

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

EDUCATIONAL PROGRAM 6B07303-« Geospatial digital Engineering »

Education Area code and classification: 6B07 Engineering Manufacturing and Civil engineering

Training area code and classification: 6B073 Architecture and Civil engineering Group of educational programs: B074 Urban planning, construction work and civil engineering

NRC level: 6 ORC Level: 6

Duration of training: 4 years

Amount of credits: 240

- NJSC "KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after K.I. SATPAEV"

Educational program 6B07303 «Geospatial digital engineering» was approved at a meeting of the Academic Council of KazNRTU named after. K.I. Satpaeva. Protocol № 13 of "28" 04 2022

Considered and recommended for approval at a meeting of the Educational and Methodological Council of KazNRTU named after. K.I. Satpaeva.

Protocol № 13 of "28" 04 2022

Educational program 6B07303 «Geospatial digital engineering» developed by the academic committee in the direction of "Geospatial Digital Engineering"

Full name	Academic degree / academic title	Position	Place of work	Signature
Chairman of the Aca	ademic Com	mittee:		
Kochetova M.A.		director	«Leica Geosystems Kazakhastan»	Jelen
Academic staff:				***************************************
Orynbassarova E.O.	Doctor PhD	head of department	SU	and
Nukarbekova Zh.M.	M.T.H.	Senior Lecturer	SU	July
Employers:				-
Alpysbay M.	M.t.s.	head of department	RSE ON PCV "NATIONAL CENTER FOR GEODESY OF SPATIAL INFORMATION	Allogs
Narbaev M.M.		director	TOO "ALIGeo"	Tedespo
Students	4			9//
Tohan A.E.		3rd year students		Mosky

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List of abbreviations and symbols

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

The Geospatial Digital Engineering educational program is a first-level qualification of three levels of the higher education system. At the expense of the qualification module and final qualification work of bachelors of the educational program.

2. The purpose and objectives of the educational program

Goal EP: The purpose of the educational program is to prepare a graduate as a competitive specialist in the field of geodesy and cartography, possessing critical thinking, able to use theoretical and practical information to perform geodetic, topographic, astronomical-geodetic, photogrammetric and cartographic work using modern geodetic equipment and geospatial digital technologies for solving applied problems.

Tasks EP:

Task 1: preparing graduates for organizational activities that exclude negative phenomena in professional activity, the development of spiritual values, moral and ethical norms of a person as a member of society, the execution of the legal and legislative system of the Republic of Kazakhstan with a high level of professional culture, civic position;

Task 2: preparing graduates for continuous self-improvement and self-development, mastering new knowledge, skills and abilities in innovative areas of geodesy and cartography;

Task 3: preparation of a graduate with acquired competencies for performing calculations of elements in geodesy and cartography, design of technical solutions, participation in the development of technical tasks for topographic, geodetic, aerospace, cartographic work on the basis of modern educational material and technical base;

Task 4: preparation of a graduate, based on the diversity and dynamism of

NJSC "KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after K.I. SATPAEV" the catalog of elective disciplines of the curriculum, with a predominance of practical skills in competencies, capable of performing professional functions within one or more types of activities based on the final results of training, taking into account the specifics of these activities, market requirements for organizational and managerial, professional competencies;

Task 5: training of graduates as a competitive specialist in the field of geodesy and cartography, including on the basis of increasing the international aspect in educational and scientific programs, competent in the field of advanced technologies of geodesy, cartography, and registration of research results.

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 educational program as a whole and for its individual modules, disciplines or tasks.

The main task at this stage is to select assessment methods and tools for all types of control, with the help of which it is possible to most effectively assess the achievement of planned learning outcomes at the discipline level.

4. Passport of the educational program

4.1 General information

No	Field Name	Note
1	Code and classification of the field	6B07 Engineering, Manufacturing and Civil
	of education	engineering
2	Code and classification of training	6B073 Architecture and civil engineering
3	Group of educational programs	B074 Urban Planning, construction works and Civil
		engineering
4	Name of the educational program	6B07303 Geospatial Digital Engineering
5	Brief description of the	Educational program "Geospatial Digital
	educational program	Engineering" – This is a first-level qualification of
		the three levels of higher education.
6	EP purpose:	The purpose of the educational program is to
		prepare a graduate as a competitive specialist in the
		field of geodesy and cartography, possessing critical
		thinking, able to use theoretical and practical
		information to perform geodetic, topographic,
		astronomical-geodetic, photogrammetric and
		cartographic work using modern geodetic
		equipment and geospatial digital technologies for
		solving applied problems.
7	EP type:	New EP
8	Level on NQF	6

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9 Level on SQF 6	
10 EP distinctive features No	
11 List of competencies of the 12	
educational program:	
12 The formed educational outcomes: 1. To form the ability to	o communicate orally and in
	=
	ssian and foreign languages to
interaction	nterpersonal and intercultural
	nding of the essence and
	nding of the essence and
	n in the development of
· · · · · · · · · · · · · · · · · · ·	ility to receive and process
	us sources, the willingness to
	formalize information in a
form accessible to othe	
	stages and patterns of the
	of society for the formation
of a civic position.	
•	es of philosophical knowledge
for the formation of a v	•
5. Demonstrate proficie	• •
	ques, ability to work in a
<u> </u>	eption of social, ethnic,
	ral differences, awareness of
	endently and improve their
skills throughout their	•
	mathematical knowledge in
	ny to solve applied problems
using Matlab.	
	g data of the Earth in solving
	stral and land management
	notography of land plots using
	les; apply GIS technologies
	arious subjects, digital models
of terrain and objects.	
	edge in the field of creating
digital models and mod	
	ed on remote sensing data,
mathematical interpreta	
	or solving geodesy problems
and creating maps and	
materials in a web envi	
•	nd algorithms when designing
maps and building web	applications, creating
interactive maps.	
	of modern geoinformation
	relopment of digital maps,
conceptual and termino	
cartography in the desi	gn and computer design of
maps.	

NJS	SC "KAZAKH NATIONAL RESEARCH	TECHNICAL UNIVERSITY named after K.I. SATPAEV"
		10. Demonstrate knowledge in the field of WEB-
		geoinformatics and modern geoinformation
		technologies for solving professional geodetic and
		cartographic tasks; use ENVI programs for
		photogrammetric image processing, ArcGIS and
		QGIS for image classification; create
		orthophotoplanes and digital terrain models based on
		UAV data.
		11. Demonstrate a wide range of theoretical and
		practical knowledge in the professional field, the
		ability to develop, implement and control the quality
		and completeness of projects of high-precision and
		applied geodetic works.
		12. Demonstrate mastery of geodetic,
		photogrammetric and cartographic methods;
		technical means of space geodesy; computer
		technology and automated processing of geodetic,
		cadastral, land management information.
		13. To form the ability to carry out the main
		technological processes of topographic and geodetic,
		aerial photogrammetric and cartographic works and
		the ability to calculate the technical and economic
		efficiency when choosing technical and
		organizational solutions for topographic and
		geodetic and cartographic production.
		14. Apply modern technologies for obtaining field
		geodetic information for mapping the territory of the
		country and updating the existing cartographic fund.
		15. Apply ground-based and satellite positioning
		technologies for geodetic support of construction of
		engineering structures; process satellite observation
		data in professional software products; perform laser
		scanning to create high-precision three-dimensional
		models of industrial facilities for their inclusion in
		corporate management systems, construction and
		control, operational monitoring of particularly
		important objects and hazardous areas, calculation of
10		volumes of displaced soil, movement slopes, etc.
	Form of study	Daytime
14	Period of study	4 years
15		240
	Language of education	Russian, Kazakh
17	The awarded academic degree	Bachelor
18	Developer(s) and authors:	Department MSaG

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

#	Name of the discipline	Short description of the discipline	Number of															
			credits	LR1	LR2	LR3	LR4	LR5	LR6	LR7	LR8	LR9	LR10	LR11	LR12	LR13	LR14	LR1 5
		Cycle of gen					lines											
			ersity co	mpo	nen	t	ı	1 1		1	ı	1 1			1			
1	The basics of anti-corruption	The discipline studies the	5	V	V													
	culture	essence, causes, causes of																
		sustainable development of																
		corruption from both historical																
		and modern points of view.																
		Examines the prerequisites																
		and impacts for the																
		development of an anti-																
		corruption culture. Studies the																
		development of anti-																
		corruption on the basis of																
		social, economic, legal,																
		cultural, moral and ethical																
		norms. Studies the problems																
		of the formation of an anti-																
		corruption culture based on																
		the relationship with various																
		types of social relations and																
		various manifestations.																
2	Fundamentals of	The discipline studies the	5	V	v	v												
	entrepreneurship and	basics of entrepreneurship and		'	•	•												
	leadership	leadership from the point of																
	1	view of science and law;																
		features, problematic aspects																
		and prospects of development;																
		theory and practice of																

		entrepreneurship as a system of economic, organizational and legal relations of business structures; readiness of entrepreneurs for innovative receptivity. The discipline reveals the content of entrepreneurial activity, career stages, qualities, competencies and responsibilities of an entrepreneur, theoretical and practical business planning and economic expertise of business ideas, as well as risk analysis of innovative development, introduction of new technologies and technological solutions.									
3	Ecology and life safety	The discipline studies the tasks of ecology as a science, environmental terms, the laws of the functioning of natural systems and aspects of environmental safety in the conditions of labor activity. Monitoring of the environment and management in the field of its safety. Sources of pollution of atmospheric air, surface, groundwater, soil and ways to solve environmental problems; life safety in the technosphere; natural and	5	V	v	V					

		man-made emergencies									
		Cycle	of basic	discipli	nes	,	•			 LI CONTRACTOR OF THE PROPERTY	
			versity co								
4	Higher geodesy	Master a holistic understanding of the tasks of higher geodesy, the main methods of high-precision geodetic measurements, while studying the planning, selection of methods and tools, and mathematical processing of geodetic measurements in the creation and development of state geodetic networks by traditional methods and satellite navigation systems and must demonstrate the ability to analyze and evaluate the quality of the construction	5	ompone	nt	V		V			
5	Geodetic instruments	of state geodetic networks. To master modern geodetic instruments, methods and methods of performing measurements with them, verification and adjustment of instruments, and the methodology of their research. Master satellite positioning technologies to perform topographic surveys. Learn how to perform topographic and geodetic work with the necessary accuracy to create	5					V	V		

		engineering plans and maps. Be able to independently choose the necessary set of geodetic tools when solving specific tasks.									
6	Geodesy	He will master the basic concepts of the Shape and size of the Earth, about coordinate systems used in geodesy, about the orientation of lines on the terrain, about plans, maps, profiles, about scale, terrain relief, about angular and linear measurements, about altitude measurements, about methods and measurements of topographic surveys, about the accuracy of geodetic measurements, the use of geodetic instruments, as well as cameral processing of the geodetic measurements obtained.	6		V				v		
7	Geoinformatics	To familiarize students with the analysis of natural and socio-economic systems through computer modeling based on geographic information systems (GIS). The student must master the algorithm and technological scheme for creating topographic maps and plans, hardware and hardware, GIS	5			Y	V	V			

		software, principles of database formation and design of specialized GIS and gain skills in creating GIS using aerospace and ground survey materials.								
8	Gravimetry	The purpose of the discipline is to study methods for determining the characteristics of the Earth's gravitational field in order to use them in solving scientific and practical problems of geodesy, geophysics and geology. As a result of studying the subject, the student must master the technologies of performing gravimetric measurements, analysis and processing of gravimetric flight data, as well as master the methods of constructing maps of gravity anomalies using modern technologies.	5				V		V	
9	Engineering geodesy	To form theoretical knowledge and practical skills in the processing and use of geodetic information as the initial basis for making and implementing decisions in land management design, cadastral registration and valuation of real estate. To master modern methods of	5		v		V			

		performing geodetic work carried out with the aim of compiling large-scale topographic and cadastral maps and plans. Be able to perform geodetic measurements to determine the boundaries of land.								
	Engineering surveying linear structures	To form theoretical knowledge and practical skills in the field of obtaining, processing and using geodetic information as the initial basis for making and implementing decisions in the design, construction and operation of engineering linear structures, the creation of geodetic plans. To master modern methods of performing geodetic works carried out during surveys of linear structures, providing topographic and geodetic plans of various scales, profiles for the design, construction and reconstruction of linear structures.	5		V			V		
11	Engineering and computer graphics	The course develops the following skills in students: to depict all kinds of combinations of geometric shapes on a plane, to conduct research and their	5		V	1	<i>,</i>			

		measurements, allowing for image transformations; create technical drawings, which are the main and reliable means of information, providing a link between the designer and the designer, technologist, builder, in AutoCAD.							
12	Cartography	To study the mathematical basis of maps and types of cartographic projections. Be able to choose and justify the scale, recognize the map projection. Examine the distortions on the maps. To master the cartographic methods of depicting the relief. To study the main sources for compiling thematic and general geographical maps. Master the basic methods of creating maps in ArcGIS.	6				V	V	
13	Mathematics I	The course is based on the study of mathematical analysis in a volume that allows you to study elementary functions and solve the simplest geometric, physical and other applied problems. The main focus is on differential and integral calculus. The course sections include the differential calculus of	5		V				

		functions of one variable, the derivative and differentials, the study of the behavior of functions, complex numbers, and polynomials. Indefinite integrals, their properties and methods of calculation. Certain integrals and their applications. Improper integrals.							
14	Mathematics II	The discipline is a continuation of Mathematics 1. The course sections include elements of linear algebra and analytical geometry. The main issues of linear algebra are considered: linear and selfadjoint operators, quadratic forms, linear programming. Differential calculus of a function of several variables and its applications. Multiple integrals. The theory of determinants and matrices, linear systems of equations, as well as elements of vector algebra. The elements of analytical geometry on the plane and in space are included.	5		V				
	Organization and planning of topographic and geodetic works	The purpose of mastering the discipline "Organization and planning of topographic and geodetic works" is to master	5				V	V	

		theoretical and practical foundations during the preparation and sending of requests to technical inventory bodies.							
16	Applied geodesy	To study the methods of geodetic works when accompanying the design, construction and operation of engineering structures. Master the processing and evaluation of the accuracy of geodetic information and the construction of the initial basis on the construction site. To analyze the composition and organization of geodetic works in the design of structures; to argue for the use of methods and means when transferring the construction project to nature; organize geodetic monitoring of buildings and structures during their operation.	5		V		V		V
17	Remediation and protection of lands from erosion	Master basic knowledge for solving theoretical and practical professional problems in the field of land reclamation and reclamation; find the right solutions to prevent, identify and eliminate violations of the use and protection of land, land and	5				V	V	V

		water legislation; develop technical specifications for the design of land reclamation and reclamation works; develop projects for the organization of the territory for engineering and reclamation of the territory.							
18	Theory of matematical processing og geodetic measurements	The purpose of studying the subject is to master the methods of processing the results of geodetic measurements, the ability to evaluate the accuracy of measurements, as well as the equalization of geodetic constructions. Within the course, the student must master the use of elements of probability theory and mathematical statistics to assess the quality of measurements performed, as well as methods of equalizing geodetic networks based on the principle of least squares.	5		V				
19	Topographical graphics	The discipline studies the theory and methods of graphic design of cartographic materials used in cartography, geodesy, land management, as well as the use of a graphic software package (CorelDRAW, AutoCAD,	4			v		V	

	etc.). It also includes theoretical knowledge and practical skills in creating a topographic map, a land management plan, compiling and editing, preparing for publication and publishing maps, drawing and design work, for which it is necessary not only to know the materials, drawing accessories and also to combine the methods and techniques of drawing and designing maps.					
20 Physics			V			

		antica recess managements of												
		optics, wave properties of												
		light, laws of thermal												
		radiation, photoelectric effect.												
21	Digital mapping	Get theoretical knowledge and	5						V	V	V			
		practical skills in using												
		software for creating and												
		updating digital topographic												
		bases, plans and maps. To												
		study the methods of creating												
		digital and electronic maps, as												
		well as the automation of												
		cartographic work. To master												
		the technology of creating												
		digital topographic maps												
		containing logical and												
		mathematical descriptions of												
		mapped objects and the												
		relationships of terrain objects												
		in the form of their												
		combinations, intersections												
		and neighborhood.												
	1	E	of basic	disci	nline	PS		ı						
		<u> </u>	ponent		_									
22	Geodetic works at industrial	To master the methods of	5				,	,						V
	sites of mines and quarries	conducting geodetic works on					\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \							•
	Sies of immed data qualities	industrial sites of mines and												
		quarries to create a reference												
		and survey network, to learn												
		how to perform a set of survey												
		work for drawing up a master												
		plan of the surface of a												
		mineral deposit with an												
		indication of the boundaries of												
		mining and land allotments on												
		mining and land anotherits on										<u> </u>		

		it, ways of carrying out the design position of mining workings in kind, drawing up and processing the necessary reporting and graphic documentation.									
23	Geoinformation cartography	To study the sequential processes of developing digital maps and technological schemes of interaction in the GIS environment. Gain skills in creating thematic maps using GIS-based tools and structurally organize input data, visualize, and interpret the resulting data. be able to use general geographical and thematic maps, aerial imagery and statistical data for digital mapping. Be able to apply modern computer and information technologies for creating maps and atlases.	4			v	v	v			
24	Geodetic and engineering surveying	To study the main types of topographic and geodetic works performed to ensure the design, construction and reconstruction of various structures, as well as to perform geological, hydrometeorological and other types of engineering surveys. To learn how to perform geodetic measurements when	5			v	V	V			

	creating a planned, high- altitude justification for the design of engineering structures, to survey linear structures and underground utilities, to process the results of geodetic measurements and topographic surveys in order to build engineering plans and terrain profiles.								
Information technology in geodesy and remote sensing	The purpose of studying the discipline is to prepare students to work with the basic algorithms for processing remote sensing data. The student should know algorithms for working with large images and be able to apply Internet technologies for creating web services for storing and presenting spatial data.	5			V	V			
Cartometry and mathematical cartography	The purpose of studying the discipline "Cartometry and mathematical cartography" is to develop students' knowledge about the principles and methods of making measurements on maps: determining the geographical and rectangular coordinates of points, measuring the lengths of sinuous and straight lines,	4		V				v	

		calculating the volumes of surface sections, measuring angles and areas. To master ways of displaying the Earth's surface on a plane, using the mathematical basis of maps: scale, map projection, cartographic grid, coordinate grid.								
27	Basics of laser scanning	To study the principle of operation of terrestrial laser scanners, the sources of errors in laser scanning and technological schemes of terrestrial laser scanning. To master the methods of external orientation of scans and the technique of laying scanner passages. Learn how to apply scanning technology in solving problems in geodesy, construction, architecture and in the oil and gas industry.	6	V	V	V	v			
28	Fundamentals of environmental mapping	To study technologies for creating ecological maps to support state and regional environmental programs. Get an idea about the parameters of environmental pollution sources. To master the methods of collecting, analyzing and cartographic data on the state of the natural environment and be able to	6					V	v	

		anasta invantany aggagement											
		create inventory-assessment,											
		forecast, and control maps											
		using modern mapping											i
20		technologies.	_										
29	Web-cartography	Learn the concept of creating	5				V	V	V				
		maps and designing											
		cartographic materials on the											
		web. To master the systems											
		and algorithms of web											
		architecture, in order to design											
		and create interactive maps											
		and web applications. Gain											
		skills in using the basics of											
		computer networks and how											
		they work, and analyze how											
		GIS servers and JavaScript											
		work. Create CSS styles,											1
		graphic design, animation and											
		effective interaction of											
		geospatial information											
		through a web browser.											
		Cycle o	f profile	e discip	lines								
			ersity co										
30	Automanion of topographic	The purpose of studying the	5							V	V		v
	and geodetic works	discipline is to obtain								•	•		
		theoretical knowledge and											1
		practical skills on how to											
		automate topographic and											
		geodetic work in solving											
		applied problems in the design											1
		and construction of											
		engineering structures.					1						
		Particular attention during the					1						
		passage of this discipline is											
	1	<u>и</u> <i>С</i>	l .		ı	l .	 1	1	l .	1		l l	

		paid to the training of modern automated geodetic instruments, the study of the principle of conducting topographic surveys using terrestrial laser scanning, the introduction of UAVs for the effective acquisition of geodetic data, as well as the use of satellite technologies.								
31	Aerospace survey methods	As part of the subject, students will study the theoretical foundations of the use of aerospace survey methods to solve geodesy and cratography problems. The physical and geometric foundations of aerial surveys, platforms and sensors of space surveys of various ranges will be considered. Students will gain skills in processing aerospace images using various software products, learn how to perform georeferencing of images, classify depicted objects, and create orthophotomaps, digital terrain and relief models.	5						V	V
32	Remote sensing of the earth	To master the methods of processing and analyzing satellite imagery data in solving cartographic, geodetic and environmental problems.	6			V			V	v

		To study the physical foundations of remote sensing of the Earth, modern sensors, and operating platforms. Master the technology of space imagery processing, including image enhancement and image interpretation methods, and learn how to select remote sensing data for solving environmental problems.							
33	Basics of the cadastre	Master the basics of land, water, legal and multifunctional cadastre, as well as the system of accounting, registration and evaluation of land. To study the procedure for carrying out cadastral activities, automate the information system of the state land cadastre, which allows filling out basic land cadastral documents, providing information support for decisions of executive authorities, providing information support to the real estate market, developing market relations, protecting and rationally using land.	5		V		V		
34	Photogrammetry	To train specialists in the basics of theoretical and practical knowledge of	5				v	v	

		modern photogrammetric processes, including methods of performing aerial surveys, their cameral processing, and analyzing the accuracy of the materials obtained, as well as methods of using them to create and update topographic maps and plans. Master the processing of aerial images from UAVs in photogrammetric programs in order to create orthophotoplanes and digital terrain models.										
		Cycle o	f profil	discin	lines	 Z	1	1	I			
		_	ponent	_		,						
35	Geodetic support for the construction of unique buildings and structures	To study the methods of engineering and geodetic works for the maintenance and construction of the construction of unique buildings and structures. Know the regulatory documents on the production and accuracy of geodetic works during the construction and operation of unique buildings and structures. To master the methods of creation and technical characteristics of geodetic justification support for the construction of unique buildings and structures. Be	5							V	V	V

		able to use high-precision geodetic instruments, perform center work and organize geodetic observations of deformations of unique structures									
36	Global navigation satellite systems	To study the basic principles of satellite positioning technologies, absolute and relative methods of satellite measurements, the differential method of GNSS, as well as the specifics of the use of pseudo ranging and phase measurements. Familiarize yourself with the coordinate and time systems used in satellite observations. To master methods for calculating the instantaneous position of satellites and orbital parameters of satellites, as well as methods for calibrating and equalizing satellite measurements. Learn how to use GNSS observations to create satellite	4						v	v	V
37	Monitoring of deformations of	geodetic networks. Geodynamics as scientific	6								v
	structures	discipline. Modern value of geodynamics at various scales of its use (global, regional, local). Geodynamic tasks of geodesy. Classification of the									

		geodynamic phenomena. Geodynamic grounds, their purpose and appointment. Research SGDZP on GDP. High-precision angular and linear measurements on GDP. Studying of SVDZK according to repeated leveling. GPS – supervision on GDP.									
38	Fundamentals of digital photogrammetry	As part of the study of the discipline, students will study the theoretical foundations of photogrammetry, modern methods, systems and software products for digital photogrammetric processing and master the complex of knowledge necessary to use digital photogrammetry methods to solve geodetic problems. Students will also learn how to perform photogrammetric processing of images in the ENVI program, perform image classification in ArcGIS and QGIS software, and process UAV data in the Agisoft program.	5							Y	V
39	Web-GIS basics	Master the acquisition of theoretical and practical skills of working in WEB-geoinformation systems and modern geoinformation	4			V	V	V			

		technologies, possess the skills of using software and working in computer networks, the ability to create databases and use Internet resources, WEB portals, own software and software, GIS technologies, be able to work with information from various sources to solve professional and social problems.										
40	Applied photogrammetry	Possess the theoretical foundations of photogrammetry, methods of photogrammetric processing of aerospace and ground images. Learn how to make topographic and cadastral plans based on aerospace survey data. Obtaining skills in modern photogrammetric software products. Be able to select space images of the required resolution, perform their primary processing and classification, as well as receive information about dynamic processes for solving environmental problems. Master the methodology of working with unmanned summer jobs.	5						v	V		
41	Thematic mapping	To master the technology of	5			v	v				v	

		creating thematic maps reflecting all phenomena and objects in their mutual connection and development. To study the mathematical basis, cartographic image, legend of conventional signs, as well as auxiliary equipment and additional data. Master the methodology of creating thematic maps using modern information technologies, methods of analyzing raw materials and be able to create physical-geographical, socio- economic maps and maps of environmental assessment and forecasting.							
42	Economics and management of cartographic production	The nature of the geographic data and the methods by which they are displayed on maps. Representation of spatial data. Preparation of the map and the process of digitization. Methods of cartographic images. Methods for input of vector data. Remote sensing as a special case of input raster data. Subsystem of storage and editing GIS. Cartographic overlay. Graphic errors in vector systems. Methods of drawing up, preparing for	5		V		V	V	

		publication and issuing maps. Elementary spatial analysis. Measurement of lengths, perimeters, areas in raster and vector systems. Measures of form.							
43	Economics and management of topogeodetic production	To form an idea of the economics of industrial production and methods of solving economic problems that arise in the process of topogeodesic and cartographic work. Be able to carry out calculations of economic efficiency and investment projects of engineering and geodetic works. Know the organization of product quality control in the main structural and auxiliary divisions of cartographic and geodetic enterprises, the standard structure of the financial management system of the cartographic and geodetic industry.	5				v	Y	

5. Curriculum of the educational program

MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTA KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY mamed after K.I.SATY AND ADMINISTRY OF THE PROPERTY OF THE PROPER



APPROVED
Chrisman of the Management BoardReco-Coff Karntumnood, after K. Satpayev
M. M. Begentuev
2022 y.

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

Educational program 6B07303 - "Geospatial digital engineering" Group of educational programs B074 - "Urban planning, construction works and civil engineering"

-	Form of study: full-time Name of disciplines	Duration of Cycle		-	Transcent of		A	cademic	degree: E	Bachelor a	of Engine	ering and	Tooler		
Disciplin		Lycle	Total	Total	classroo	SIS	+ 01 101 04	A	Bocation o	f face-to-f	ace training	or hased	rechnol	ogy	
	· .		amount	hours	m	(includin	control	10	ourse	II o	ourse	III a	ourse :		
code	1		in		volume	g TSIS)		1	2	3	4	Ssemeste		IVe	ourse
			credits		of	in hours		semester	semester	semester	semester	F	1	semester	8
CYCLE	OF GENERAL EDUCATION DIS	CIBI INCE (C	P.De		lek/lab/p			TO THE TANK	100000	100.00			semester	semester	semes
	The state of the s	CILTIAES (C	ED)												_
LNG 108	English language	_		- 13	M-1, Mode	de of lange	rage train	ing				_	_	_	_
-		GED, RC	10	300	0/0/6	210	E	5	5						
LNG 104	Kazakh (Russian) language	GED, RC	10	300	0/0/6	210	-		- 22					1	
C. C		1	- 10		Action to the second		E	5	5						
KFK 101-	Physical Culture			- Far 1 1 2 41 4	M-2. Modu	ile of phys	ical traini	ng							_
104		GED, RC	8	240	0/0/8	120	Diforedit	2	2	2	2				-
				M-	. Module e			Alexander .	.0.						
CET CON	Information and communication					a milor ma	cross techn	otogy							
CSE 677	technologies (in English)	GED, RC	5	150	2/1/0	105	E				500		12		
			0.9	7500	10000	HERE:					5				
100000				M-4,	Module of	socio-cultu	ral develo	noment							
HUM 100	Modern History of Kazakhstan	GED, RC	5	150	1/0/2	105	SE	-pantant	. 1	-					
HUM 132	- Transcription	GED, RC	5	150	1/0/2	105	E		5						
HUM 120	Socio-political knowledge module	-11-10-07-1		77.55							- 5			10-	
	(sociology, politology)	GED, RC	3	90	1/0/1	60	E				3				
HUM 134	Socio-political knowledge module	GED, RC	5	140											
10000000	(culturology, psychology)		100	150	2/0/1	150	E			5			- 1		
			M-5. Mo	dule of ar	ti-corrupti	on culture	ecology	and life so	Safer house	- 22					
HUM 133	Fundamentals of anti-corruption				1	- contain	, cennigy	and me as	nety base						
11000	culture														
MNG 488	Fundamentals of Emrepreneurship	GED, CCH	5	140	****	120	40								
MING 488	and Leadership	SEDUCEN	2	150	2/0/1	150	E			5					
CHE 656	Ecology and life safety												- 1		
Company of the Company	BASIC DISCIPLINES (BD)						-								
. I C.L.E. OF	BASIC DISCIPLINES (BD)					-						_			
			D.	f-6, Mode	le of physi	cal and ma	thematic	al training							
Andrew Street,	Mathematics I	BD, UC	5	150	1/0/2	105	p T	5	-						
	Physics I	BD, UC	5	150	1/1/1	103	E	5		_					
MAT 102	Mathematics II	BD, UC	. 5	150	1/0/2	105	-	2		-					
				-	M-7. Modu	The second second	Produčna		5						
GEN 429	Engineering and computer	22.00			77.77.77.000	or or passe	training								
1000011201	graphics	BD, UC	5	150	1/0/2	105	E	5							
(AP449.	Topographical graphics	BD, UC	3	90	9/0/2	75	E	4	-						
(AP536	Geodesy	BD, UC	6	180	2/0/2	120		4							
(AP537	Cartography:	BD, UC	6	180	2/0/2	120	E	_	5	-					
Company 1	STREET, STREET				odule of e	reinsering	manufation.	e de la contra		6					
	Engineering geodesy	BD, UC	5	150	1/0/2	105	E	FUEKS	-		_				
	Higher geodesy	8D, UC	5	150	1/0/2	105	E	-		5					
IAP478	Theory of matematical processing	nn ro		900				-			5				
	og geodetic measurements	BD, UC	5	150	1/0/2	105	E				5				
	Geodetic instruments	BD, UC	5	150	1/0/2	105	E	-							
AP481		BD, UC	5	150	1/0/2	105		-				5			
AP481	Digital mapping		_			100	E				5				
AP481 AP477 AP488	Organization and planning of	200			1/0/2	105	E					5			
IAP481 IAP477 IAP488	Organization and planning of	BD, UC	5	150	Dinta.										
AP481 (AP477 (AP488 (AP114	Digital mapping Organization and planning of topographic and geodetic works Geoinformatics	200	77	17.5%	75.	75									
AP481 AP477 AP488 AP114 AP498	Organization and planning of topographic and geodetic works	BD, UC	5	120	1/0/2	75	E					5			
AP481 AP477 AP488 AP114 AP498	Organization and planning of topographic and geodetic works Geoinformatics	BD, UC BD, UC BD, UC	5	120	1/0/2	105	E					5	5		
AP481 AP477 AP488 AP114 AP498 AP482 CAP480 AP480	Organization and planning of topographic and geodetic works Occumbormatics Applied geodesy Gravimenty Engineering surveying linear	BD, UC BD, UC BD, UC BD, UC	5 5 5	120 150 150	1/0/2 1/0/2 1/0/2	105	E					5	5 5		
AP481 AP477 AP488 AP114 AP498 AP482 AP480 AP480	Organization and planning of topographic and geodetic works Ocountermanes Applied geodesy Gravinnery Engineering surveying linear structures.	BD, UC BD, UC BD, UC	5	120 150 150	1/0/2	105	E					5			
AP481 IAP488 IAP488 IAP488 IAP488 IAP480 IAP4	Organization and planning of topographic and geodetic works Occumbormatics Applied geodesy Gravimenty Engineering surveying linear	BD, UC BD, UC BD, UC BD, UC BD, UC	5 5 5	120 150 150 150	1/0/2 1/0/2 1/0/2 1/0/2	105 105 105	E E					5		5	
IAP481 IAP477 IAP488 IAP488 IAP498 IAP482 IAP480 IAP	Organization and planning of topographic and geodetic works Geoinformatics Applied geodesy Gravimetry Engineering surveying linear structures.	BD, UC BD, UC BD, UC BD, UC	5 5 5	120 150 150	1/0/2 1/0/2 1/0/2 1/0/2 1/0/2	105	E					5		5	
AP481 AP477 AP488 AP114 AP498 AP482 AP480 AP480	Organization and planning of topographic and geodetic works Ocountermanes Applied geodesy Gravinnery Engineering surveying linear structures.	BD, UC BD, UC BD, UC BD, UC BD, UC	5 5 5	120 150 150 150	1/0/2 1/0/2 1/0/2 1/0/2	105 105 105	E E							5	

								31	29	28	321	30	30	33	27
	Total based on UNIVERSITY:			_				-			-				
AAP500	Military affairs	ATT	0 1	14.14.1	Module of a	dditional	types of	raining							
		1.0	0	Mildi											6
CA103	(project) Defense of the thesis (project)	FA	6												6
CA003	Preparation and writing of a thesis	FA	. 1		1-13. Mods	de of fina	attestati	049							
		COVER	,										3		-
AAP187		PD, UC	3		-						2			-	_
AAP174	Production practice 1	PD, UC	2			1000			2					_	
AAP184	Educational practice	BD, UC	-		M-12.	Practice N	Todule								_
3303	1345016	PD, CCH	4	150	1/0/2	105	E						4		-
3303	Elective				M-11.	Модуль "	'R&D"								-
4306	- Control	PD, CCH	5	150	1/9/2	105	E								-
4305	Elective	PD, CCH	\$	150	1/0/2	105	E						-		
4364	Elective	PD, CCH	5	150	1/0/2	105	E							-	
4303	Elective	PD, CCH	6.	180	2/0/2	120	E							6	-
	Elective	PD, CCH	5	120	1/0/2	75	Ε							5	-
4302	Elective	PD, CCH	4	120	1/0/2	75	E						4		Г
3302	Elective			M	-10. Geode	tic works	design m	odule.						0	_
		1 70.00	- 6	180	2/0/2	120	E							6	-
MAP341	Remote sensing of the earth	PD. UC	5	150	1/0/2	105	E						5	_	-
MAP483		PD, UC	5	150	1/0/2	105	E					5		-	-
MAP155	Photogrammetry	PD. UC	5	150	1/0/2	105	E			3					1
MAP476	Basics of the cadastre	PD. UC	-	, n	4-9. Modul	e of profe	exional ac	tivity				-			1
1600		BD, CCH	6	180	2/0/2	120	E	V.						6	+
4203	Elective	BD, CCH	5.	150	1/0/2	105	E							5	1
4202	Elective		4	150	1/0/2	105	E						4.		T
3207	Elective	во, ссн	142	1	1/0/2		-	-							

	Number of credits for the entire Cycles of disciplines		Cre	dits	
Cycle code		required component (RC)	university compenent (UC)	component of choice (CCR)	Total
GED	Cycle of general education disciplines	51		-	
BD	Cycle of basic disciplines	- 21	02	7	56
	Cycle of profile disciplines		87	25	112
			26	34	60
FA	Total for theoretical training:	51	113	64	228
EA	Fistal attestation	12-			12
	TOTAL:	63	113	64	240

Decision of the Academic Council of Kazntu named after K.Satpayev, Protocol No. 130 "25" 0 4 20 22.

Decision of the Educational and Methodological Council of Kazntu named after K.Satpayev, Protocol No. 70x "26 0420 22

Decision of the Academic Council of the Institute

Vice-Rector for Academic Affairs

Director Mining and Metallurgical Institute named after

Head of the Department " Mine surveying and geodesy"

Specialty Council representative from

tocal No 5 or "20" 12 2021 y.

B.A.Zhautikov