

Approve
Director of the Mining and
Metallurgical
Institute named after O.A. Baikonurov



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20 22 у.

Educational program

SPECIALIST MODEL

6B07213 - Mineral Processing

1 Awareness and Formulation of Basic Goals (Objectives) of the Educational Program 6B07213 - Mineral Processing

1.1. Goals of the educational program 6B07213 - Mineral Processing

Goal 1: To provide social, humanitarian, and professional training for bachelor's degree students in the field of mineral enrichment in accordance with the advancement of science and technology, as well as the changing needs of the mining and processing industry, scientific centers, and graduate programs of educational institutions in personnel with this qualification.

Goal 2: To train bachelor's degree graduates as enrichers who have knowledge of the raw material base, ore enrichment processes, and processing, possessing deep knowledge in the field of physical, chemical, and thermal ore treatment, as well as skills in working with modern equipment and technologies.

Goal 3: To ensure knowledge, skills, and abilities enabling the control and automation of technological processes, designing and implementing new enrichment methods, and solving problems related to mining and processing production.

1.2. Tasks of the educational program

1. Study of the cycle of general education disciplines to provide social and humanitarian education based on the laws of socio-economic development of society, history, modern information technologies, the state language, and foreign and Russian languages.

2. Study of the cycle of basic disciplines to provide knowledge of natural sciences, general technical, and economic disciplines as the foundation of professional education.

3. Study of the cycle of specialized disciplines to form theoretical knowledge, practical skills, and abilities in the technology of processing natural and man-made raw materials.

4. Study of the principles and methods of automation and control of technological processes in the field of ore enrichment.

5. Study of disciplines that form knowledge, skills, and abilities in planning and organizing research, designing technologies and equipment in the mining and processing industry.

6. Familiarization with the technologies and equipment of factories and plants during various types of internships.

7. Acquisition of skills and abilities in laboratory research, pilot testing of ore enrichment processes, technological calculations, equipment selection, and design using modern computer technologies and programs.

1.3. Decomposition of key tasks of the specialty into clusters of «related» competencies.

Bachelor of the educational program 6B07213 - Mineral Processing should possess the main competencies for the following types of activities (from the State Educational Standard + recommendations):

1. Research Activity:

- Investigation and analysis of the composition, structure, and properties of minerals;
- Development of methods and technologies for processing and treatment of minerals;
- Conducting experiments and research to determine the effectiveness of various processing methods;
- Utilization of mathematical models and simulations for analysis and optimization of mineral processing processes;
- Conducting literature and patent searches, compiling reports, reviews, conclusions, etc.

2. Production and Technological Activity:

- Determination of optimal technological regimes for various types of minerals;
- Development and implementation of technical solutions to improve processes for processing and treatment of minerals;
- Organization and control of equipment operation and process control systems;
- Development and implementation of methods for quality control of products.

3. Organizational and Management Activity:

- Planning and organizing the work of production and laboratory departments;
- Personnel and project resource management in the field of mineral processing;
- Development and control of project budgets;
- Interaction with clients and contractors.

4. Calculation and Design Activity:

- Development of technical projects and drawings for equipment and systems for mineral processing;
- Calculation of processing parameters and resource utilization efficiency;
- Modeling and simulation of mineral processing processes;
- Assessment of economic efficiency and risks of projects in the field of mineral processing.

5. Service and Operational Activity:

- Maintenance and operation of technological main and auxiliary equipment;
- Planning and implementation of repair and restoration work on equipment and structures.

6. Installation and Commissioning Activity:

- Construction of facilities and installation of technological equipment for beneficiation, ore processing, and crushing and sorting productions.

- Commissioning and putting into operation of main and auxiliary equipment.

1.2 Competence model of the specialist of the educational program 6B07213 – «Mineral Processing» includes the following groups of competences:

Table 1 - Competencies, competencies, behavioral indicators, disciplines

Competence	Behavioral indicators (form of competence manifestation)
1	2
A. Intelligent (Instrumental)	
1. Ability to analyze and synthesize, compare and contrast	Ability to analyze and synthesize, from the whole to the particular and from the particular to the whole. Application of methods of comparison and contrast, analogy. Ability to understand the phenomenon, object. Knowledge of the boundaries of definitions.
2. Ability to organize and plan, systematize	Ability to organize and plan, draw up an algorithm of actions, systematize data
3. Basic general knowledge.	Demonstrates knowledge of math, physics, chemistry, computer science, history, native and foreign languages
4. Коммуникативные навыки на родном языке.	Use of written and oral communication in the native language
5. Communicative skills in the mother tongue.	Uses written and oral communication in a foreign language
6. Elementary computer skills.	Uses communication means, the Internet to search for information. Uses software: Word, Excel, Access, Autocad, etc.
7. Information management skills	Can extract, systematize and analyze information from various sources.
8. Ability to make decisions and solve problems.	Is able to formulate a goal and choose methods to achieve it and makes a decision. Demonstrates the ability to use adequate problem-solving technologies.
B. Social (Interpersonal)	
1. Ability to criticize and self-criticize.	Ability to formulate critical judgments. Ability to listen to, perceive, and question suggestions. Demonstrates flexible and critical thinking.
2. Ability to work in a team.	Demonstrates a willingness to collaborate, is a team member, supports team members, adapts personal style to develop relationships with colleagues.
3. Interpersonal skills.	Demonstrates interpersonal understanding, ready to resolve conflicts, strives to achieve a win-win result in negotiations.
4. Ability to embrace diversity and intercultural differences.	Understanding of cultures and customs of other countries. Considers different cultural styles and values in external relations.
5. Ability to work in an international context.	Fluent in speaking and writing a foreign language, professionally competent, communicative, establishes and maintains external contacts.
6. Commitment to ethical values.	Maintains ethical standards and rules.
C. Systemic	
1. Learning ability.	Absorbs information well, has goals, and is ready for continuing education.
2. Mobility	Ability to adapt to new situations. Orientates when conditions change and changes behavioral style.
3. Creativity	Ability to generate new ideas, displays creativity. Produces innovative ideas and non-standard approaches
4. Leadership ability.	Ability to manage a group of colleagues, partners, participants in temporary teams, ability to integrate behavior.
5. Ability to operate autonomously.	Demonstrates the ability to work independently using appropriate sources of information
6. Ability to take initiative and entrepreneurship.	Initiates improvement, puts forward new ideas, looks for opportunities to apply skills. Able to negotiate, customer oriented.
7. Responsibility for quality.	Strives to achieve the best quality in all activities. Studies and complies with regulations, technological regulations, instructions.
8. Will to succeed.	In activities, strives for concrete results.
D. Professional (Specific)	
D.1 Economic, organizational and managerial	

a) Organization of the work of teams	Organizes the activities of the team, controls the execution of tasks. Performs activities to organize production. Recognizes and honors the contributions of others in the workplace.
b) Staff and resource planning.	Draws up work plans. Resolves issues of information support of production. Participates in the preparation of technical documentation. Resolves issues of material and technical support.
c) Support of the quality management system	Ensures team members understand personal and collective responsibility, participates in product quality management activities.
D.2 General scientific competence	
a) Fundamentality of education, basic general knowledge.	Knowledge of mathematics, physics, chemistry, physical chemistry, heat engineering, electrical engineering, theoretical mechanics. Ability to find necessary reference information and solve applied problems.
b) Research abilities, mastery of cognitive methods	Demonstrates research methods, ability to extrapolate results and draw conclusions. Familiar with research methods, familiar with TRIZ theory.
c) Informational	Search systematization and analysis of information. Preparation of reports, reviews, conclusions, etc.
D.3 General professional competence	
a) Basic knowledge of engineering and technology	Has knowledge and skills in solving tasks in the field of engineering and technology, finds solutions to general technical problems.
b) Situationally appropriate actualization of knowledge	To solve a problem, identifies the area of knowledge to which the problem pertains and can find the necessary background information
c) Knowledge structuring and integration	Systematizes knowledge and information. Uses patterns of relevant knowledge and reference data to solve a problem
D.4 Professional competence	
a) Basic enrichment knowledge, application of knowledge in practice	The application of enrichment knowledge in practice involves the complex solution of problems associated with improving the quality and concentration of useful substances to produce a sought-after end product.
b) Научно-исследовательская	Can formulate the research goal, develop an experimental plan, design an experimental setup, conduct experiments, and process data to obtain graphs or dependencies of the researched parameter on factors.
c) Production and technological	Knows regulatory and technological documentation of production, standards, HSE requirements. Possesses knowledge and skills in the implementation of technological processes of concentrate production. Has knowledge and skills in implementation of environmental protection measures at the production site; Has knowledge and skills in implementation of energy and resource saving technologies in mineral processing;
d) Ability to develop and manage projects.	Is able to set the goal and objectives of the project. Draws up a technological scheme of enrichment, justifies regime parameters and indicators. Can make a business plan and propose technological solutions, make technological and energy balances, calculate the design of apparatuses, select auxiliary equipment and automation scheme. Carries out calculations of mass-exchange, thermal processes, calculate gas and hydrodynamics on the scheme of the chain of apparatuses. Develops drawings of equipment, buildings and structures.
e) Service and Maintenance	Has skills and ability to maintain crushers, mills, sedimentation machines, flotation machines, concentration table, magnetic separator, etc.
i) Installation and adjustment	Has skills in process equipment installation and set-up
D.5 Special competence	
a) Project expertise, solving complex issues.	Solves complex issues and makes decisions, can conduct expert examination of apparatuses, technologies. Makes an expert opinion on the advantages and disadvantages of projects, suggests ways of further improvement.

b) Solving scientific and technological problems	<p>Is able to identify a problem, set a goal, and is result-oriented.</p> <p>Develops methods and conducts research on an object or process.</p> <p>Develops schematic and design of experimental setup, conducts installation and debugging.</p> <p>Conducts experimental studies of processes, units, and products;</p> <p>Processes data using planning, regression and correlation analysis techniques.</p> <p>Analyzes and summarizes research results, publishes results, executes patents.</p> <p>Develops mathematical and simulation models of enrichment processes.</p>
c) Professional development abilities,	Finding opportunities for continuous self-development, increases the degree of preparedness for specific function

1.3 Program Outcomes and Assessment.

Learning outcomes are expected indicators of what the learner should know, understand and/or be able to accomplish at the end of the learning process. They may relate to a single course, module or period of study, or to a first or second level program as a whole.

Table 2 - Learning outcomes of the educational program 6B07213 - Mineral Processing

Outcomes of the educational program	Competencies
<p>A bachelor's degree must be intellectually competent:</p> <ul style="list-style-type: none"> - Have the ability to analyze and synthesize, compare, contrast. - have communication skills in native and foreign languages, and be able to present ideas and information, orally and in writing. - demonstrate basic computer and information management skills. - Demonstrate decision-making and problem-solving skills 	A1-A8
<p>A bachelor's degree must be socially competent:</p> <ul style="list-style-type: none"> - Demonstrate critical and self-critical abilities and the ability to work in a team. - have interpersonal skills and the ability to interact with experts from other subject areas and to work in an interdisciplinary team. - demonstrate the ability to work in an international context, to embrace diversity and intercultural differences. - demonstrate a commitment to ethical values 	B1-B6
<p>A bachelor's degree should be systemically competent:</p> <ul style="list-style-type: none"> - be able to apply knowledge in practice and exhibit research skills. - have mobility and creativity. - have the will to succeed, the capacity for leadership and independent autonomous work. - show responsibility for quality and the ability to learn 	C1-C8
<p>A Bachelor's degree holder should demonstrate specific types of competencies:</p> <ul style="list-style-type: none"> - Economic and organizational and managerial competence - to be able to organize the work of teams, to plan the work of personnel and resources, to maintain a quality management system - General scientific competence - to have fundamental education, basic general knowledge, to know the methods of cognition, to be able to systematize and analyze information. - General professional competence - to have basic knowledge in the 	D1-D5

field of engineering and technology, to be able to actualize, structure and integrate knowledge.

- Professional competence - to have basic knowledge of enrichment fundamentals, to be able to engage in enrichment activities: research, production-technological, design and calculation, service and operation, installation and commissioning

- Special competence - to be able to carry out project expertise, to solve complex issues of enrichment production, to be able to find solutions to scientific and technological problems, to have the ability to professional development

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of «Metallurgy and Mineral Processing»**



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