I. SATPAYEV"

The educational program 8D07306 "Geospatial digital engineering" was approved at the meeting of the Academic Council of KazNRTU named after K.I.Satpayev.
Protocol № 13 of "28" 04 2022
Reviewed and recommended for approval at a meeting of the Educational and Methodological Council of KazNRTU named after K.I.Satpayev.
Protocol № 13 of "28" 04 2022

The educational program 8D07306 "Geospatial digital engineering"
was developed by the academic committee in the direction 8D07306 "Geospatial digital Engineering"

Full name	Academic degree/ academic title	Position	Place of work	Signature
Chairman of the Academic Committee:				
Kochetova M.A.		director	«Leica Geosystems Kazakhastan»	
Teaching staff:				
Orynbassarova E.O.	Doctor PhD	head of the department	SU	
Nukarbekova Zh.M.	м.t.s.	senior lecturer	SU	
Employers:				
Alpysbay M.	м.t.s.	head of department	RSE ON PCV "NATIONAL CENTER FOR GEODESY OF SPATIAL INFORMATION	
Narbaev M.M.		director	TOO "ALIGeo"	
Students				
Ahmetov R.	м.t.s.	3rd year doctoral student		

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List of abbreviations and designations

Table 1 – Abbreviations used

Reduction	Full name
ECTS	European Credit Transfer and Accumulation System
NJSC SU	NJSC Satbayev university
MES RK	Ministry of Education and Science of the Republic of Kazakhstan
TS	Teaching staff
EP	Educational program
RO	Registrar's Office
WC of the EP	Working curriculum of the EP

1. Description of the educational program

Training of scientific, technical and engineering personnel with world-class competencies in the field of digital technologies based on the integration of fundamental physical-mechanical and practice-oriented engineering education with research and development for geodesy, cartography, geoinformatics, land management and surveying.

2. The purpose and objectives of the educational program

Goal EP: creation, based on the integration of education and science, of an effective system for training scientific, scientific and pedagogical personnel of a new formation capable of solving issues of improving society, economy, production, science and the development of new technologies in the field of geodesy, geospatial digital engineering.

Tasks EP:

Task 1: The readiness of specialists for research and project work in the field of geodesy, cartography, geoinformatics, including in related fields related to the selection of necessary research methods, modification of existing and development of new methods based on the objectives of a specific study.

Task 2: The readiness of specialists to develop and implement methods of technologies at the local level to solve problems in the field of geospatial technologies.

Task 3: The readiness of specialists to search for and obtain new information necessary to solve professional tasks in the field of knowledge integration in relation to their field of activity, to actively participate in the activities of an enterprise or organization.

Task 4: The readiness of specialists for scientific, informational, ideological and problematic communications in the professional environment and in the audience of non-specialists with a clear and deep justification of their position, to

engage in organizational, managerial and service activities, to be aware of the responsibility for making their professional decisions.

Task 5: The readiness of specialists for self-study and continuous professional development.

Task 6: Willingness to analyze scientific publications and to present in writing the results of their own research in accordance with accepted norms in a foreign language.

Task 7: Willingness to navigate in modern approaches, methods and means of study, as well as trends and ways of developing methods for solving the problem.

3. Requirements for the evaluation of learning outcomes of the educational program

Learning outcomes include knowledge, skills and competencies and are defined both for the general education program and for its individual modules, disciplines or tasks.

The main task at this stage is to choose methods and means of evaluation for all types of control, with the help of which it is possible to effectively assess the achievement of the planned learning outcomes at the subject level.

4. Passport of the educational program

4.1. General information

№	Field name	Note
1	Field of education	8D07 Engineering, Manufacturing and Civil engineering
2	Direction of personnel training	8D073 Architecture and Civil engineering
3	Group of educational programs	D123 Geodesy
4	Educational program	8D07306 Geospatial Digital Engineering
5	Brief description of the educational program	Training of scientific, technical and engineering personnel with world-class competencies in the field of digital technologies based on the integration of fundamental physical-mechanical and practice-oriented engineering education with research and development for geodesy, cartography, geoinformatics, land management and surveying.
6	EP purpose	Creation, based on the integration of education and science, of an effective system for training scientific, scientific and pedagogical personnel of a new formation capable of solving issues of improving society, economy, production, science and the development of new technologies in the field of geodesy, geospatial digital engineering.
7	EP type	New EP
8	Level on NQF	8
9	Level on SQF	8
10	EP distinctive features	No
11	List of competencies of the educational program:	7
12	The formed educational outcomes	1) Analyze the trends of modern science, identify promising areas of scientific research in the subject area of professional activity, the composition of research papers, their determining factors. 2) Use methods of mathematical, numerical and computer modeling in the analysis and solution of applied and engineering problems, exhibiting the skills of expanding their knowledge based on information and educational technologies. 3) Gain in-depth knowledge in the subject area of professional activity, reflecting the current level of development. 4) To form a conceptual worldview of the future scientist in terms of studying the spatial aspects of the surrounding world when making professional and/or managerial decisions. 5) Use a mathematical and statistical approach to spatial problems, including methods from geoinformation systems and packages for statistical data processing. 6) To be guided by modern approaches, methods and means of studying the shape and external gravitational field of the Earth and other planets, as well as trends and

		ways of developing methods for solving this problem. 7) Analyze scientific publications and present in writing the results of their own research in accordance with accepted norms in a foreign language.
13	Form of training	Daytime
14	Duration of training	3 years
15	Volume of the credits	180
16	Languages of instruction	Russian, Kazakh
17	The awarded academic degree	Doctor
18	Developer(s) and authors:	Department of MSaG

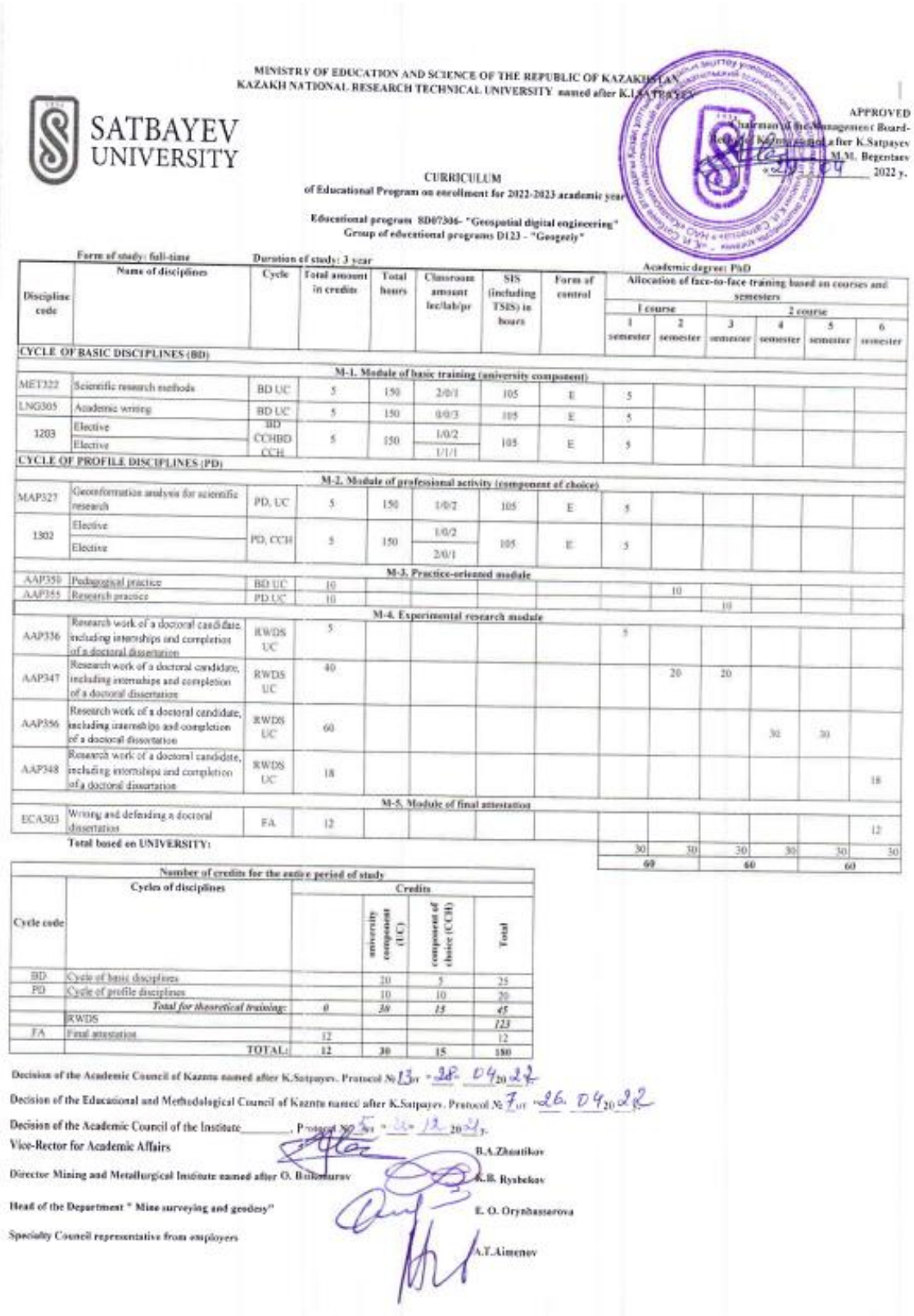
4.2. The relationship between the achievability of the formed learning outcomes according to the educational program and academic disciplines

№	Name of the discipline	Brief description of the discipline	Number of credits	Generated learning outcomes (codes)							
				LR1	LR2	LR3	LR4	LR5	LR6	LR7	LR8
Cycle of basic disciplines University component											
1.	Academic writing	The course is aimed at developing academic writing skills and writing strategies for doctoral students in the field of engineering and natural sciences. The course focuses on the basics and general principles of academic writing for; -writing effective sentences and paragraphs; -using tenses in scientific literature, as well as styles and punctuation; -writing an abstract, introduction, conclusion, discussion, conclusion, literature and resources used; - quoting in the text; - preventing plagiarism, and making a presentation at the conference.	5							v	
2.	Methods of scientific research	The concept of science and scientific research, methods and methodology of scientific research, methods of collecting and processing scientific data, principles of organization of scientific research, methodological features of modern science, ways of development of science and scientific research, the role of technical sciences, computer science and engineering research in modern science, the structure of technical sciences, the use of general scientific, philosophical and special methods scientific research in theory and in practice.	5	v							

Cycle of basic disciplines Elective component											
1.	Mathematical methods in geodesy	The study of the theoretical and practical foundations of the branches of mathematics that make up the fundamental basis of the production and processing of geodetic measurements. Mathematical statistics, modeling methods for the design of geodetic networks, measurement errors and the solution of optimization geodetic problems during research in the field of geodesy, cartography, geospatial technologies.	5		**v**			**v**			
2.	Mathematical modeling of deformation processes	Basic concepts and information about geosystems, geomodeling and the technological scheme of monitoring the movement of the Earth's surface, buildings and structures. Study of methods of correlation and regression analysis to establish trends in the dynamics of deformation processes; cellular automata to create predictive models of subsidence; forecasting of deformations of the Earth's surface, buildings and structures based on the results of geodetic observations using available quantitative and qualitative data of other types of field observations in Matlab software during research.	5		**v**			**v**			
Cycle of profile disciplines University component											
1.	Geoinformation analysis for scientific research	Within the framework of this discipline, a doctoral student will master the practical development of GIS technologies when performing scientific research, when making professional, managerial decisions, effectively and taking into account specific needs to solve the tasks of automating the	5			**v**	**v**	**v**			

		processing and analysis of spatial data of territories. As a result of the course, the doctoral student must demonstrate the ability to analyze, synthesize and design databases, digital models.									
Cycle of profile disciplines Component of choice											
1.	Theory of the figure of the Earth	As part of the course, the doctoral student will master the possibilities of determining the figure of the Earth by successive approximations using heterogeneous geodetic, gravimetric, astronomical and satellite measurements: the concept of determining the figure of the Earth by its sequential refinement, as well as the relationship of parameters describing the figure and the external gravitational field of the Earth.	5			**v**			**v**		
2.	Fundamental and applied coordinate-time support of geodesy tasks	The discipline is focused on the formation of ideas and understandings about the main tasks and structure of the fundamental segment, the definition of the celestial and terrestrial reference coordinate systems, simplified models of the celestial and terrestrial systems, the modern level of solving the fundamental coordinate-time support, the parameters of the PVZ, the requirements for a set of tools, the use of GNSS in coordinate-time support.	5			**v**					

5. Curriculum of the educational program



MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN
KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after K.I.SATPAYEV

SATBAYEV UNIVERSITY

APPROVED
Chairman of the Management Board-
Rector of KazNRTU named after K.Satpayev
M.M. Begentaev
«28» 04 2022 y.

CURRICULUM
of Educational Program on enrollment for 2022-2023 academic year

Educational program 8D07306- "Geospatial digital engineering"
Group of educational programs D123 - "Geogeely"

Form of study: full-time | Duration of study: 3 year | Academic degree: PhD

Discipline code	Name of disciplines	Cycle	Total amount in credits	Total hours	Classroom amount lec/lab/pr	SIS (including TSIS) in hours	Form of control	Allocation of face-to-face training based on courses and semesters					
								I course		2 course			
								1 semester	2 semester	3 semester	4 semester	5 semester	6 semester
CYCLE OF BASIC DISCIPLINES (BD)													
M-1. Module of basic training (university component)													
MET322	Scientific research methods	BD UC	5	150	2/0/1	105	E	5					
LNG305	Academic writing	BD UC	5	150	0/0/3	105	E	5					
1203	Elective	BD CCHBD	5	150	1/0/2	105	E	5					
	Elective	CCH			1/1/1								
CYCLE OF PROFILE DISCIPLINES (PD)													
M-2. Module of professional activity (component of choice)													
MAP327	Geoinformation analysis for scientific research	PD, UC	5	150	1/0/2	105	E	5					
1302	Elective	PD, CCH	5	150	1/0/2	105	E	5					
	Elective				2/0/1								
M-3. Practice-oriented module													
AAP350	Pedagogical practice	BD UC	10						10				
AAP355	Research practice	PD UC	10							10			
M-4. Experimental research module													
AAP336	Research work of a doctoral candidate, including internships and completion of a doctoral dissertation	RWDS UC	5					5					
AAP347	Research work of a doctoral candidate, including internships and completion of a doctoral dissertation	RWDS UC	40						20	20			
AAP356	Research work of a doctoral candidate, including internships and completion of a doctoral dissertation	RWDS UC	60								30	30	
AAP348	Research work of a doctoral candidate, including internships and completion of a doctoral dissertation	RWDS UC	18										18
M-5. Module of final attestation													
ECA303	Writing and defending a doctoral dissertation	FA	12										12
Total based on UNIVERSITY:								30	30	30	30	30	30
								60		60		60	

Number of credits for the entire period of study

Cycle code	Cycles of disciplines	Credits			
			university component (UC)	component of choice (CCH)	Total
BD	Cycle of basic disciplines		20	5	25
PD	Cycle of profile disciplines		10	10	20
	Total for theoretical training:	*0*	*30*	*15*	*45*
	RWDS				*123*
FA	Final attestation	12			12
	TOTAL:	12	30	15	180

Decision of the Academic Council of Kaznu named after K.Satpayev. Protocol № 13 от «28» 04 2022

Decision of the Educational and Methodological Council of Kaznu named after K.Satpayev. Protocol № 7 от «26» 04 2022

Decision of the Academic Council of the Institute_____. Protocol № 5 от «28» 12 2021 y.

Vice-Rector for Academic Affairs — B.A.Zhautikov

Director Mining and Metallurgical Institute named after O. Baikonurov — K.B. Ryskeldiev

Head of the Department " Mine surveying and geodesy" — E. O. Orynbassarova

Specialty Council representative from employers — A.T.Aimenov

МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РЕСПУБЛИКИ КАЗАХСТАН
КАЗАХСКИЙ НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ ТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ имени К.И.САТПАЕВА

SATBAYEV UNIVERSITY

APPROVED by
Director of the Mining and Metallurgical Institute named
K.B. Rysbekov
_____ 2022

ELECTIVE DISCIPLINES of the educational program for recruitment for the 2022-2023 academic year

Educational program 8D07306 - "Geospatial Digital Engineering"
Group of educational programs D123 - Geodesy

Form of study: full-time Duration of study: 3 years Academic degree: Doctor PhD

Year of study	Elective code according to the curriculum	Discipline code	Name of disciplines	Semester	Cycle	Credits	Total hours	lec/lab/pr	SIW (including SIWT) in hours
			Profile training module						
1	1301	MAP328	Theory of the figure of the Earth	1	P, EC	5	150	1/0/2	105
		MAP329	Fundamental and applied coordinate-time support of geodesy tasks					1/0/2	
			"R&D" module						
	1203	MAP326	Mathematical modeling of deformation processes	1	B, EC	5	150	1/0/2	105
		MAP316	Mathematical methods in geodesy					1/1/1	

Number of credits in elective disciplines for the entire period of study	
	Credits
Cycle of basic disciplines (B)	5
Cycle of profile disciplines (P)	5
TOTAL:	10

Decision of the Academic Council of the Institute Minutes No 5 dated 20 12 2021

Head of the department "Mine surveying and geodesy" E.O.Orynbasarova

Specialty Council representative A.T. Almenov