

**NJSC «Kazakh National Research Technical University named after  
K.I.Satpayev»  
Institute of Metallurgy and Industrial Engineering named after O.A.Baykonurov  
Chair «Mine surveying and geodesy»**

**EDUCATIONAL PROGRAM**  
**(scientific and pedagogical direction (2 years))**  
**Master of Science in Engineering Program**  
**"7M07306 - Geospatial Digital Engineering"**

2 st edition  
in accordance with the State Educational Standard of Higher Education 2018

**Almaty 2021**

**The program is compiled and signed by the parties:**

From Satbayev university:

1. Director of the Mining and Metallurgical Institute
2. Head of the Department of Mine Surveying and Geodesy
3. Chairman of the E&M Council of the Department



Rysbekov K.B.

Orynassarova E.O.

Nukarbekova Zh.M.

**From employers:**

Director  
Department of Thematic  
Digital  
Mapping and Monitoring of  
the geographical names  
database of the RSE "NKGf"

Kirgizbaeva D.M.

**From the partner university (if available):**

International Educational  
Corporation

Candidate of  
Technical Sciences,  
assoc.prof.  
Kuznetsova I.A.

Approved at the meeting of the Academic Council of Satbayev University  
Protocol No. 3 of 25/06/2021.

**Qualification:**

Level 7 of the National Qualifications Framework;  
7M07306 Geospatial Digital Engineering - M120 - "Surveying", M123 -  
"Geodesy", M128 - "Land Management".

**Professional competence:** Based on the received theoretical and practical knowledge of the scientific and pedagogical magistracy, it forms professional competencies: To justify, choose and implement a rational way to solve a production task. To justify the type and type of geodetic instruments and equipment for the rational production of measurements and to own methods; to carry out educational and pedagogical activities on credit technology of training; to know the methods of teaching professional disciplines; the use of modern information technologies in the educational process; possess in-depth knowledge necessary for daily professional activities and continuing education in doctoral studies.

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 2 from 57
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## Content

1	Normative references	4
2	Abbreviations, terms and definitions used	4
3	Brief description of the program	6
4	Scope and content of the program	8
5	Requirements for applicants	10
6	Requirements for completing studies and obtaining a diploma	10
7	Working curriculum of the educational program	13
8	Descriptors of the level and amount of knowledge, abilities, skills and competencies	16
9	Competencies acquired by students during the development of the educational program "Geospatial Digital Engineering"	16
10	Matrix of competencies of the educational program "Geospatial Digital Engineering"	23
11	ECTS Diploma Supplement	26
12	Brief descriptions of disciplines	27
13	Defense of the thesis / diploma project	59

## 1 Normative references

Table 1 - List of regulatory and other documents, references to which are present in the document

№	Title of document	Storage link
1	The Law of the Republic of Kazakhstan "On Education" with amendments and additions within the framework of legislative changes to increase the independence and autonomy of universities from 04.07.18, No. 171-VI	Office Registrar (OR) <a href="http://online.zakon.kz/Document/?doc_id=30118747">http://online.zakon.kz/Document/?doc_id=30118747</a>
2	State compulsory standard of higher education (Appendix 7 to the order of the Minister of Education and Science of the Republic of Kazakhstan dated 31.10.18, No. 604	OR <a href="http://online.zakon.kz">http://online.zakon.kz</a>
3	European Qualifications Framework for Higher Education	OR <a href="http://ecahe.eu/w/images/7/76/A_Framework_for_Qualifications_for_the_European_Higher_Education_Area.pdf">http://ecahe.eu/w/images/7/76/A_Framework_for_Qualifications_for_the_European_Higher_Education_Area.pdf</a>
4	Dublin descriptors	<a href="http://ecahe.eu/w/index.php/Dublin_Descriptors">http://ecahe.eu/w/index.php/Dublin_Descriptors</a>
5	GOST 3.1105-2011 Unified system for technological documentation (ESTD). Forms and rules for drawing up general documents	<a href="http://online.zakon.kz/document/?doc_id=31194118">http://online.zakon.kz/document/?doc_id=31194118</a>
6	Satbayev University regulatory documents	Internal Audit Department

## 2 Abbreviations used. Terms and Definitions

Table 2 - Abbreviations used

Abbreviations	Full name
ECTS	European credits accumulation and transfer system
SU	NJSC Satbayev university
MES RK	Ministry of Education and Science of the Republic of Kazakhstan
PTS	Professor-teaching staff
EP	Educational program
OR	Office Registrar
WCP	Working curriculum plan EP

Table 3-Terms and definitions used in the document text

Term	Definition
Dublin descriptors (Dublin descriptors)	An integral part of the European framework for higher education qualifications describing the degree of development of competencies
Competencies (Competency)	The ability of students to apply the knowledge, skills and abilities acquired in the course of training in professional activities
Control (Audit)	Qualitative characteristics of the student assessment system
Credit technology of	Learning based on the choice and self-planning of the student learning
Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute
Approved by: SMC of Satbayev university	
Page 4 from 57	

education (Credit Education)	sequence of disciplines using credit as a unified unit of measurement of the volume of educational work of the student and teacher
Matrix of Competencies (Matrix of Competencies)	Based on Dublin descriptors describing the depth of competence development within the EP
Modular training (Cycle)	Segment of mastering and the depth of mastering by a student of competencies with an intermediate completed cycle
Educational program or EP (Curriculum)	Description of the educational process based on the achievements of learning outcomes and competencies for obtaining a recognized diploma in a specific area of professional activity
Learners (students)	Persons enrolled in the undergraduate program
Assessment (Assessment)	Quantitative characteristics of the student's assessment system
Applied Bachelor general engineering (Associate Degree, Short Cycle)	Completion of the minimum undergraduate degree with at least 124 credits of theoretical study
Working curriculum plan (Curriculum)	A document containing a complete list of academic disciplines of a compulsory component and an optional component, indicating the number of credits, the sequence of study of disciplines, types of training and forms of control
Framework of Competencies (Framework of Competencies)	Based on Dublin descriptors describing the depth of competence development
Outcome results (Outcome results)	Knowledge, abilities, skills, qualifications, competence
Sub-competency (Sub-competency)	The ability of students to apply the knowledge, skills and abilities acquired in the learning process within the framework of a certain competence
Graduate (Graduate)	Persons from among the students (students) who have successfully mastered the full theoretical course of study

### 3 Brief description of the program:

It is intended for the implementation of scientific and pedagogical training of masters in the educational program "Geospatial Digital Engineering" at Satbayev University and developed within the direction of "Geospatial Digital Engineering". The goal of the program is to train highly qualified scientific, technical and engineering personnel in the field of geodesy, cartography, geoinformatics, land management and mine surveying through practice-oriented training focused on the development of the Master's competencies.

The objectives of the EP in the direction 7M07306 - "Geospatial Digital Engineering" are formulated based on the conditions of the external environment and the need to position the program as a competitive educational product in the world market. They are determined by the competencies acquired by graduates in the process of mastering the program at the university, and provide consumers with information about the areas of professional training, the profile of the program and the types of professional activities for which graduates of this educational master's program are preparing.

Preparing a graduate for activities for continuous self-improvement and self-development, mastering new knowledge, skills and abilities in innovative areas of geodesy and cartography.

Preparation of a graduate with acquired competencies for performing calculations of elements of geodesy and cartography, design of technical solutions, participation in the development of technical specifications for topographic and geodetic, aerospace, cartographic work based on a modern educational material and technical base.

Preparation of a graduate competent in production and management, design and engineering, organizational, technological and scientific and pedagogical areas on the basis of modern teaching aids of information technology and information resources.

Preparation of a graduate, based on the diversity and dynamism of 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 learning outcomes, taking into account the specifics of these types of activities, market requirements for organizational and management , professional competencies.

Preparation of a graduate as a competitive specialist in the field of geodesy and cartography, including on the basis of increasing the international aspect in educational, scientific programs, competent in the field of advanced technologies

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 6 from 57
---	---	--	----------------

of geodesy and cartography, the implementation and registration of scientific research results.

**Types of work**

A feature of this master's program is the preparation of graduates capable of conducting the following types of professional activities:

- pedagogical;
- research;
- organizational and managerial;
- production and technological.

**Objects of professional activity**

The area of professional activity of masters in the direction 7M07208 - "Geospatial digital engineering", includes production, pedagogical and research activities containing a set of tools, techniques, methods and methods of human activity aimed at effective and safe digital geospatial technology, modern high-precision instruments. Requirements for professional activity, the undergraduate must be competent:

- the use of regulatory and legal documents in the field of construction, conduct a dialogue-dialogue in the state and foreign languages, using the rules of speech etiquette, read special literature without a dictionary in order to search for information, translate texts with a dictionary, compose annotations, abstracts and business letters in a foreign language , perform calculations of structures of buildings and structures;
- in the field of modern technologies for the production of geodetic works, design and creation of geographic information systems;
- in the use of space technologies in topographic and geodetic, aerospace, photogrammetric production;
- in methods and means of mathematical processing of the results of geodetic measurements;
- in the methods of operation of modern geodetic, photogrammetric complexes and other special equipment;
- knowledge of the basics of architectural and construction design, the use of modern methods of inspection and testing of structures, work with software products, knowledge of the state language, the language of international communication, the lexical and grammatical minimum of one of the foreign languages, etc.

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 7 from 57
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#### 4 Scope and content of the program

The term of study in the master's program is determined by the amount of acquired academic credits. Upon mastering the established amount of academic credits and achieving the expected learning outcomes for obtaining a master's degree, the master's educational program is considered fully mastered. In the scientific and pedagogical magistracy, at least 120 academic credits for the entire period of study, including all types of educational and scientific activities of the undergraduate.

The planning of the content of education, the method of organizing and conducting the educational process is carried out by the university and the scientific organization independently on the basis of the credit technology of education.

The master's degree in scientific and pedagogical direction implements educational programs of postgraduate education for the preparation of scientific and scientific-pedagogical personnel for universities, and scientific organizations with in-depth scientific, pedagogical and research training.

The content of the master's educational program consists of:

- 1) theoretical training, including the study of cycles of basic and major disciplines;
- 2) practical training of undergraduates: various types of practices, scientific or professional internships;
- 3) research work, including the implementation of a master's thesis - for a scientific and pedagogical master's degree;
- 4) final certification.

##### **Objectives of the educational program:**

**Objective 1:** The readiness of specialists for research and design work in the field of geodesy, cartography, geoinformatics, mine surveying and land management, including in related areas related to the selection of the necessary research methods, modification of existing and development of new methods based on the tasks of a specific research.

**Objective 2:** The readiness of specialists for production and technological activities, ensuring the introduction of new digital developments at the local level.

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

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 8 from 57
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Objective 4: The readiness of specialists for scientific, informational, ideological and problem communications in a professional environment and in an audience of non-specialists with a clear and deep justification of their position, engage in organizational, managerial and service activities, be aware of the responsibility for making their professional decisions.

Objective 5: The readiness of specialists for self-study and continuous professional development throughout the entire period of scientific or professional activity.

## 5 Requirements for applicants

The previous level of education of applicants is higher professional education (bachelor's degree). The applicant must have a diploma of the established sample and confirm the level of knowledge of the English language with a certificate or diplomas of the established sample.

The procedure for admitting citizens to the magistracy is established in accordance with the "Standard rules for admission to training in educational organizations that implement educational programs of postgraduate education".

The formation of a contingent of undergraduates is carried out by placing a state educational order for the training of scientific and pedagogical personnel, as well as paying for training at the expense of citizens' own funds and other sources. The state provides citizens of the Republic of Kazakhstan with the right to receive, on a competitive basis, in accordance with the state educational order, free postgraduate education, if they receive education of this level for the first time.

At the "entrance", a master's student must have all the prerequisites necessary for mastering the corresponding educational master's program. The list of required prerequisites is determined by the higher educational institution independently.

In the absence of the necessary prerequisites, the master student is allowed to master them on a paid basis.

## 6 Requirements for completing studies and obtaining a diploma

**Awarded degree / qualifications:** The graduate of this educational program is awarded the academic degree "Master of Technical Sciences" in the direction of "Geospatial Digital Engineering".

A graduate who has mastered master's programs must have the following general professional competencies:

- the ability to independently acquire, comprehend, structure and use new knowledge and skills in professional activity, develop their innovative abilities;
- the ability to independently formulate research goals, to establish a sequence for solving professional problems;
- the ability to apply in practice the knowledge of fundamental and applied disciplines that determine the focus (profile) of the master's program;
- the ability to professionally choose and creatively use modern scientific and technical equipment for solving scientific and practical problems;

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 10 from 57
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- the ability to critically analyze, represent, defend, discuss and disseminate the results of their professional activities;
- possession of skills in the preparation and execution of scientific and technical documentation, scientific reports, reviews, reports and articles;
- willingness to lead a team in the field of their professional activities, tolerantly perceiving social, ethnic, confessional and cultural differences;
- readiness for communication in oral and written forms in a foreign language to solve the problems of professional activity.

A graduate who has mastered the master's program must have professional competencies corresponding to the types of professional activities that the master's program is focused on:

*research activities:*

- the ability to form diagnostic solutions to professional problems by integrating the fundamental sections of science and specialized knowledge gained during the master's program;
- the ability to independently conduct scientific experiments and research in the professional field, generalize and analyze experimental information, draw conclusions, formulate conclusions and recommendations;
- the ability to create and explore models of the studied objects based on the use of in-depth theoretical and practical knowledge in the field of geodesy, cartography, mine surveying, land management;

*research and production activities:*

- the ability to independently carry out production and research and production field, laboratory and interpretation work in solving practical problems;
- the ability to professionally operate modern field and laboratory equipment and instruments in the field of the mastered master's program;
- the ability to use modern methods of processing and interpreting complex information to solve production problems;

*project activities:*

- the ability to independently compose and submit projects of research and development work;
- readiness to design complex research and development work in solving professional problems;

*organizational and management activities::*

- readiness to use practical skills in the organization and management of research and development work in solving professional problems;
- readiness for the practical use of regulatory documents in the planning and organization of scientific and industrial work;

*scientific and pedagogical activity:*

- the ability to conduct seminars, laboratory and practical exercises;

– the ability to participate in the leadership of scientific and educational work of students in the field of geodesy, cartography, mine surveying, land management.

When developing a master's program, all general cultural and general professional competencies, as well as professional competencies related to those types of professional activities that the master's program is focused on, are included in the set of required results of mastering the master's program.

## 7 Working curriculum of the educational program

MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN  
 Non-profit Joint Stock Company "KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after K.L. SATBAYEV"



### WORKING CURRICULUM

Education program 7M07306 "Geospatial digital engineering"  
 Group of Educational Programs M123 - Geodesy  
 enrolment for 2020 - 2021 academic year

Academic degree: **Magister**  
Term of study: **2 years**


Year of study	Code	Name of course	Component	Academic credits	Lectures/Laboratory/practicum (L/L/P)	Prerequisites	Code	Name of course	Component	Academic credits	Lectures/Laboratory/practicum (L/L/P)	Prerequisites	
<b>1 semester</b>													
1	LNG205	Foreign language (professional)	BD IC	3	150	1:0:3	108						
	HEM204	Management psychology	BD IC	3	90	1:0:1	80						
	MAP113	Final Data Infrastructure	BD OC	3	150	1:0:2	105						
	MAP703	Innovative methods of engineering and geodetic works	PS IC	5	150	1:0:2	105						
	MAP503	Modern problems of land management and cadastres	IL	3	120	1:0:2	105						
	MAP717	Big data in geosciences	IL EIBER	5	120	1:0:2	105						
	AAP242	Scientific research work of master's	MSSR	6									
		In total			29								
<b>2 semester</b>													
2	MAP7143	Three-dimensional modeling of objects in GIS	PS OC	5	150	1:0:2	105						
	MAP2503	Visualization and processing of geospatial data	PS OC	5	150	1:0:2	105						
	MAP708	Technology of automating the geodetic works	BD OC	5	150	1:0:2	105						
	MAP719	Occupational data visualization	BD IC	5	120	1:0:2	105						
	MAP299	Research of natural resources by aerospace methods and RS	PS OC	5	150	1:0:2	105						
	MAP2712	Monitoring of deformation processes of buildings and structures											
	AAP242	Scientific research work of master's	MSSR	6									
		In total			31								

Number of credits for the whole period of study	
Cycles of disciplines	Credits
The cycle of general education	0
A cycle of basic disciplines (BD IC, BD OC)	36
A cycle of principal subjects (PS IC, PS OC)	52
All on the theoretical classes	88
MSSR	24
Registration and defense of the master's thesis (RadMT)	12
In total	124

Decision of the Academic Council KazNRTU named after K.L.Satbayev. Minutes # 2, dated 25.06.2021

Decision of the Academic Board of the Institute. Protocol No. 6 of 14 of 06.2021

Vice-Rector for Academic Affairs  B.A. Zhautikov

Director of the Institute of Geology, Oil and Mining  A. Szyzlykov

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

## MODULAR CURRICULUM

Education program: 7M07306 - "Geospatial digital engineering"

Form of study: full

Duration of training: 2 years

Academic degree: Master of

The cycle	code	Name of disciplines	Semester	Acad. credits	lec.	lab.	prac	IWS	Type of control	Chair
<b>Profile training module</b>										
<b>Basic disciplines (BD) (40 credits)</b>										
<b>University component (18 credits)</b>										
BD 1.2.1	HUM201	History and philosophy of science	1	4	1	0	1	2	Exam	SD
BD 1.2.2	HUM207	Higher school pedagogy	1	4	1	0	1	2	Exam	SD
BD 1.2.3	LNG202	Foreign language (professional)	2	6	0	0	3	3	Exam	EL
BD 1.2.3	HUM204	Management psychology	2	4	1	0	1	2	Exam	SECPM
<b>Practice-oriented module (4 credits)</b>										
	AAP244	Pedagogical practice	2	4					Report	
<b>Choice component (18 credits)</b>										
BD 1.2.4	MAP713	Spatial Data Infrastructure	1	6	2	0	1	3	Exam	
BD 1.2.5	MAP708	Technology of automating the land survey process	1	6	2	0	1	3	Exam	
BD 1.2.6	MAP709	Methods for the creation and development of state geodetic networks	1	6	1	1	1	3	Exam	
<b>Major disciplines (MD) (55 credits)</b>										
<b>University component (UC)</b>										
MD 1.3.1	MAP258	Organization of topographic and geodetic works	2	6	2	0	1	3	Exam	
MD 2.3.4	MAP704	Geoinformational and spatial analysis of territories	3	6	1	1	1	3		
MD 2.3.5	MAP714	Three-dimensional modeling of objects in GIS	3	6	1	1	1	3		
MD 2.3.6	MAP705	<a href="#">Remote sensing methods of the Earth and extraterrestrial territories</a>	3	6	2	0	1	3		
MD 2.3.7	MAP299	Research of natural resources by aerospace methods								
<b>Choice component (CC)</b>										
MD 1.3.2.1	MAP701	Innovative methods of engineering and geodetic works	1	6	2	0	1	3	Exam	
MD 1.3.2.2	MAP702	Geotechnical and mine surveying monitoring								
MD 1.3.2.3	MAP703	Modern problems of land management and cadastres								
MD 1.3.3.1	MAP7102	WEB-GIS	2	6	2	0	1	3	Exam	
MD 1.3.3.2	MAP7112	<a href="#">WEB-GIS in subsoil use</a>								

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of the Institute

Approved by:  
SMC of Satbayev university

Page 14 from 57

MD 1.3.3.3	MAP7122	Management of land resources using WEB-GIS								
MD 2.3.8.1	MAP271	Monitoring of deformation processes of buildings and structures	3	6	1	1	1	3	Exam	
MD 2.3.8.2	MAP706	<a href="#">Analytical methods for processing measurement results</a>								
MD 2.3.8.3	MAP707	<a href="#">Legal support for innovation activities</a>								
<b>Practice-oriented module (7 credits)</b>										
MD	AAP236	Research practice	4	7					Report	
<b>Research Module (24 credits)</b>										
MSSR	AAP242	Master's student scientific research	1	6					Report	
MSSR	AAP242	Master's student scientific research	2	6					Report	
MSSR	AAP242	Master's student scientific research	3	6					Report	
MSSR	AAP242	Master's student scientific research	4	6					Report	
<b>Module of final attestation (12 credits)</b>										
FA	ECA205	Registration and defense of the master's thesis	4	12					Defense of dissertation	
<b>Total</b>				<b>131</b>						

## **8 Descriptors of the level and amount of knowledge, abilities, skills and competencies**

Requirements for the level of preparation of a master's student are determined on the basis of the Dublin descriptors of the second level of higher education (master's) and reflect the acquired competencies expressed in the achieved learning outcomes.

Learning outcomes are formulated both at the level of the entire educational program of the master's program, and at the level of individual modules or academic discipline.

Descriptors reflect learning outcomes that characterize the student's ability:

1) demonstrate developing knowledge and understanding in the studied field of geodesy, cartography, mine surveying, land management, based on the advanced knowledge of this field of geodesy, cartography, mine surveying, land management, while developing and / or applying ideas in the context of research;

2) apply at a professional level their knowledge, understanding and ability to solve problems in a new environment, in a broader interdisciplinary context;

3) collect and interpret information to form judgments based on social, ethical and scientific considerations;

4) communicate clearly and unambiguously information, ideas, findings, problems and solutions, both to specialists and non-specialists;

5) learning skills necessary for the independent continuation of further education in the studied field of geodesy, cartography, mine surveying, land management.

## **9 Competencies acquired by students during the development of the educational program "Geospatial Digital Engineering"**

9.1 Requirements for the key competencies of graduates of a *specialized master degree* must:

1) *have an idea:*

–about current trends in the development of scientific knowledge;

–on topical methodological and philosophical problems of natural (social, humanitarian, economic) sciences;

–on the contradictions and socio-economic consequences of globalization processes;

–on the current state of the economic, political, legal, cultural and technological environment of the global business partnership;

–on the organization of strategic enterprise management, innovation management, leadership theories;

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 16 from 57
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–on the main financial and economic problems of the functioning of enterprises.

2) *know:*

- methodology of scientific knowledge;
- the main driving forces behind changes in the structure of the economy;
- features and rules of investment cooperation;
- at least one foreign language at a professional level, allowing for scientific research and practical activities.

3) *be able to:*

- apply scientific methods of cognition in professional activities;
- critically analyze existing concepts, theories and approaches to the study of processes and phenomena;
- integrate knowledge gained in different disciplines, use it to solve analytical and managerial problems in new unfamiliar conditions;
- conduct a microeconomic analysis of the economic activity of the enterprise and use its results in the management of the enterprise;
- apply in practice new approaches to the organization of marketing and management;
- make decisions in difficult and non-standard situations in the field of organization and management of economic activities of an enterprise (firm);
- to apply in practice the norms of the legislation of the Republic of Kazakhstan in the field of regulation of economic relations;
- think creatively and be creative in solving new problems and situations;
- to carry out information-analytical and information-bibliographic work with the involvement of modern information technologies;
- to summarize the results of experimental research and analytical work in the form of a master's thesis, article, report, analytical note, etc..

4) *have skills:*

- solutions to standard scientific and professional problems;
- scientific analysis and solution of practical problems in the organization and management of economic activities of organizations and enterprises;
- research of problems in the field of management and marketing and use the results obtained to improve the methods of enterprise management;
- professional communication and intercultural communication;
- oratory, correct and logical formulation of your thoughts in oral and written form;
- expanding and deepening knowledge necessary for daily professional activities and continuing education in doctoral studies;
- use of information and computer technologies in the field of professional activity.

5) *be competent:*

- in the field of research methodology in the specialty;
- in the field of modern problems of the world economy and the participation of national economies in world economic processes;
- in the organization and management of the enterprise;
- in the implementation of industrial relations with various organizations, including public service bodies;
- in ways to ensure constant updating of knowledge, expanding professional skills and abilities.

B – Basic knowledge, abilities and skills

B1- work with geodetic, stereophotogrammetric devices and cartographic equipment;

B2- expertly perform mathematical processing of geodetic and photogrammetric measurements;

B3 - own graphic software products.

P – Professional competence:

P1 – Economic characteristics of the infrastructure of the cartographic and geodetic area, knowledge of the methodology for the development of design materials (documents) in the field of geodesy and cartography, feasibility studies of design solutions, readiness to change economic roles in the context of dynamism of change and uncertainty.

P2 – Theoretical and practical professional skills, implementation of professional functions in the framework of various types of activity, understanding of trends in the development of theory and practice in the field of geodesy and cartography, readiness to change professional roles in the face of dynamism of change and uncertainty.

P3 – Ability to analyze and apply modern computer technologies for computer-aided design of production processes

P4 – Ability to ensure the adaptation of modern information technologies and quality management systems to specific production conditions

P5 – Ability to provide protection and assessment of the value of objects of intellectual activity; organize the development of creative initiative, rationalization, invention

P6 – Possession of modern geodetic instruments, the ability to show creative initiative, to prepare applications for inventions and industrial designs

P7 – Ability to apply innovative methods and graphic software products when building 3D models

P8 – Implementation of industrial and technological types of professional activities

P9 – Ability to work with geodetic, mine surveying, stereophotogrammetric instruments and cartographic equipment

P10 – Ability to skillfully perform mathematical processing of geodetic and photogrammetric measurements

P11- Possess the skills of land management design, technology of land management process management

P12 – Justify, choose and implement a rational way to solve a production problem.

P13 – Justify the type and type of geodetic instruments and equipment for the rational production of measurements and master the methods and techniques of working on them.

P14 – Improvement and development of your intellectual and general cultural level, moral and physical improvement of your personality.

P15 – Analysis and decision-making on social, ethical, scientific and technical problems arising in professional activities.

P16 – Carrying out research work related to the professional field

P17 – Experiments organization skills with analysis of their results

P18 – Able to develop plans and programs for organizing innovative activities at the enterprise, assess innovative and technological risks when introducing new technologies, organize advanced training and training of employees of divisions in the field of innovation and coordinate the work of personnel in the complex solution of innovative problems

P19 – Knows how to organize the development of creative initiative, rationalization, invention, the implementation of the achievements of domestic and foreign science, technology, the use of advanced experience, ensuring the effective work of the unit, enterprise

P20 – Practical knowledge of professional communication techniques

P21 - Able to compose descriptions of the principles of operation and design of designed products and objects with justification of the adopted technical solutions

P22 - Able to develop methodological and regulatory documents, proposals and carry out activities for the implementation of developed projects and programs

P23 - Able to independently perform production tasks;

Has knowledge and understanding of his rights and obligations as a citizen of the Republic of Kazakhstan and a specialist

P24 – Knowledge and ownership of the main business processes in the enterprise

P25 – Possession of methods of rational production of geodetic measurements, their control and quality assessment using professional automated systems. Making optimal management decisions

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 19 from 57
---	---	--	-----------------

P26 – Knowledge of the main directions of technical progress (concepts and tools) and the ability to use them in practice

P27 – Ability to develop plans and programs for organizing innovative activities at an enterprise, to assess innovation and technological risks when introducing new technologies.

G – General human, social and ethical competences

G1 – The ability to organize the work of teams of performers, to make executive decisions in the context of a spectrum of opinions, to determine the procedure for performing work, to organize work on improvement and modernization in the unit

G2 – Awareness in the field of project management and business, the basics of macro and microeconomics, knowledge and understanding of risks in market conditions. Have an understanding of the organization of strategic enterprise management, innovation management, leadership theories.

G3 - Able to conduct microeconomic analysis of the economic activity of the enterprise and use it in enterprise management.

G4 – Able to apply in practice new approaches to the organization of marketing and management.

G5 – Able to apply psychological methods and tools to improve the efficiency and quality of production in new or non-standard situations

G6 – Able to clearly and clearly communicate their findings and knowledge and their rationale to specialists and non-specialists.

G7 – Competent in the field of modern problems and challenges of the modern economy, and the participation of national economies in world economic processes.

G8 – Competent in ways to ensure constant updating of knowledge, expansion of professional skills and abilities. Is able to continue learning independently

G9 – Able to apply knowledge, understanding and problem-solving ability in new or unfamiliar work situations.

G10 – Able to independently apply methods and means of cognition, learning and self-control to acquire new knowledge and skills, including in new areas that are not directly related to the field of activity.

G11 – Able to critically evaluate the learned theories and concepts, rethink the accumulated experience, change, if necessary, the profile of his professional activity

G12 – Able to organize his work on a scientific basis, independently evaluate the results of his activities, own the skills of independent work in the field of scientific research.

G13 – Able to use literary, business, written and oral speech in an accepted business language, is able to create and edit professional texts, including in a foreign language.

G14 – Able to improve and develop his intellectual and general cultural level.

G15 – Able to organize the work of teams of performers, make executive decisions in the conditions of a spectrum of opinions, determine the procedure for performing work, organize work in the division to improve, modernize, unify manufactured products and their elements, develop draft standards and certificates, ensure the adaptation of modern versions of quality management systems to specific production conditions based on international standards.

G16 – Able to work in multinational teams, including when working on interdisciplinary and innovative projects, to create relationships of business cooperation in teams.

G17 – Able to conduct marketing research and prepare business plans for the release and sale of promising and competitive products

G18 – Able to organize work to improve the scientific and technical knowledge of employees

G19 – Able and ready to use modern psychological and pedagogical theories and methods in professional activities

S – Special and management competencies:

S1-competence in production and management, design and engineering, organizational and technological and scientific and pedagogical areas on the basis of modern teaching aids of information technology and information resources.

S2-the ability to perform professional functions within one or more types of activities based on the final learning outcomes, taking into account the specifics of these types of activities, market requirements for organizational, managerial, professional competencies.

9.2 Requirements for the experimental research work of a master's student in a specialized master's program:

1) corresponds to the profile of the master's educational program, according to which the master's project is carried out and defended;

2) based on modern achievements of science, technology and production and contains specific practical recommendations, independent solutions to management problems;

3) performed using advanced information technologies;

4) contains experimental and research (methodological, practical) sections on the main protected provisions.

9.3 Requirements for organizing practices:

The educational program of the profile master's degree includes industrial practice in the IP cycle.

Industrial practice in the PD cycle is carried out with the aim of consolidating the theoretical knowledge gained in the learning process, acquiring practical skills, competencies and professional experience in the educational program of the Master's program, as well as mastering advanced experience.









## 11 ECTS Diploma Supplement

The application was developed according to the standards of the European Commission, Council of Europe and UNESCO / CEPES. This document is for academic recognition only and is not an official proof of education. Not valid without a university degree. The purpose of completing the European Supplement is to provide sufficient information about the holder of the diploma, the qualification obtained, the level of this qualification, the content of the study program, the results, the functional purpose of the qualification, as well as information about the national education system. The application model, which will be used to translate grades, uses the European Credit Transfer or Transfer System (ECTS).

The European Diploma Supplement provides an opportunity to continue education at foreign universities, as well as to confirm national higher education for foreign employers. When going abroad for professional recognition, additional legalization of the educational diploma is required. The European Diploma Supplement is completed in English upon individual request and is issued free of charge.

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 26 from 57
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**12 Brief descriptions of disciplines**

**Foreign language (professional)**

**CODE – LNG205**

**CREDIT – 5 (0/0/3)**

**PREREQUISIT –Academic English, Business English, IELTS 5.0-5.5**

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**PURPOSE AND TASKS OF THE COURSE**

The aim of the course is to develop students' knowledge of the English language for their ongoing academic research and to improve their performance in the field of project management.

**BRIEF DESCRIPTION OF THE COURSE**

The course is aimed at building vocabulary and grammar for effective communication in the field of project management and improving reading, writing, listening and speaking skills at the "Intermediate" level. Students are expected to develop their Business English vocabulary and learn grammatical structures that are often used in a management context. The course consists of 6 modules. The 3rd module of the course ends with an intermediate test, and the 6th module is followed by a test at the end of the course. The course ends with a final exam. Master students also need to study independently (MIS). MIS - independent work of undergraduates under the guidance of a teacher.

**KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE**

Upon successful completion of the course, students are expected to be able to recognize the main idea and message as well as specific details while listening to monologues, dialogues and group discussions in the context of business and management; understand written and spoken English on topics related to management; write management texts (reports, letters, emails, minutes of meetings) following a generally accepted structure with a higher degree of grammatical accuracy and using business words and phrases, speak about various business situations using appropriate business vocabulary and grammatical structures - in pairs and groups discussions, meetings and negotiations.

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 27 from 57
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**Psychology of management**

**CODE – HUM204**

**CREDIT – 3 (1/0/1)**

**PREREQUISIT – NONE**

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**PURPOSE AND TASKS OF THE COURSE**

teaching undergraduates the basics of higher school psychology, expanding their professional capabilities in terms of the application of psychological knowledge in the field of pedagogical activity.

**BRIEF DESCRIPTION OF THE COURSE**

Psychological education at the university. The psychological structure of the learning process, the psychology of cognitive activity, psychological methods and means of increasing the efficiency and quality of education in modern conditions, the psychology of the individual and the student body, the upbringing and formation of professional self-awareness, psychodiagnostics in higher education, the psychological characteristics of the pedagogical activity of a higher school teacher, a student as a subject educational activities, psychological and pedagogical communication, psychology of pedagogical influence, main psychological problems in pedagogical activity.

**KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE**

At the end of the course, the undergraduate must master basic knowledge, skills and abilities about the socio-psychological nature of pedagogical activity, about the properties of mental and cognitive processes included in cognitive activity, about the content and specifics of psychological and pedagogical influence, about the individual characteristics of objects of influence of skills, be able to use the necessary psychological and methodological resources for the preparation and conduct of classes (lectures, seminars, SRSP and exams); be able to apply adequate psychodiagnostic methods for studying the personality of a student and student group; manage the learning process, on various aspects of communication in the field of professional activity, professional reflection, mastery of the main methods of psychological influence.

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 28 from 57
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**Spatial data infrastructure**

**CODE – MAP713**

**CREDIT – 5 (1/0/2)**

**PREREQUISIT – mathematics, physics, electrical engineering, computer science, geodesy, photogrammetry, space geodesy, higher geodesy.**

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**PURPOSE AND TASKS OF THE COURSE**

The purpose of teaching this discipline is to study the relationship of geoinformation technologies with geodesy and cartography by students. The role and importance of geodesy and cartography in the life of modern society are determined by a wide range of use of geodetic and cartographic methods in solving problems of creating databases of spatio-temporal data, monitoring the human environment, studying the natural resources of the Earth.

The task of teaching the discipline is to master the knowledge of the theoretical foundations of geodetic and cartographic support of geoinformation systems by undergraduates; acquisition of practical skills in the analysis and design of geodetic and cartographic databases in GIS technologies; ability to plan and maintain the creation of geospatial databases.

**BRIEF DESCRIPTION OF THE COURSE**

The role and importance of the discipline " Spatial data infrastructure" in the training of specialists is determined by the use of geoinformation technologies in almost all areas of human activity. Geodesy and cartography provide the geographic portion of the spatio-temporal GIS databases. Computer technologies for processing spatial data used in GIS technologies are successfully applied both in geodesy and cartography.

**KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE**

After completing the course, the student must demonstrate the ability about the tools of GIS packages for working with SDI, building queries, information about the formats and methods of entering cartographic data, about various sources of spatial data for solving professional problems.

Master student **must be able to:**

- find spatial information using domestic and foreign SDI;
- perform simple queries to data, create your own objects and add them by placing them in geoportals;
- create geographic databases and databanks, use spatial data infrastructures and a geoportal.

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 29 from 57
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Master student **must know:**

- interface of GIS packages for working with public geodata, digital cartographic data formats;
- methods and technologies for processing spatial information from various sources.

**Innovative methods of engineering and geodetic works**

**CODE – MAP701**

**CREDIT – 5 (1/0/2)**

**PREREQUISIT – mathematics, geodesy**

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**PURPOSE AND TASKS OF THE COURSE**

The aim of the discipline is to form professional competencies in the field of studying and mastering modern innovative methods and means in the production of engineering and geodetic works. Particular attention is paid to the development of modern geodetic instruments and computer technology based on information technology.

**BRIEF DESCRIPTION OF THE COURSE**

Innovative methods today accompany the entire period of the construction of a structure, including research, design, construction and supervision of an industrial, civil and transport facility accepted into operation. As part of the course, the undergraduate will master the theoretical and practical use of innovative methods and techniques for solving applied problems in the field of geodesy and used in production.

**KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE**

After completing the course, the undergraduate must demonstrate the ability to analyze, synthesize and design engineering and geodetic data using innovative methods.

**Should be able to:**

- use innovative technologies at the stage of engineering and geodetic surveys;
- apply computer technologies for processing geodetic information, creating digital terrain models, designing areal and linear objects.

**Must know:**

- Methods for the structure and classification of data sources;
- Innovative methods and new methods for solving applied problems of geodesy in construction and linear works.

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 31 from 57
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**Modern problems of land management and cadastres**  
**CODE – MAP2922**  
**CREDIT – 5 (1/0/2)**  
**PREREQUISIT – mathematics, geodesy**

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**PURPOSE AND TASKS OF THE COURSE**

The purpose of mastering the discipline "Modern problems of land management and cadastres" is the systematization of the content of individual disciplines and the formation of professional competence in the organization of complete, rational and efficient use of land resources at the present stage.

**BRIEF DESCRIPTION OF THE COURSE**

The course will present modern methods and methods of land management and organization of the use of a single land fund at various administrative-territorial levels, at enterprises and organizations of various sectors of the national economic complex, obtaining, collecting and processing, as well as applying these methods and methods in maintaining the cadastre. Also considered the current state of land management and cadastral science, the main problems in this area and the direction of their improvement.

The teaching of the discipline is based on the main legal provisions on land management and cadastre, the existing system of land relations, its development, foreign experience.

**KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE**

As a result of mastering the competence, the ability to use knowledge for the management of land resources, real estate, the organization and conduct of cadastral and land management works, the student must:

**Know:** the basics, principles and provisions of legal, economic and administrative regulation of land and property relations, the content of the rules and regulations of civil, labor land, administrative natural resource law;

**Be able to:** solve legal issues in the field of land and property relations.

**Own:** economic and legal categories, the regulatory framework used in the regulation of land and property relations and land management.

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 32 from 57
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**Big data in geosciences**  
**CODE – MAP717**  
**CREDIT – 5 (1/0/2)**  
**PREREQUISIT – NONE**

**PURPOSE AND TASKS OF THE COURSE**

Acquaintance of future teachers with the practical use of methods of mining big data in problems of search, processing and analysis, as well as the skills of a data scientist.

**BRIEF DESCRIPTION OF THE COURSE**

The course is intended for undergraduates EP "7M7306 - Geospatial Digital Engineering"

As part of the course, the undergraduate will master the practical use of big data mining methods in search, processing and analysis tasks, as well as the skills of a data scientist. Basic knowledge and skills in big data in geosciences and programming techniques will be presented.

The final stage of the course is the final exam.

**KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE**

Upon completion of the course, the student must demonstrate the ability to assess the impact of big data technologies on the conduct of scientific research in the geosciences.

The student should be able to:

- to get access to big data, to extract the necessary information, to form requests;
- process and reveal hidden dependencies and patterns in big data obtained as a result of the experiment;
- to formalize the obtained results of processing big data in the form of scientific and technical reports and reports at scientific and technical conferences.

At the end of the course, the student should know:

- fundamental laws of natural science disciplines, apparatus of theoretical and experimental research;
- the basic principles of collecting and storing big data, the main areas of collecting big data;
- basic rules and technologies for the development of information systems in geosciences for storing and working with big data.

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 33 from 57
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**History and philosophy of science**  
**CODE – HUM201**  
**CREDIT – 4 (1/0/1)**  
**PREREQUISIT - philosophy**

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**PURPOSE AND TASKS OF THE COURSE** - to reveal the connection between philosophy and science, to highlight the philosophical problems of science and scientific knowledge, the main stages of the history of science, the leading concepts of the philosophy of science, modern problems of the development of scientific and technical reality.

**BRIEF DESCRIPTION OF THE COURSE**

Subject of philosophy of science, dynamics of science, specificity of science, science and pre-science, antiquity and the formation of theoretical science, the main stages of the historical development of science, features of classical science, non-classical and post-non-classical science, philosophy of mathematics, physics, technology and technology, specificity of engineering sciences, ethics of science, social and moral responsibility of a scientist and engineer.

**KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE**

**know** and understand the philosophical issues of science, the main historical stages of the development of science, the leading concepts of the philosophy of science,

**be able to** critically evaluate and analyze scientific and philosophical problems, understand the specifics of engineering science, possess the skills of analytical thinking and philosophical reflection, substantiate and defend one's position, possess the techniques of conducting discussion and dialogue,

**possess** the skills of communication and creativity in their professional activities.

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 34 from 57
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**Higher education pedagogy**

**CODE – HUM207**

**CREDIT – 4 (1/0/1)**

**PREREQUISIT - NONE**

**PURPOSE AND TASKS OF THE COURSE**

Familiarization of future teachers with the methodological and theoretical foundations of higher education pedagogy, modern technologies for analysis, planning and organization of training and education, communication technologies of subject-subject interaction between teacher and student in the educational process of the university.

**BRIEF DESCRIPTION OF THE COURSE**

The subject of higher education pedagogy, the methodology of pedagogical science, aspects and trends in the development of modern education, pedagogical activity, the personality of a higher school teacher, the essence and structure of pedagogical activity, modern requirements for competence, communicative competence of a higher school teacher, didactics of higher school, modern pedagogical technologies, educational high school process. Active methods and forms of training in the preparation of future specialists, educational work in higher education, the organization of independent work of students in conditions of credit technology, the organization of pedagogical control in conditions of credit technology.

**KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE**

To know and understand the current problems of pedagogical science, the laws of pedagogical theories, the essence of the pedagogical activity of a university teacher. To master the skills of designing the educational process, based on new concepts of teaching and education; creation of a creative and developing environment in the process of teaching and upbringing. Be competent in solving problems of higher pedagogical education and the prospects for its further development; in the application of effective university teaching technologies; the main types of pedagogical communicative interaction, organization and management of students' activities.

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 35 from 57
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**Methods for the creation and development of state geodetic networks**

**CODE - MAP709**

**CREDIT – 5 (1/0/2)**

**PREREQUISIT – mathematics, geodesy**

**PURPOSE AND TASKS OF THE COURSE**

The purpose of mastering the discipline "Methods for the creation and development of state geodetic networks" is to form a clear understanding of the means and methods of a full range of geodetic works in the creation of a state geodetic network, methods of constructing and mathematical processing of measurements. The main tasks of mastering the academic discipline are the acquisition of master's students the skill of designing and producing geodetic measurements when building state geodetic networks, conducting field geodetic works, processing the data obtained, drawing up reporting documentation and other materials for topographic and geodetic surveys.

**BRIEF DESCRIPTION OF THE COURSE**

The state geodetic network is a set of geodetic points located evenly throughout the entire territory and fixed on the ground by special centers that ensure their safety and stability in plan and in height for a long time.

The course will present practical solutions for the creation and development of state geodetic networks using modern technologies and methods, the tasks of deepening knowledge in the theory and practice of mathematical processing of geodetic measurements in the design and construction of state geodetic networks.

**KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE**

As a result of mastering the discipline, the master student:

**must know:**

- the basic principles of building state geodetic networks, their connection with global geodetic networks (IGS)
- the role of state geodetic networks for studying the geodynamics of the country and regions
- the role of satellite methods for building state geodetic networks

**should be able to:**

- design and production of geodetic measurements for the construction of state geodetic networks using modern methods and technologies;
- participate in work on innovative high-tech projects using basic research methods.

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 36 from 57
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**Organization of topographic and geodetic works**  
**CODE – MAP 2583**  
**CREDIT – 5(1/0/2)**  
**PREREQUISIT – Geodesy, Geodetic instruments, full course**  
**Master's studies**

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**PURPOSE AND TASKS OF THE COURSE**

The purpose of teaching the discipline "Organization of topographic and geodetic works" is to train future specialists in the rational organization of performing topographic and geodetic works with the most efficient course of the production process and the use of modern equipment.

The master student must master the theory, methods and technology of organizing, performing seasonal topographic and geodetic works for a rhythmic course of production, taking into account the duration of the production cycle.

**BRIEF DESCRIPTION OF THE COURSE**

The course contains a training program that gives basic concepts about the features of the production of topographic and geodetic works, the composition of topographic and geodetic works, regulatory laws and acts of the Republic of Kazakhstan, regulating topographic and geodetic works, planning and financing of topographic and geodetic works, the composition of contractual documentation of geodetic enterprises and organizations, collection of initial data necessary for the execution of work, drawing up a work program (technical prescription). The course is structured in such a way as to teach the student not only basic concepts, but also teach how to organize the procedure for performing topographic and geodetic works, taking into account the calculation of time and safety precautions.

**KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE**

The undergraduate **must know:** the basic principles and forms of organizing topographic and geodetic production, planning and management, taking into account the specifics of performing topographic and geodesic and engineering and geodetic works in various industries.

The master's student **should be able to:** theoretically increase efficiency, improve the quality indicators of work, comprehensively use production reserves.

When studying this discipline, students will gain professional skills to quickly make decisions using new technologies, a creative approach to the task..

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 37 from 57
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**Spatial analysis**

**CODE –MAP 716**

**CREDIT – 5 (1/0/2)**

**PREREQUISIT – geodesy, cartography**

**PURPOSE AND TASKS OF THE COURSE**

The purpose of mastering the discipline " Spatial analysis " is the formation of professional competencies that determine the readiness and ability of the master to use the methods and technologies of spatial analysis in the tasks of managing territories.

The objective of the discipline is to train specialists in the implementation of geographic information systems, creating digital terrain models, spatial analysis using the results of space activities.

**BRIEF DESCRIPTION OF THE COURSE**

The course contains a training program that gives knowledge to undergraduates on the use of spatial systems to form a database, on the possibilities of spatial modeling and spatial analysis to identify patterns in the structure or features of the distribution of objects, the relationship in the spatial distribution of objects, trends in the development of phenomena in space and time.

**KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE**

As a result of mastering the discipline, the master student must:

**know:** methods and technologies of spatial analysis for solving problems of territory management.

**be able to:**

- to analyze the location, structure, relationships of objects and phenomena using the methods of spatial analysis.

- analyze groups of functions that provide analysis of the placement, relationships and other spatial relationships of spatial objects, including analysis of visibility zones, neighborhood analysis, network analysis, creation and processing of digital elevation models, spatial analysis of objects within buffer zones.

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 38 from 57
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**WEB-GIS**

**CODE – MAP7103**

**CREDIT – 5 (1/0/2)**

**PREREQUISIT – mathematics, geodesy**

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**PURPOSE AND TASKS OF THE COURSE**

The aim of the course is to master the theoretical foundations and practical skills of conducting the study of spatial data using tools of modern geoinformation technologies. The program of the practical part of the course provides for a detailed step-by-step study of specialized software for working in a geographic information system.

The program of the practical part of the course provides for a detailed step-by-step study of specialized software for working in a geographic information system.

**BRIEF DESCRIPTION OF THE COURSE**

Have basic knowledge in the field of computer science and modern geoinformation technologies, possess the skills to use software and work in computer networks, the ability to create databases and use Internet resources, own GIS technologies; be able to work with information from various sources to solve professional and social problems.

**KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE**

**know:** the basic principles of work and the analytical capabilities of modern geoinformation software.

**be able to:** use modern information technology (software) to conduct a scientific research or expert assessment of the state of the territory and its mapping for solving professional and social problems.

**own:** methods of searching, processing and analyzing geographic information using modern information technologies and Internet resources.

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 39 from 57
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**Land management using WEB-GIS**

**CODE – MAP7123**

**CREDIT – 5 (1/0/2)**

**PREREQUISIT – mathematics, geodesy**

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**PURPOSE AND TASKS OF THE COURSE**

The purpose of mastering the discipline "Land Management" with the use of WEB-GIS is to form a holistic understanding of land use management in modern conditions, knowledge of the scientific and theoretical foundations of land use management in the amount provided by the curriculum and necessary to solve production and research problems.

Objectives: studying the principles of land management; acquaintance with the main aspects of land management: industrial, legal, economic and environmental; assessment of land resources; acquisition of skills in compiling a scientific and information base for land management based on soil-cartographic materials.

**BRIEF DESCRIPTION OF THE COURSE**

The discipline reveals the organizational, legal and socio-economic nature of land management, its importance in the system of social production, the impact on it of objective economic, social and environmental laws, its historical, socio-economic and natural patterns of development. Methods for determining the economic efficiency of land management are given, the corresponding criteria and indicators.

**KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE**

As a result of mastering the discipline, the master student must:

- **to know** modern problems of rational use of land resources, methods of monitoring observations and surveys, software and hardware for remote sensing and cartographic display of quality characteristics of land, mechanisms and functions of land management;
- **be able to** formulate tasks, plan and justify the necessary research methods, conduct environmental and economic expertise of investment programs, schemes and land management projects based on cadastre data and land monitoring.

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 40 from 57
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**Technology of automation of the process of land exploration**

**CODE – MAP7082**

**CREDIT – 6 (2/0/1/3)**

**PREREQUISIT – maths, physics**

**PURPOSE AND TASKS OF THE COURSE**

The aim of the course is to develop sustainable skills in the use of basic applied software (GIS, CAD, office software and software for scientific research) in solving production and scientific problems in land management and real estate cadastre.

**BRIEF DESCRIPTION OF THE COURSE**

The discipline is aimed at preparing masters for: production, technical and design activities in the field of creating new projects using modern means of obtaining and processing information, solving research and applied problems related to automating the processes of obtaining and processing data, searching and analyzing specialized scientific and technical information necessary to solve specific engineering problems, including when performing interdisciplinary projects.

**KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE**

- As a result of studying this discipline, the master should **know**:
- the essence, content and processes of computer technologies, including modern trends in the development of programming technologies and methods for managing software projects;
- methods of developing factual databases and knowledge bases;
- main directions of development of Internet and Web - technologies;
- modern trends in the development of CAD / GIS technologies in land management and land cadastre;

**be able to:**

- to develop technological schemes and processes of computer technologies for processing and presentation of land management and cadastral information;
- to develop and compose: auxiliary templates, system settings, macros, additional functions, SQL queries and applications in office applications and GIS;
- create databases in Access and integrate them into office applications and GIS systems;

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 41 from 57
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– to process the results of experiments and to solve mathematical problems in systems for scientific research.

**own:**

- methods of processing, analysis and interpretation of information in office applications, in systems for scientific research and CAD / GIS systems;
- methods of developing automated processes and expanding office applications and GIS using internal tools.

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 42 from 57
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**Three-dimensional modeling of objects in GIS**

**CODE –MAP 7143**

**CREDIT – 5 (1/0/2)**

**PREREQUISIT – geodesy, cartography**

**PURPOSE AND TASKS OF THE COURSE**

Formation of general cultural and professional competencies that determine the readiness and ability of a master in the direction of training mine surveying and geodesy to use knowledge and skills in the field of creating geodetic works by means of multimedia and GIS.

**BRIEF DESCRIPTION OF THE COURSE**

The discipline is studied at the final stage of mastering the module of modern computer technologies for the interpretation of geophysical data. It is closely related to the study of geographic information systems and technologies, geographic information technologies, methods of parallelizing computations and methods of interpretation. Forms knowledge on the development process, presentation and analysis of the main results of interpretation of geophysical data, as well as remote sensing data in three-dimensional form.

**KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE**

Master's student **should know:**

- the main types of models in geoinformatics and geophysical interpretation systems, description structures, as well as formats for representing complex volumetric objects that are studied by modern geophysicists;
- methods of forming and operating with such objects, methods for calculating various characteristics of objects, including external and internal fields;
- specific software tools for working with volumetric objects;
- problems of improvement and directions of development of these 3D software, as well as promising directions in the creation of three-dimensional and multidimensional images.

**be able to:**

- Develop models of the studied objects of geoinformatics and geophysical systems.

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 43 from 57
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**Visualization and processing of geospatial data**

**CODE –MAP 290**

**CREDIT – 5 (1/0/2)**

**PREREQUISIT – none**

**PURPOSE AND TASKS OF THE COURSE**

The goal of mastering the discipline is the presentation of information in an understandable and user-friendly form is one of the main functions of any data processing system. Since GIS is mainly focused on processing spatially distributed data, they provide processed information in the form of various maps, cartodiagrams, three-dimensional and animated images.

**BRIEF DESCRIPTION OF THE COURSE**

The course contains a training program that gives knowledge to undergraduates on the use of geospatial systems for the formation of a database, on the possibilities of visualization and processing of geospatial data to identify patterns in the structure or features of the distribution of objects, the relationship in the spatial distribution of objects, trends in the development of phenomena in space and time.

Visualization and processing of geospatial data studies and uses the methodology, technique of extraction, accumulation, transmission, processing and display of data to obtain on their basis new information and knowledge about spatio-temporal phenomena in geosystems.

**KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE**

As a result of mastering the discipline, the undergraduate must:

know: methods and technologies of geoinformation and spatial analysis for solving problems of territory management.

be able to:

- to analyze the location, structure, relationships of objects and phenomena using the methods of spatial analysis and geomodeling.

- to analyze groups of functions that provide analysis of the placement, connections and other spatial relationships of spatial objects, including analysis of

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 44 from 57
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visibility zones, neighborhood analysis, network analysis, creation and processing of digital elevation models, spatial analysis of objects within buffer zones.

**Technology of automation of the process of geodetic works**

**CODE – MAP708**

**CREDIT – 5 (1/0/2)**

**PREREQUISIT – maths, physics**

**PURPOSE AND TASKS OF THE COURSE**

The aim of the course is to develop sustainable skills in the use of basic applied software (GIS, CAD, office software and software for scientific research) in solving production and scientific problems in land management and real estate cadastre.

**BRIEF DESCRIPTION OF THE COURSE**

The discipline is aimed at preparing masters for: production, technical and design activities in the field of creating new projects using modern means of obtaining and processing information, solving research and applied problems related to automating the processes of obtaining and processing data, searching and analyzing specialized scientific and technical information necessary to solve specific engineering problems, including when performing interdisciplinary projects.

**KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE**

- As a result of studying this discipline, the master should **know**:
- the essence, content and processes of computer technologies, including modern trends in the development of programming technologies and methods for managing software projects;
- methods of developing factual databases and knowledge bases;
- main directions of development of Internet and Web - technologies;
- modern trends in the development of CAD / GIS technologies in land management and land cadastre;
- be able to:**
- to develop technological schemes and processes of computer
- technologies for processing and presentation of land management and cadastral information;

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 45 from 57
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- to develop and compose: auxiliary templates, system settings, macros, additional functions, SQL queries and applications in office applications and GIS;
- create databases in Access and integrate them into office applications and GIS systems;
- to process the results of experiments and to solve mathematical problems in systems for scientific research.

**own:**

- methods of processing, analysis and interpretation of information in office applications, in systems for scientific research and CAD / GIS systems;
- methods of developing automated processes and expanding office applications and GIS using internal tools.

**Geospatial data visualization**  
**CODE – MAP719**  
**CREDIT – 5 (1/0/2)**  
**PREREQUISIT – none**

**PURPOSE AND TASKS OF THE COURSE**

The purpose of teaching this discipline is to study the visualization of geospatial data by undergraduates. The role and importance of geodesy and cartography in the life of modern society are determined by a wide range of using geodetic methods in solving problems of creating databases of spatio-temporal data, monitoring the human environment, and studying the natural resources of the Earth.

**BRIEF DESCRIPTION OF THE COURSE**

The role and importance of the discipline in the training of specialists are determined by the use of geoinformation technologies in almost all areas of human activity. Geospatial data visualization provides the geographic portion of spatio-temporal GIS databases. Computer technologies for processing spatial data used in GIS technologies are successfully used both in geodesy and cartography.

The task of teaching the discipline is to master the knowledge of the theoretical foundations of geodetic and cartographic support of geoinformation systems by undergraduates; acquisition of practical skills in the analysis and design of geodetic and cartographic databases in GIS technologies; the ability to plan and ensure the creation of geospatial databases.

**KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE**

In the process of studying the discipline, undergraduates must acquire theoretical knowledge and practical skills:

- to carry out geodetic referencing of space images;
- perform geometric correction and brightness correction of satellite images;
- drawing up a technogenic project;
- to carry out transformation of space images;
- updating the topographic plan.

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 47 from 57
---	---	--	-----------------

**Exploration of natural resources by aerospace and remote sensing**  
**CODE –MAP 2993**  
**CREDIT –5 (1/0/2)**  
**PREREQUISIT – geodesy, cartography**

**PURPOSE AND TASKS OF THE COURSE**

The purpose of the discipline is the mastering of modern achievements of aerospace technologies and means of studying natural resources by undergraduates, teaching them the basics of remote sensing, methods of analysis and interpretation of aerial and space images.

The objectives of the discipline are to reveal the main issues of the methodology of remote sensing, to familiarize with the methods of aerospace study of natural and manufactured geosystems, to master practical skills for decoding remote information.

**BRIEF DESCRIPTION OF THE COURSE**

The course introduces undergraduates to the means of aerospace monitoring, various classifications of aerospace imagery, geometric, visual and informational properties of images. Also outlines materials related to technology and methods for decoding images, and creating maps based on aerospace information.

**KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE**

Upon completion of the course, the undergraduate must have an understanding of the essence of aerospace methods and possess the skills of decoding remote sensing materials.

**must know:**

- about the geometric, graphic, informational properties of images, the impact of natural shooting conditions on their ecological information content;
- methods of analysis and interpretation of aerial photographs and space images;
- classification of remote sensing methods and means of studying natural resources.

**should be able to:**

- to use aerospace methods in practice to solve various problems in the field of environmental management.

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 48 from 57
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**Monitoring of deformation processes of buildings and structures**

**CODE – MAP271**

**CREDIT – 5 (1/0/2)**

**PREREQUISIT – General course of mine surveying, Geodesy, Geodetic Instruments, Complete Undergraduate Course**

**PURPOSE AND TASKS OF THE COURSE A**

The aim of teaching the discipline "Monitoring deformation processes of buildings and structures" is to train future specialists in the organization and implementation of monitoring for the study, observation and timely analysis of the stress-strain state (SSS) of surface buildings and structures during the construction and operation of the metro, taking into account various factors.

The objectives of the course are the formation of practical and applied measurement skills: elevation marks of parts of buildings and structures; stress state in the soil mass and structures of buildings and structures; horizontal displacements of soil masses, limited by slopes or slopes; subsidence and displacement of the surface of soil massifs subject to underworking.

**BRIEF DESCRIPTION OF THE COURSE**

The course contains a training program that gives basic concepts about monitoring the technical state of structures, identifying changes in the stress-strain state (SSS), predicting engineering-geological and hydrogeological conditions, automated monitoring of deformations of the enclosing massif. The course is structured in such a way as to teach the listener to reliably determine the actual deformation and strength properties of the enclosing massif, according to which to make engineering decisions to reduce construction risks and risks during operation.

**KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE**

The master's student will know: the basic principles and methods of monitoring during the construction and operation of the subway.

The master's student will be able to: assess deformation processes with justification of their significance in the construction and operation of the metro, work with regulatory and methodological documents.

When studying this discipline, students will gain professional skills to quickly make decisions using new technologies, a creative approach to the task at hand.

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 49 from 57
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**Teaching practice**  
**CODE – AAP244**  
**Credit - 4**

**PURPOSE AND OBJECTIVES OF THE COURSE**

The purpose of pedagogical practice: formation and development of professional skills of a higher school teacher in a master's student; mastering the basics of pedagogical skills, skills and abilities of independent conduct of educational work.

Undergraduates as future teachers of higher education should be guided in the problems of organizing educational work, searching for new innovative approaches to teaching and educating students in the conditions of higher professional education institutions in line with the trends and directions of development of modern education.

Tasks of pedagogical practice:

- to form a clear idea of the planning of the content of the educational process of the Department;
- improve the analytical and professional activities of teachers;
- improve skills in conducting training sessions with students;
- improve the skills of developing educational and methodological literature;
- to form an adequate self-esteem, responsibility for the results of their work.

**BRIEF DESCRIPTION OF THE COURSE**

Pedagogical practice of undergraduates is a practical training of future teachers, conducted in conditions as close as possible to the professional activity of a teacher. In the process of teaching practice, the professional and personal development of future teachers is activated. During the practice, undergraduates draw up and implement a plan of educational activities with a group of students, develop and conduct a system of classes that reflect the completed segment of the learning process based on the content of the profile disciplines, demonstrate their knowledge of modern technologies and teaching methods.

**KNOWLEDGE, SKILLS AND ABILITIES AT THE END OF THE COURSE**

To complete the program of pedagogical practice, a master's student must have knowledge of pedagogy and technology of vocational training, psychology of adult education.

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 50 from 57
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Pedagogical practice equips undergraduates with the necessary experience of professional and pedagogical activity and involves mastering the following professional and pedagogical skills:

- navigate the organizational structure and regulatory documentation of the vocational education institution;
- to be guided in the theoretical foundations of the science of the taught subject;
- didactically transform the results of modern scientific research in order to use them in the educational process;
- independently design, implement, evaluate and adjust the educational process;
- use modern innovations in the process of professional training;
- master the methods of self-organization of activities and improvement of the teacher's personality;
- build relationships with colleagues, find, make and implement management decisions in their scientific and pedagogical practice;
- master the conduct of various types of classes with students in the assigned academic discipline;
- master the culture of speech and communication.

**Research work of a master's student including internships and the completion of a master's thesis**

**CODE - AAP242**

**CREDIT – 6**

**PURPOSE AND OBJECTIVES OF THE COURSE**

The objectives of the research internship are:

- formation of professional and research competencies that contribute to the qualified conduct of scientific research within the chosen topic of the dissertation research;
- study of the latest theoretical, methodological and technological achievements of domestic and foreign science;
- consolidation of practical skills and application of modern methods of scientific research, analysis, processing and interpretation of experimental data in the dissertation research.

The main task of the research practice is the acquisition of doctoral students ' experience in conducting research and mastering such skills as:

- identification and formulation of current scientific problems;
- development of research and development programs, organization of their implementation;
- development of research methods and tools and analysis of their results;
- development of organizational and managerial models of processes, phenomena and objects, evaluation and interpretation of results;
- search, collection, processing, analysis and systematization of information on the research topic;
- practical participation in the research work of research teams;
- preparation of scientific reviews, reports, publications.

**BRIEF DESCRIPTION OF THE COURSE**

Research practice is a mandatory component of the master's degree program and is a type of practical activity related to conducting scientific research within the chosen topic of dissertation research, preparing scientific publications and the analytical part of the dissertation work.

Research practice of undergraduates is aimed at deepening and systematization of theoretical and methodological training of undergraduates, as well as at the formation and development of research competencies necessary for the analysis of modern scientific achievements, the use of research methods in solving practical scientific problems.

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 52 from 57
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**KNOWLEDGE, SKILLS AND ABILITIES AT THE END OF THE COURSE**

To prepare for a scientific study, a master's student must study:

- methods of research and experimental work;
- rules of operation of research equipment;
- methods of analysis and processing of experimental data;
- physical and mathematical models of processes and phenomena related to the object under study;
- information technologies in scientific research, software products related to the professional sphere;
- requirements for the design of scientific and technical documentation;
- the procedure for implementing the results of scientific research and development.

At the same stage, the master's student develops a methodology for conducting the experiment.

Conducting an experimental study.

At this stage, the master's student assembles an experimental installation, installs the necessary equipment, develops a computer program, and conducts an experimental study.

Processing and analysis of the results obtained.

At this stage, the master's student conducts statistical processing of experimental data, draws conclusions about their reliability, analyzes them, and checks the adequacy of the mathematical model.

The master's student analyzes the possibility of implementing the research results, using them to develop a new or improved product or technology. Prepares an application for a patent, for participation in the competition of scientific works, an article for publication.

**Research practice**  
**CODE – MAP7062**  
**CREDIT – 7**  
**PREREQUISIT: None**

**PURPOSE AND TASKS OF THE COURSE**

**The purpose of the research practice** is to deepen and consolidate professional training for undergraduates by focusing on the main areas of scientific research in the field of geodesy, cartography, land management and cadastre.

**The tasks of the research practice** of the undergraduate include:

- systematization, consolidation and expansion of theoretical knowledge and practical skills in research;
- deepening the theoretical knowledge gained in the field of geodesy, cartography, land management and cadastre and their application in solving specific research problems;
- development and stimulation of the skills of independent research work;
- identification and formulation of topical scientific problems in the field of geodesy, cartography, land management and cadastre;
- search, processing, analysis and systematization of information on the research topic;
- development of research programs and, organization of their implementation;
- mastering the skills of presentations with reports and conducting meaningful scientific discussions, assessments and examinations.

**BRIEF DESCRIPTION OF THE COURSE**

Research practice is a type of practice aimed at acquiring and consolidating undergraduates the competencies necessary for preparing and writing a dissertation research and acquiring the skills of independent research work. In the course of research practice, undergraduates collect, analyze and generalize scientific material, develop original scientific proposals and scientific ideas for the preparation of a master's thesis.

**KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE**

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 54 from 57
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- **know:** the content of the main stages and principles of the organization of the research process; the main directions of scientific research, topical problems in the field of their professional activity and the main methods and ways of solving them; information sources on the topic being developed for the purpose of their use in the performance of scientific research work; principles for the selection of scientific literature and its analysis in accordance with the set goals and objectives of the research; classification and features of various types of sources; methods and means of presenting research results; requirements for registration of research results;

- **be able to:** freely navigate in modern trends, problems in the spheres of geodesy, cartography, land management and cadastre; critically reflect on existing analytical materials and data; use information technologies used in scientific research, software products related to the professional sphere; analyze, systematize and generalize information on the research topic; to draw up scientific and bibliographic apparatus; to formulate scientific problems in the direction of research; to adequately select the means and methods for solving the assigned tasks in scientific research; analyze and synthesize information from various types of sources.

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 55 from 57
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**13 Defense of the thesis / diploma project**

**CODE – ECA205**

**CREDIT – 12**

**PREREQUISIT: None**

**PURPOSE AND TASKS OF THE COURSE**

The purpose of the master's thesis is: demonstration of the level of scientific / research qualifications of a master's student, the ability to independently conduct scientific research, test the ability to solve specific scientific and practical problems, knowledge of the most general methods and techniques for their solution.

**BRIEF DESCRIPTION OF THE COURSE**

A master's thesis is a final qualifying scientific work, which is a generalization of the results of an independent study by a master student of one of the urgent problems of a specific specialty of the corresponding branch of science, which has internal unity and reflects the course and results of the development of the chosen topic.

Master's thesis is the result of the research / experimental research work of the master's student, carried out during the entire period of the master's student's training.

The defense of a master's thesis is the final stage of the master's preparation. A master's thesis must meet the following requirements:

- research should be carried out in the work or actual problems in the field of geodesy, cartography, mine surveying, land management should be solved;
- work should be based on the definition of important scientific problems and their solution;
- decisions must be scientifically grounded and reliable, have internal unity;
- the thesis should be written individually;

Designed by: Department of Mine Surveying	Reviewed: meeting of the SC of the Institute	Approved by: SMC of Satbayev university	Page 56 from 57
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