N-PJSC "KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY NAMED AFTER K.I. SATPAYEV"

GRADUATE MODEL (Master's Degree)
Educational program

7M07227 – Surveying

Almaty, 2023

CONTENT

Introduction

The main idea of the educational program is to implement a continuous process of training scientific, pedagogical and professional personnel of a new generation capable of work aimed at transforming the new scientific potential of Kazakhstan in the field of surveying.

The uniqueness of the OP "Surveying" is determined by the competencies possessed by a master who has been educated under this program.

Planning of the content of education, the way of organizing and conducting the educational process is carried out by the university and the scientific organization independently on the basis of credit technology of training.

The Master's degree in scientific and pedagogical direction implements educational programs of postgraduate education for the training 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 degree program consists of:

1) theoretical training, including the study of cycles of basic and core 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;

4) final certification.

The content of the OP "Surveying" on the basis of the development of a multi-level system of personnel training, the fundamental nature and quality of training, continuity and continuity of education and science, unity of training, education, research and innovation activities aimed at maximum satisfaction of consumer needs should ensure:

- training of professional and competitive specialists in the field of surveying;
- creation of new technologies in the field of surveying, geodesy, geoinformatics and production management;
- ability to apply knowledge of mathematics, physics, fundamental and technical sciences;
- using methods of analysis and evaluation of experimental results.

The specialist model provides for: competencies due to the development of modern science and technology; competencies dictated by the requirements of the profession, specialty; competencies due to the socio-political system of the country, its spiritual and moral system.

To acquire a complex of professional, intercultural, communicative competencies, a graduate must master the knowledge of a set of general education (OOD), basic (DB) and specialized (PD) disciplines, both their mandatory component and the component of choice in accordance with the chosen trajectory of education in full, established by the state standard.

Of great importance in the modern world is the ability to navigate the information flow: the ability to find and systematize various sources of

information according to a certain criterion; use rational methods of obtaining, converting, systematizing and storing information, actualize it in the necessary situations of intellectual and cognitive activity, as well as computer literacy, possession of modern technologies in the field of surveying, geodesy, geoinformatics and the ability to critically evaluate information.

1 Goals and objectives of the educational program 7M07227 – Surveying

Purpose: training of highly qualified scientific, technical and engineering personnel in the field of surveying, geospatial digital technologies with a focus on the development of Master's competencies.

Tasks:

• be able to develop plans and programs for the organization of innovative activities in the mining sector and understand the economic efficiency using professional automated systems in solving surveying tasks;

• apply the skills of management systems, means of increasing production efficiency and adaptation of modern information technologies for surveying;

• to plan the development of mining operations and surveying control of the condition of mining workings, buildings, structures and the earth's surface at all stages of development and protection of the subsoil with industrial and environmental safety;

• to carry out research and pedagogical work, to raise the intellectual and general cultural level, to improve the moral and physical development of one's personality in the competence of professional activity;

• be able to analyze and apply modern computer technologies, including web-based GIS systems, to create database management systems, analyze mathematical processing methods, the ability to show creative initiative, prepare applications for inventions and industrial designs in the development of mineral resources;

• understand the trends in the development of technologies for digitalization of geospatial data, the readiness to transform processes in the conditions of dynamic changes in processes in the production market, apply modern technologies for visualization and optimization of production processes in the field of surveying;

• apply the skills to express your thoughts freely and clearly in English and use it as a means of business communication at a professional level;

• possess theoretical and practical skills, perform professional functions in the tasks of rational production of geodetic and surveying measurements, including justification of the type and type of geodetic instruments and equipment.

2 List of qualifications and positions

A graduate in the specialty 7M07227 – Surveying is awarded the academic degree of Master of Technical Sciences.
Qualifications and positions are determined in accordance with the National Qualifications Framework (NQF) approved by the Protocol of March 16, 2016 by the Republican Tripartite Commission on Social Partnership and Regulation of Social and Labor Relations. Approved professional standards (https://atameken.kz/ru/services/16-professionalnyye-standarty-i-tsentry-sertifikatsii-nsk).
Graduates of the specialty 7M07227 – Surveying , regardless of the training trajectory , can work in the following positions:
- Chief Surveyor;
- Chief Surveyor;
- The head (manager) in mining.
- Designer
- Teacher. University teacher
- Manager in education
- Researcher

Types of professional activity
The peculiarity of this master's program is the training of graduates who are able to conduct the following types of professional activities:
- research activities;
- scientific and production activities;
- project activities;
- scientific and pedagogical activity.
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Objects of professional activity
The objects of professional activity of students in the specialty "Surveying" are mining enterprises; geodesy; geology; geotechnical research to ensure safety in the development of mineral deposits; engineering construction; scientific research.

3. Descriptors

1. The requirements for the master's degree level are determined on the basis of the Dublin descriptors of the second level of higher education (Master's degree) and reflect the acquired competencies expressed in the achieved learning outcomes.
2. Learning outcomes are formulated both at the level of the entire master's degree program, and at the level of individual modules or academic discipline.
3. Descriptors reflect learning outcomes that characterize the learner's abilities:
4. 1. demonstrate developing knowledge and remembrance in the studied

5. areas of surveying based on advanced knowledge of this field, in the development and application of ideas in the context of research;
6. apply at a professional level their knowledge, understanding and abilities to solve problems in a new environment, in a broader interdisciplinary context;
7. to collect and interpret information to form judgments taking into account social, ethnic and scientific considerations;
8. clearly and unambiguously communicate information, ideas, conclusions, problems and their solutions;
9. training skills necessary for independent continuation of further training in the field of surveying

4. Competencies upon completion of training

4.1 Requirements for the key competencies of graduates of the scientific and pedagogical Master's degree, must:

1) to have

about the role of science and education in public life;

about current trends in the development of scientific knowledge;

about actual methodological and philosophical problems of natural (social, humanitarian, economic) sciences;

about the professional competence of a high school teacher;

about contradictions and socio-economic consequences of globalization processes;

2) to know:

the methodology of scientific knowledge;

principles and structure of the organization of scientific activity;

psychology of cognitive activity of students in

the learning process;

psychological methods and means of improving

the effectiveness and quality of training;

3) be able to:

use the acquired knowledge for the original development and application of ideas in the context of scientific research;

critically analyze existing concepts, theories and approaches to the analysis of processes and phenomena;

integrate knowledge gained in different disciplines to solve research problems in new unfamiliar conditions;

by integrating knowledge to make judgments and make decisions based on incomplete or limited information;

apply the knowledge of pedagogy and psychology of higher education in their teaching activities;

apply interactive teaching methods;

to carry out information-analytical and information bibliographic work with the involvement of modern information technologies;

think creatively and creatively approach the solution of new problems and situations;

be fluent in a foreign language at a professional level, which allows conducting scientific research and teaching special disciplines in universities;

summarize the results of research and analytical work in the form of a dissertation, a scientific article, a report, an analytical note, etc.;

4) have the skills of:

research activities, solving standard scientific problems;

implementation of educational and pedagogical activities on credit technology of training;

methods of teaching professional disciplines;

the use of modern information technologies in the educational process;

professional communication and intercultural communication;

public speaking, correct and logical design of their

thoughts in oral and written form;

expanding and deepening the knowledge necessary for daily professional activities and continuing education in doctoral studies.

5) be competent:

in the field of research methodology;

in the field of scientific and scientific-pedagogical activity in higher educational institutions;

in matters of modern educational technologies;

in the implementation of scientific projects and research in the professional field;

in ways to ensure constant updating of knowledge, expansion of professional skills and abilities.

B - Basic knowledge, skills and abilities

B1- knowledge of basic methods, methods for the development of plans and programs, the organization of innovative activities at the enterprise and understanding of economic efficiency using professional automated systems. Make optimal management decisions;

B2 - understanding and application of the concept of geospatial analysis, immersive technologies and 3D visualization of the results of aerospace and ground survey methods in the development of mineral deposits;

BZ is the ability to solve standard tasks in the field of surveying with the use of innovative technologies.

P - Professional competencies, including according to the requirements of industry professional standards, providing deep theoretical knowledge and practical skills in the field of geospatial digital engineering.

P1 - A wide range of theoretical and practical knowledge in the professional field, production technology in the field of surveying.

P2 - Possess theoretical and practical skills, perform professional functions in the tasks of rational production of surveying and geodetic measurements, including justification of the type and type of geodetic instruments and equipment, their control in accordance with IOS standards.

PZ - Possess theoretical and practical skills in conducting surveying and geodetic surveys to solve applied and scientific problems.

P4 - Be able to analyze and apply modern computer technologies, including Web-based GIS for creating database management systems, analyzing mathematical processing methods, the ability to show creative initiative, prepare applications for inventions and industrial designs.

P5 - To understand the trends in the development of digitalization technologies in the field of surveying, mining, the readiness to transform

processes in the conditions of dynamic process changes in the production market, to apply modern technologies for visualization and optimization of production processes, big data management in the field of technologies for process automation.

P6 - Willingness to participate in the implementation of automated production management systems in the field of surveying, mining.

P7 - Apply skills of management systems, means of increasing production efficiency and adaptation of modern information technologies.

P8 - Knowledge of legislative bases in the field of surveying, mining, geology, geodesy and spatial data.

P9 - The ability to perform marketing research, conduct economic cost analysis for the implementation of processes in the field of surveying.

P10 - Willingness to participate in the research of objects of professional activity and their structural elements;

P11 - Be able to study and use scientific and technical information in the field of surveying, mining, geology, geodesy and spatial data.

P12 - Willingness to perform scientific and laboratory research, interpret the results obtained, compile and defend reports;

P13 — Knowledge of the skills of organizing scientific research.

P14 —Readiness to develop innovative design solutions in the field of surveying, mining, geology, geodesy and spatial data.

P15 — The ability to develop the necessary technical and regulatory documentation as part of creative teams and independently, to control the compliance of projects with the requirements of standards, specifications and documents in the field of surveying, mining, geology, geodesy and spatial data..

P16 – The willingness to develop, coordinate and approve in the prescribed manner technical, methodological and other documents regulating the order, quality and safety of surveying work.

P17 - Skills in conducting scientific research, performing laboratory and experimental studies with subsequent processing of results using modern computer technologies, improving existing and developing new research methods and techniques, technical and technological solutions and hardware for their implementation, choosing technical means for conducting research.

P18 - The ability to analyze and apply the law on geodesy, cartography and spatial data at work and regularly monitor changes and additions to these laws.

0 - Universal, social and ethical competencies

01 - Ability to abstract thinking, analysis, synthesis;

02 - The ability to use the basics of philosophical knowledge to form a worldview position;

03 - The ability to analyze the main stages and patterns of the historical development of society for the formation of a civic position;

04 — The ability to use the basics of economic knowledge in various spheres of life;

05 —Ability to use the basics of legal knowledge in various spheres of life;

06 - Willingness to act in non-standard situations, to bear social and ethical responsibility for the decisions taken;

07 - Readiness for self-development, self-realization, use of creative potential;

08 - The ability to use methods and means of physical culture to ensure full-fledged social and professional activities;

08 - The ability to use first aid techniques, methods of protection in emergency situations.

C - Special and managerial competencies:

C1 —The ability to solve the tasks of professional activity on the basis of information and bibliographic culture with the use of information and communication technologies and taking into account the basic requirements of information security;

C2 - Readiness for communication in oral and written forms in the state, Russian and foreign languages to solve the tasks of professional activity;

SZ - Willingness to lead a team in the field of their professional activities, to perceive social, ethnic, confessional and cultural differences with tolerance;

C4 - The ability to use software products for processing information arrays;

C5 - Knowledge of methods of digital modeling of spatial systems in the implementation of interdisciplinary educational and research projects

C6 - Demonstration of readiness for independent research work in the field of designing the development of mineral deposits and forecasting the safety of their development on the basis of modern digital programs.

C7 – The ability to apply information technology to solve national applied problems in the field of surveying, mining, geology, geodesy.

C8 – Readiness to use data from instrumental, satellite, and geophysical technologies to ensure safety during the development of mineral deposits.

4.2 Requirements for the research work of a master's student in the scientific and pedagogical magistracy

1) corresponds to the profile of the master's degree program, according to which the master's thesis is being performed and defended;

2) relevant and contains scientific novelty and practical significance;

3) based on modern theoretical, methodological and technological achievements of science and practice;

4) performed using modern methods of scientific research;

5) contains research (methodological, practical) sections on the main protected provisions;

6) is based on the best international experience in the relevant field of knowledge.

4.3 Requirements for the organization of practices

The educational program of the scientific and pedagogical Master's degree includes two types of practices that are conducted in parallel with theoretical training or in a separate period:

1) pedagogical in the DB cycle - at the university;

2) research in the PD cycle - at the place of completion of the dissertation.

Pedagogical practice is conducted in order to form practical skills of teaching and learning methods. At the same time, undergraduates are involved in conducting undergraduate classes at the discretion of the university.

The research practice of a master's student is conducted in order to familiarize with the latest theoretical, methodological and technological achievements of domestic and foreign science, modern methods of scientific research, processing and interpretation of experimental data

5 Requirements for completing studies and obtaining a diploma

The main criterion for the completion of the educational process for the preparation of masters of technical sciences is the development of at least 120 credits by a master's student, of which at least 73 credits of theoretical training, at least 12 credits of pedagogical and research practice and at least 24 credits of research work of a master's student.

Awarded degree/qualifications: The graduate of this educational program is awarded the academic degree "Master of Technical Sciences" in the direction 7M072 – Manufacturing and processing industries.

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

the ability to independently acquire, comprehend, structure and use new knowledge and skills in professional activities, develop their innovative abilities;

the ability to independently formulate research goals, establish the sequence of solving professional tasks;

the ability to apply in practice the knowledge of fundamental and applied sections of disciplines that determine the orientation (profile) of the master's degree program;

the ability to professionally choose and creatively use modern scientific and technical equipment to solve scientific and practical problems;

the ability to critically analyze, present, defend, discuss and disseminate the results of their professional activities;

proficiency 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;

willingness to communicate orally and in writing in a foreign language

to solve the tasks of professional activity.

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

Research activity:

the ability to form diagnostic solutions to professional problems by integrating fundamental sections of sciences and specialized knowledge acquired during the development of the master's degree 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 surveying, able to implement their professional knowledge, skills and abilities in public and private management, in design and research organizations of any form;

Scientific and production activity:

the ability to independently carry out production and scientific and production field, laboratory and interpretive work in solving practical problems in the field of surveying, mining, geology, geodesy;

the ability to professionally operate modern field and laboratory equipment and devices in the field of the master's degree program;

the ability to use modern methods of processing and interpreting complex information to solve scientific and industrial problems;

Project activities:

the ability to independently compile and submit research and production projects;

readiness to design complex research and scientific-production works in solving professional tasks;

Organizational and managerial activity:

readiness to use practical skills of organization and management of research and scientific-production works in solving professional tasks;

readiness for the practical use of regulatory documents in the planning and organization of scientific and production work.

Scientific and pedagogical activity:

the ability to conduct seminars, laboratory and practical classes;

the ability to participate in the management of scientific and educational work of students in the field of surveying, mining, geodesy.

When developing a master's degree 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.

Change registration sheet to _____

Sequence number	Section, item	Type of change (replace, cancel, Add)	Number and date of notification	The change has been made	
				Date	SNP Signature, position