CJSC «Kazakh National Research Technical University named after K.I. Satbayev»

Institute of «Geology, Oil and Mining

named after K.Turysov»

Department of «Geophysics»

EDUCATIONAL PROGRAM
CURRICULUM PROGRAM

Bachelor of engineering and technology in the educational program 6B07201- «OIL-GAS AND ORE GEOPHYSICS»

second edition
in accordance with SCES of higher education in 2018

Almaty 2021

The program is composed and signed by the parties:

From KazNRTU named after K.I. Satbayev:

1. Director of the Institute — A.Kh. Syzdykov
2. Head of Department — A.E. Abetov
3. Secretary of Teaching group Department, Senior Lecturer — G.K. Umirova

Fromemployers:

1. Candidate of Geological and Mineral Sciences, Deputy General Director of SPC "GEOKEN" LLP, Laureate of the State Prize of the Republic of Kazakhstan in the field of science and technology named after Al-Farabi, P. Kovrizhnykh
2. Manager of the data processing center of the company "PGS Kazakhstan LLP", Ph.D., D. Khitrov
3. Chief geologist of KNOC, Candidate of Geological and Mathematical Sciences, A.Zh. Akhmetzhanov

From partner universities (Perm State National Research University, Tomsk State Technological University):

1. Head of the Department of Geophysics, V.I. Kostitsyn
2. Vice-rector of Science, S.O. Makarov
3. Doctor of Geological and Mineralogical Sciences, professor, corresponding member of Russian Academy of Sciences, V.I. Isaev

Approved at the meeting of the Training and Methodological Council of the Kazakh National Research Technical University named after K.I.Satpayev.
Minutes№4 dated 14.01.2020

Qualifications:

Level 6B- National Qualifications Framework:

6B072- Manufacturing and processing industries

6B07201-Oil and gas and ore Geophysics

Professional competence:providing basic theoretical knowledge and practical skills in the field of fundamental research of the earth's crust, methodologies and methods for conducting surface and borehole geophysical studies in the search and exploration of mineral deposits.

A graduate of the department in the undergraduate program should know:

- goals and objectives of geophysics in the system of earth sciences;
- be aware of the social significance of their future profession;
- to have high motivation to carry out professional activities;
- be able to evaluate the capabilities of each geophysical method and navigate in terms of the applicability of individual methods;
- have skills in working with geophysical equipment and geophysical data and have computer skills as a means of information management.

Demonstrate the ability of the research team to participate in the preparation of reports, essays, bibliographies on the subject of scientific research, in the preparation of publications; willingness to work with geophysical data, field and laboratory geophysical instruments, installations and equipment. To put into practice the methods of collecting, processing, analyzing and summarizing stock, field and laboratory geological and geophysical information (in accordance with the profile of preparation); to participate in the organization of scientific and scientific-practical seminars and conferences.

1 Short description of the program

Designed to carry out specialized training ofbachelors in the educational program of the specialty " Oil and Gas and Ore Geophysics" in Satbayev University and was developed as part of the direction " Manufacturing and processing industries"

This document meets the requirements of the following legislative acts of the Republic of Kazakhstan and regulatory documents of the Ministry of Education and Science of the Republic of Kazakhstan:

- The Law of the Republic of Kazakhstan "About 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.
- The Law of the Republic of Kazakhstan "On Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan on the Expansion of the Academic and Management Independence of Higher Education Institutions" dated 04.07.18, No. 171-VI.
- Order of the Minister of Education and Science of the Republic of Kazakhstan dated October 30, 18, No. 595 "On the Approval of the Model Rules for the Activities of Educational Organizations of the corresponding Types".
- The State Compulsory Standard of Higher Education (Appendix 7 to the Order of the Minister of Education and Science of the Republic of Kazakhstan dated October 31, 18 No. 604).
- Decree of the Government of the Republic of Kazakhstan dated 01.19.12, No. 111 "On approval of the Model Rules for admission to study at educational organizations implementing educational programs of higher education" with amendments and additions dated 14.07.16, No. 405.
- Decree of the Government of the Republic of Kazakhstan dated 13.08.12, No. 1042 "On approval of the Concept for the development of the geological industry until 2030".
- The Law on Subsoil and Subsoil Use and the draft Code on Subsoil and Subsoil Use.
- Code of public reporting on the results of exploration, mineral resources and reserves of KAZRC.

The bachelor's program in oil and gas and ore geophysics provides: a) the training of specialists in the field of geophysical methods of prospecting and exploration of mineral deposits; b) obtaining qualitative and professional knowledge on stage-by-stage and rational complexes of geological and geophysical research, on organizing and conducting field and borehole geological and geophysical research, processing, interpreting and modeling the obtained data; c) acquiring skills in analyzing geological and geophysical data, their structuring,classifications of targets in mineral deposits; statements and solutions of direct and inverse problems in the search and exploration of

mineral deposits.

The program includes training in working in modern computer programs Studio RM, Petrel, Eclipse, Surfer, Geosoft, Geolog-Focus, Echos-Gold.

To conduct lectures and consultations on modern problems of geophysics and geology of solid minerals, oil and gas, professors from leading universities of near and far abroad, leading experts from manufacturing companies and research institutes are invited.

3rd-year bachelors who study in the oil and gas industry and have high academic performance can study under the Minor additional educational program. This is a set of disciplines and (or) modules and other types of educational work defined by the student for study in order to obtain professional competencies defined directly by the Customer (KazMunaiGas) (Rules for the organization of the educational process on credit training technology Order of the Ministry of education of the Republic of Kazakhstan from 12.10.2018 №563).

Students undergo training at the university's training ground in Karatau and practical training at research institutes (Institute of Seismology of the Ministry of Education and Science of the Republic of Kazakhstan, Institute of Geological Sciences named after K. I. Satpayev, KazNIPImunaigas, operator and service companies Karachaganak Petroleum Operating, Tengizchevroil , "Kazgeology", "PGD SERVICES", "DANK", PGS, "SPC" Geoken "," Geo Energi Group "," TatArka "," Kazakstankaspiyshelf ""Kazakh Geophysical Company "," Batys geophysical service "," Company GIS "," Azimut Energy Services "," Kazakhmys "," Kazzinc ", EvraIy Industrial Association, Kazfosfor, Maykayn-gold, Kazatomprom, Zhairemsky GOK, Asemtas, Izdenis, GeoincenterAlstron LLP, Azimut Geology LLP, Anega Kazakhstan LLP , Volgovgeologiya JSC - Geotechnocenter, GISS LLP, DP Ortalyk LLP, Zhanros Drilling LLP, Izdenis LLP, Karakudukmunai LLP, Karazhanbasmunay LLP, KazGIIZ LLP, Kazakhoil LLP Aktyube, Kyzylkum LLP, KOR Oil Company JSC, Uzenpromgeofizika JSC, KATKO JV JSC KazMunayGas JSC, PetroKazakhstan JSC, BapyMining LLP, NAK KazatomProm JSC KAZ Mineral sPLS ", JSC" MMC Kazakhaltyn ", LLP" GEOENERGYGROUP "and others.

The best students can receive additional education through the program of academic mobility at the Colorado Mining School (USA), Tomsk Polytechnic University, Frye University, Lorraine University (Nancy, France), the Institute of Mining Engineering and Technology (Beijing, China) and other universities around the world.

Graduates receive the qualification of a bachelor of engineering and technology and work in research institutes, in oil and gas and mining companies in engineering and technical positions.

The purpose of the educational program:

Training for research institutes, operator (subsoil users) and service companies of

professionally educated and competent specialists who are able to effectively participate in research on the earth's crust and work in engineering and technical jobs while conducting geological and geophysical research in search, exploration and pre-exploration of mineral deposits based on innovative methods and technologies (including software), using modern equipment.

The objectives of the educational program:

- study of the cycle of *general educational disciplines* to ensure social and humanitarian education on the basis of the laws of socio-economic development of society, history, modern information technologies, the state language, foreign and Russian languages;
- study of the cycle of *basic disciplines* to ensure knowledge of natural sciences, general technical and economic disciplines, as the foundation of professional education;
- study of the *cycle of majors*, focused on the study of key theoretical and practical aspects of engineering and technology for conducting surface and borehole geophysical surveys with the aim of rational use of natural resources;
- familiarization with the methods, technologies and equipment of operator and service companies during the production and undergraduate practice.
- Acquisition of skills to perform laboratory research of core samples and reservoir fluid samples using modern computer technologies and programs.
- multi-aspect bachelor's training in modular programs for oil and gas and ore geologists and geophysicists, including on conducting field practical exercises on obtaining geological and geophysical data, processing and interpretation of these data, building geological and geophysical and production geophysical models;
- training of competitive specialists in demand on the labor market, owning a set of necessary knowledge and skills, including: a) studying disciplines that form knowledge and planning and organization of geophysical work; b) the acquisition of experience in the implementation of research projects and skills in the implementation of work in modern software.

Field of professional activity:

The field of professional activity of a bachelordegree includes a combination of technologies, resources, ways and methods of human activity in the field of science, technology and industry, aimed for search, exploration and exploitation of mineral deposits, the study of processes in the bowels of the Earth.

Possible field of work: manufacturing organizations, service companies, research and design organizations, etc.

Objects of professional activity:

Geological bodies in the earth's crust, mine workings, physical fields in rocks, as a source of measurement information for geological exploration, mathematical and

physical models of formations, sections, mineral deposits in the process of their exploration and development; geophysical computerized and software-controlled information-measuring and processing systems and complexes; theoretical and physical models for their design and operation.

Types of professional activity:

Graduates of Bachelorstudies in the field of "Oil and Gas and Ore Geophysics", in accordance with the fundamental and professional trainings, can perform the following activities:

Organizational and managerial:

- planning and organizing geophysical work on licensed blocks and areas;
- development of operational plans for the work of geophysical parties and detachments;
- selection and justification of scientific, technical and organizational solutions based on geological and geophysical data and economic calculations.

Production and technological:

- Organization of the production process performing field and borehole geophysical surveys;
- ensuring the compliance of these studies with design estimates, technical requirements and safety rules;
- choiceof methods, equipment and facilities performing geophysical research;
- the effective use of methods and technical means, equipment, algorithms and programs for the selection and calculation of parameters for performing field and borehole geophysical surveys.

Experimental research:

- collection and systematization of scientific and technical information of domestic and world experience in relation to solving problems of geophysical methods of prospecting and exploration of mineral deposits;
- numerical modeling of geophysical research objects based on modern software;
- planning and conducting pilot geophysical work;
- regulation and adjustment of geophysical equipment and instrumentation;
- registration of various geophysical parameters. Quality assurance of receiving signals;
- quality control of work performed.

Design and analytical:

- the formation of the goals and objectives of the project (program), ensuring the current level of field and borehole geophysical research;
- registration of technological documentation of geophysical research;
- collection and analysis of information source data for design;
- conducting a preliminary feasibility study of design calculations;
- development of design estimates for the implementation of field and borehole

geophysical surveys;

- implementation of projects in production and field supervision
- participation in the assessment of economic efficiency of production activities of personnel of geophysical parties and groups;
- ensuring the safety of geophysical work.

The subjects of professional activity appear to be:

Study of the structure of the earth's crust, physical models of the earth's crust and the physical properties of rocks; conducting scientific research in the field of geo-electric, seismic, gravimagnetic and nuclear geophysical methods, as well as borehole geophysical observations; conducting field observations, processing, interpretation and modeling of the data obtained in the study of geological objects, as well as measures to ensure safety during geophysical work and reduce their technological pressure on the environment.

Areas of professional activity of the bachelor degree appear to be:

- organizations of the Ministry of Energy and the Ministry of Industry and Infrastructure Development of the Republic of Kazakhstan;
- Academic and departmental research organizations related to the solution of geological problems;
- operator and service companies engaged in geological exploration for the search, exploration and re-exploration of mineral deposits, as well as implementing control over the development of these deposits;
- organizations related to environmental monitoring and solving environmental problems;
- Institutions of higher and secondary specialized education.

2Volume and contents of the program:

The volume of the undergraduate educational program (OP) is 248 credits, regardless of the form of study, the educational technologies used, the implementation of the undergraduate program using the online form, the implementation of the undergraduate program according to an individual curriculum, including accelerated learning.

The content of OP “Oil and Gas and Ore Geophysics” based on the development of a multi-level training system, the fundamentality and quality of education, the continuity and succession of education and science, the unity of training, education, research and innovation, aimed at maximizing customer satisfaction **should ensure**:

- Obtaining a full and high-quality professional education in the field of oil and gas and ore geophysics, confirmed by the level of knowledge and skills, competencies, on the basis of criteria established by the State educational standard, their assessment, both in content and

volume;

- preparation of the students from the bachelor degree for the oil and gas and mining industries, who know the technology and methods of conducting geophysical work, methods of processing, interpretation and modeling of the obtained geophysical data;

-Training of professional and competitive specialists in the field of oil and gas and ore geophysics, capable of applying innovative methods in the search and exploration of mineral deposits;

- application of knowledge of fundamental and technical sciences, including mathematics, physics, chemistry;

-use of system analysis methods in assessing the obtained geological and geophysical and field geophysical data;

-knowledge of modern problems of oil and gas and ore geophysics;

- the acquisition of practical skills in working with geophysical equipment, modern software in processing, interpreting and modeling the obtained geological and geophysical data using modern information technologies;

- the use of methods, skills and modern technical means necessary for identifying oil and gas promising objects and deposits of solid minerals;

- the ability to find and work with the necessary literature, computer information, databases and other sources of information to solve the tasks;

- the formation of students' teamwork skills, but at the same time show individuality, and if necessary solve problems independently;

- the formation of students' industrial and ethical responsibility, the ability to understand the problem of working together with various specialists, find the best solutions, the need to improve their knowledge and skills;

- Students' readiness for professional activities through disciplines that provide fundamental knowledge, skills and work skills in production, government organizations, research institutes and educational institutions;

- the ability to analyze geological and geophysical data and monitor geophysical work, as well as make managerial decisions based on their results;

- possess erudition, knowledge of modern social and political problems, speak the state, Russian and foreign languages, instruments of a market economy, safety and environmental issues.

3. Entry Requirements

The previous level of education of the applicant is secondary (complete) general education.

The applicant must have a state document on secondary (full) general education or secondary vocational education, if it contains a record of the receipt by the bearer of secondary (full) general education or higher vocational education.

Admission of students entering Satbayev University is carried out by placing a state educational order (educational grants), as well as paying for tuition at the expense of

citizens' own funds and other sources.

Admission is carried out at the request of an applicant who has completed the full secondary, specialized secondary education on a competitive basis in accordance with the points of a certificate issued according to the results of a Unified national test (hereinafter - UNT) or complex test. To participate in the competition, you must score at least 65 points when entering SatbayevUniversity.

At the "entrance" the applicant must have all the prerequisites necessary for mastering the corresponding educational program of undergraduate studies. The list of required prerequisites is determined by the higher educational institution independently.

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

Special requirements for admission to the program, if any, including for graduates of 12 summer schools, colleges of applied undergraduate programs, etc.

Admission to the university of people with technical and vocational or post-secondary education with the qualification of "middle level specialist" or "applied bachelor" in related areas of higher education personnel providing for shortened training periods is carried out according to UNT. (Model rules for admission to training in educational institutions implementing educational programs of higher and postgraduate education No. 600 dated October 31, 2018).

Credit transfer rules for accelerated (shortened) education based on 12-year secondary, secondary technical and higher education.

Code	**CompetencyType**	**CompetencyDescription**	**CompetencyResult**	**Responsible**
GENERAL (It implies full education with possible additional depending on the level of knowledge)				
G1	Communicative	- Fluent monolingual oral, written and communicative skills; - the ability to not fluent communication with a second or more language; - the ability to use communicativecommunication in various situations; - have the basics of academic writing in their native language; - diagnostic test for language level.	A full 4-year training with the development of at least 240 academic loans (of which 129 are contact academic academic loans), with the possible re-crediting of loans in the second language, where students have an advanced level. The language level is determined by passing a diagnostic test.	Departments of Kazakh and Russian, English languages
G2	Mathliteracy	- Basic mathematical thinking at the communicative level;	Full 4-year training with the development of at least 240	DepartmentofMath

		– the ability to solve situational problems on the basis of the mathematical apparatus of algebra and the beginnings of mathematical analysis; - diagnostic test for mathematical literacy in algebra.	academic loans (of which 129 contact classroom academic loans). With a positive diagnostic test, the level is Mathematics 1, with a negative - the level of Algebra and the beginning of the analysis.	
G3	Basic Literacy in Science disciplines	- A basic understanding of the scientific picture of the world with an understanding of the essence of the basic laws of science. - understanding basic hypotheses, laws, methods, formulating conclusions and estimating errors	Full 4-year education with the development of at least 240 academic loans (of which 129 contact classroom academic loans). With a positive diagnostic test, the level is Physics 1, General Chemistry, with a negative - level of the Beginning of Physics and the Basic Fundamentals of Chemistry.	Departments in the areas of natural sciences
SPECIFIC (implies reduced education by transferring loans, depending on the level of knowledge of competencies for graduates of 12-year schools, colleges, universities, including humanitarian and economic areas)				
S1	Communicative	- Fluent bilingual oral, written and communicative skills; - the ability to not fluent communication with a third language; - writing skills of various styles and genres; - skills of deep understanding and interpretation of one's own work of a certain level of complexity (essay); - basic aesthetic and theoretical literacy as a condition for full perception, interpretation of the original text.	Full transfer of loans by language (Kazakh and Russian)	Department of Kazakh and Russian language
S2	Mathliteracy	- Special mathematical thinking using induction and deduction, generalization and concretization, analysis and synthesis, classification and	Transfer of credits in the discipline of Mathematics (Calculus) I	DepartmentofMath

		systematization, abstraction and analogy; - ability to formulate, justify and prove the provisions; - application of general mathematical concepts, formulas and extended spatial perception for mathematical problems; - full understanding of the basics of mathematical analysis.		
S3	Special literacy in natural sciences (Physics, Chemistry, Geology)	- Wide scientific perception of the world, involving a deep understanding of natural phenomena; - critical perception for understanding the scientific phenomena of the world - cognitive abilities to formulate a scientific understanding of the forms of existence of matter, its interaction and manifestations in nature.	Relocation of credits by Physics I, General Chemistry, Introduction to Geology; Training practice, etc.	Departments in the areas of natural sciences
S4	Englishlanguage	- Readiness for further self-study in English in various fields of knowledge; - willingness to gain experience in design and research using the English language.	Transfer of English loans above academic to professional (up to 15 credits)	DepartmentofEnglish language
S5	Computerskills	- Basic programming skills in one modern language; - the use of software and applications for training in various disciplines; -the presence of a global standard certificate of language level.	Transfer of credits by discipline. Introduction to Information and Communication Technologies, Information and Communication Technologies	DepartmentofSoftwareEngineering
S6	Social and humanitarian competencies and	-Understanding and awareness of the responsibility of every citizen for the development of the	Transfer of loans on the modern history of Kazakhstan (with the exception of the state exam)	DepartmentofPublicDisciplines

	behavior	country and the world; - Ability to discuss ethical and moral aspects in society, culture and science.		
		- Critical understanding and ability to polemic for debating on modern scientific hypotheses and theories.	Relocation of loans in philosophy and other humanitarian disciplines.	
PROFESSIONAL (implies reduced training by transferring loans, depending on the level of knowledge of competencies for graduates of colleges, schools, universities, including humanitarian and economic areas)				
P1	Professionalcompetencies	- Critical perception and deep understanding of professional competencies at the level of 4, 5 or 6; - the ability to discuss and debate on professional issues in the framework of the mastered program.	Transfer of credits in basic professional disciplines, including geophysical methods of prospecting and exploration of mineral deposits, earth physics, petrophysics, radiometry, geophysical research of wells, educational and production training	Graduating department
P2	Generalengineeringcompetencies	- Basic engineering skills and knowledge, ability to solve engineering problems and problems; - be able to use application software packages for processing experimental data, solving systems of algebraic and differential equations.	Transfer of credits in general engineering disciplines (well drilling, engineering geology and geophysics, mathematical modeling in geology, geodesy, mechanics, solid state physics, electrical engineering and electronics, hydrodynamics of thermodynamics, etc.).	Graduating department
P3	ComputerEngineeringCompetencies	Basic skills of using computer programs and software systems for solving engineering problems	Relocation of credits in the following disciplines of computer graphics basics AutoCAD, CAE, CorelDraw, Mapinfo, etc.	Graduating department
P4	EngineeringCompetencies	Skills and skills of using technical means, instruments, equipment and devices in solving engineering tasks during field and borehole geophysical work.	Relocation of credits in academic disciplines of experimental direction: in the presence of certificates of a geophysicist, assistant - operator, programmer, etc.	Graduating department

P5	Socio-economiccompetencies	-Critical understanding and cognitive ability to reason on contemporary social and economic issues; - a basic understanding of the economic valuation of objects of study and the profitability of industry projects.	Relocation of loans in socio-humanitarian and technical and economic disciplines to offset the elective cycle	Graduating department

The university may refuse to transfer credits if a low diagnostic level is confirmed or the final grades for completed disciplines were lower than A and B.

4 Requirements for completing studies and obtaining a diploma

The graduate of this educational program is awarded the academic degree: Bachelor of Oil and Gas and Ore Geophysics.

Graduate bachelors must have basic knowledge in the field of geophysical methods of prospecting and exploration of mineral deposits. They should have practical experience on the basis of studying basic and specialized disciplines, methods of solving the set geological and geophysical problems, acquired during all types of practices. They should have the knowledge and skills to conduct analysis of the obtained geological-geophysical and field-geophysical data, the ability to identify existing problems and outline ways to solve them. Graduates should be able to develop engineering projects based on integrated technical and economic calculations.

Bachelors must have communication skills in order to be able to present their submissions, suggestions and recommendations verbally and in writing. The specialist should be able to present graphical information in the form of drawings, tables, slides and drawings. He must be competent in the search and interpretation of technical information using various search engines (patent search, literature review of magazines and books, the Internet).

Bachelors must be socially mobile, be able to adapt to new situations in a professional environment. They must perceive diversity and intercultural difference, appreciate variable approaches to understanding and solving society's problems..

Bachelors should be able to organize cooperation in a team, show creativity and a wide range of interests for solving interdisciplinary problems. They must be tolerant, capable of criticism and self-criticism, be prepared to accept the role of team leader and have the skills of interaction and cooperation. The graduate must have an ethical education and the need for his development through self-improvement and training. throughout life.

Bachelors are required to have a good knowledge of Kazakh, Russian and foreign languages, to be able to work in the international community, to maintain ethical rules in society, at work and in interpersonal communication. They must demonstrate skills in

achieving goals, solving problems in unusual situations; to take care of environmental protection and, raising qualifications, to serve the development of the welfare of the whole society.

Bachelors should have: good communication skills, appreciate the traditions of other cultures, their diversity in modern society, fundamental basic education, economic, social and legal training.

6 Descriptors of the level and volume of knowledge, skills, abilities and competencies

6.1 based on the achievement of training results in the OP "oil And gas and ore Geophysics", the main framework descriptors of training based on the Dublin descriptors were adopted:

a	Knowledge and understanding – by demonstrating knowledge and understanding in the field of study, formed on the basis of secondary education, including certain advanced knowledge in the field of study
в	Application of knowledge and understanding – by applying their knowledge and understanding of actions that indicate a professional approach to the profession through a set of competencies demonstrated through the formation and justification of arguments and solutions to problems in the field of study
c	Expression of judgments and analysis of actions - by accumulating, evaluating, processing and interpreting data, knowledge and skills in order to develop independent judgments, taking into account the analysis of social, ethical and scientific considerations
d	Communication skills and it skills-by transmitting real and virtual information, problems, their solutions, ideas, and their implementations to both specialists and non-specialists in the field of study
e	Self-learning and existential skills - by developing self-learning and retraining skills with a high degree of autonomy in the field of study and related fields.

6.2 on the basis of achieving the results of training in the OP "oil And gas and ore Geophysics", the main framework competencies were adopted:

a	Natural-scientific and theoretical-worldview competences
в	Social, personal and civic competencies
c	Generalengineeringprofessionalcompetencies
d	Communication and IT virtual competencies
e	Specifically-professional competencies, including additional (Minor) ones.

6.3 on the basis of the training descriptors and the main framework competencies, the following framework characteristic of the graduate's competencies was adopted, which guarantees the achievement of a competitive level in the professional activity market (figure).

On the basis of the specified framework of competence of the graduate, teachers of the Department of Geophysics form the results of training, competencies, subcompetitions and a matrix of competencies of the disciplines that are part of the RUP OP "oil And gas and ore Geophysics" (table).

7. Competencies acquired by bachelors during the development of the educational program

Generalculturalcompetencies (GC)	
GC-1	Ability to communicate orally and in writing in the state, Russian and foreign languages to solve problems of interpersonal and intercultural interaction
GC-2	Understanding and practical use of healthy lifestyle norms, including prevention issues, and the ability to use physical culture to optimize performance
GC-3	The ability to analyze the main stages and patterns of historical development of society for the formation of a civil position
GC-4	Ability to use the basics of philosophical knowledge to form a worldview position
GC-5	Ability to critically use the methods of modern science in practice
GC-6	Awareness of the need and acquisition of the ability to independently study and improve their skills throughout their working life
GC-7	Value and understanding of professional ethical standards, knowledge of methods of professional communication
GC-8	Ability to work in a team, tolerant of social, ethnic, religious and cultural differences
GC-9	Ability to use the basics of economic knowledge in various fields of activity
Generalprofessionalcompetence (GPC)	
GPC-1	Ability to independently acquire new knowledge using modern educational and information technologies
GPC-2	Possession of computer skills sufficient for professional activity and knowledge of professional programs
GPC-3	Knowledge of the main methods, methods and means of obtaining, storing, and processing information, and the ability to use modern technical tools and information technologies to solve General professional tasks
GPC-4	Understanding the essence and knowledge of information in the development of modern society, the ability to receive and process information from various sources, the willingness to interpret, structure and design information in a form accessible to others
Professionalcompetence (PC)	
PC 1	Ability to systematically study scientific and technical information, domestic and foreign experience in the geophysical profile of training

PC 2	The ability to integrate applied Geophysics (including gravimagnetization, geoelectrics, seismic, mathematical Geophysics, well logging) and specialized geological and geophysical knowledge (including physical processes occurring in the Earth) to solve problems of Geology and Geophysics.
PC 3	Ability to participate in work on innovative projects using basic research methods. Knowledge of system logical thinking skills when analyzing scientific data and setting practical tasks for geophysical research.
PC 4	Ability to review, analyze and generalize geological and geophysical information to select the main parameters of the field geophysical survey, conduct experimental and methodological work and optimize the methodology of geophysical observations and knowledge of the methodology for conducting field geophysical work in land, sea, air and well variants
PC 5	Ability to independently set specific geophysical tasks and solve them using modern equipment, software and information technologies using the latest domestic and foreign experience
PC 6	The ability to manage research and production activities in solving complex Geophysics problems, at the stages of design, execution (including processing, analysis and interpretation) and preparation of reports to present results, freely and creatively use modern methods of analysis, processing and interpretation of complex geophysical information to solve practical problems.
PC 7	Proficiency in professional operation of modern geophysical field and laboratory equipment (in accordance with professional training); determination of technical and technological parameters of equipment, equipment, materials and preparation of equipment for field work (configuration, verification or testing, preventive maintenance)
PC 8	Skills in conducting field petrophysical studies from preparing equipment, rock samples (minerals) and core material for laboratory petrophysical studies to conducting laboratory measurements of petrophysical parameters of rock samples and core material. Knowledge of the stages of processing and analysis of measurements of petrophysical parameters of rock samples and core material.
PC 9	Ability to carry out metrological measures for the preparation of equipment, tools and installations for measuring the physical parameters of rocks and ores with an acceptable error. Calibration and calibration of ground and well equipment designed for solving petrophysicalproblems.Ability to organize and conduct high-quality interpretation processing for linking and joint geological interpretation of the results of the previous stages of processing well drilling, geophysical and petrophysical data. Organization of processing results processing and transfer them to the customer.
PC 10	Ownership of software packages for computers designed to work with a complex of geological and geophysical data (Petrel, Focus-Geolog, OazisMontaj, Studiorm, etc.).
PC 11	Ability to analyze and apply the laws on subsoil and subsoil use, industrial safety and environmental code, and regularly monitor changes and additions to these laws.
PC 12	Ability to identify and systematize the main ideas in scientific publications; to critically evaluate the effectiveness of various approaches to solving geophysical problems; to formulate an independent view of the proposed problem taking into account the latest domestic and foreign experience and knowledge of the main directions of development and problems of Geophysics, the current level of elaboration of problems and the most promising areas of development.

САТБАЕВ УНИВЕРСИТЕТІ

SATBAYEV UNIVERSITY

APPROVED
Chairman of the Board - Rector
[illegible] K. Satpayev
[illegible] M. M. Begentayev
"24" 12 2021 y.

Duration of training: 4 years

Academic degree: Bachelor of Engineering and Technology

Year of study	Code	Name of disciplines	Cycle	Total amount in credits	Total hours	lec/lab/pr	SIW (including UIW) in hours	Transfer code	prerequisite
1	LNG108	English	O	5	150			S4	Диагност. Тест
	LNG104	Kazakh (Russian) language	O	5	150			S1	Диагност. Тест
	GEO482	General and structural geology	B	5	150				нет
	PHY111	Physics I	B	5	150			S2	Диагност. Тест
	MAT101	Mathematics I	B	5	150			S2	Диагност. Тест
	GEN177	Engineering and computer graphics	B	5	150				нет
	HUM129	Culturology	O	2	60	1/0/0	45		нет
	KFK101	Physical education I	O	2	60	0/0/2	30		нет
		Total:		34		21			
		2nd semester (spring 2022)							
	LNG108	English	O	5	150	0/0/2	105	S4	Диагност. Тест
	LNG104	Kazakh (Russian) language	O	5	150	0/0/2	105	S1	LNG104,1-2
	HUM100	Modern history of Kazakhstan (webinar)	O	5	150	1/0/2	105	S6	нет
	PHY112	Physics II	B	5	150	1/1/1	105		PHY111
	MAT102	Mathematics II	B	5	150	1/0/2	105		MAT101
	HUM128	Political science	O	2	60	1/0/0	45		нет
	CHE495	Chemistry	B	5	150	1/1/1	105		нет
	KFK102	Physical education I	O	2	60	0/0/2	30		нет
		Total:		34		20			
2		3rd semester (autumn 2022)							
	HUM132	Philosophy	O	5	150	1/0/2	105		нет
	MAT103	Mathematics III	B	5	150	1/0/2			MAT102
	HUM122	Pwchology	O	2	60	1/0/0	45		нет
	MNG487	Fundamentals of Entrepreneurship, Leadership and Anti-corruption culture	O	3	90	1/0/1	60		нет
	CHE451	Life safety	O	2	60	1/0/0	45		нет
	GPH183	Fundamental Physics of Earth	B	5	150	2/1/0	105		PHY111
	GEO423	Mineralogy and petrography	B	5	150	2/1/0	105	P1	нет
	GPH130	Geoinformation systems in geology and geophysics	B	5	150	2/1/0	105		нет
	KFK103	Physical education III	O	2	60	0/0/2	30		нет
		Total:		34		23			
		4th semester (spring 2023)							
	CSE677	Information and communication technology	O	5	150	2/1/0	105		GEN101
	HUM127	Sociology	O	2	60	1/0/0	45		нет
	CHE452	Ecology and sustainable development	O	2	60	1/0/0	45		нет
	GPH173	Technogenic geophysics	B	5	150	2/1/0	105		GPH107
	GPH184	Exploration Geophysics	B	5	150	2/0/1	105		GEO116
	GPH185	Petrophysics	B	5	150	2/1/0	105		GEO423
	GPH165	Theory of field	B	5	150	2/1/0	105		GPH107
	GPH148	Fundamentals of nuclear Geophysics	B	5	150	2/1/0	105		GPH107
	KFK104	Physical education IV	O	2	60	0/0/2	30		нет
		Total:		36		22			
3		5th semester (autumn 2023)							
	GPH121	Theoretical basis, registration and processing of seismic data	B	5	150	2/1/0	105		GPH165
	GPH180	Geophysical exploration (well logging) of uranium deposits	B	5	150	2/1/0	105		GPH164
	GPH122	Methods of electric reconnaissance on a constant and alternating electric current	B	5	150	2/1/0	105		GPH132
	GPH167	Fundamental gravity survey	B	5	150	2/1/0	105		GPH165
	GPH174	Theoretical foundations of geophysical data processing	P	5	150	2/1/0	105		GPH165
		Total:		25		18			
		6th semester (spring 2024)							
	GPH182	Modern geophysical technologies for calculating reserves of uranium deposits	B	5	150	2/1/0	105		GPH121
	GPH181	Theoretical bases and applied aspects of well logging	B	5	150	2/1/0	105		GPH164
	GPH187	Methods for interpretation gravitational anomalies and the objects parameters evaluation	P	5	150	2/1/0	105		GPH167
	GPH186	Methods of interpretation of	P	5	150	2/1/0	105		GPH122
	3304	ELECTIVE	P	5	150	2/1/0	105		нет
	GPH189	Magnetometry 1 (physical and geological principles of magnetometry)	P	5	150	2/1/0	105		GPH121
		Total:		30		18			
4	4306	ELECTIVE	P	5	150	2/1/0	105		GPH161
	4307	ELECTIVE	P	5	150	2/1/0	105		GPH107
	4308	ELECTIVE	P	5	150	2/1/0	105		GPH119
		Total:		15		18			
		8th semester (spring 2025)							
	ECA003	Graduate thesis (project) preparation	IA	6					
	ECA103	Graduate thesis (project) defense	IA	6					
	4309	ELECTIVE	P	5	150	2/1/0	105		GPH132
	4310	ELECTIVE	P	5	150	2/1/0	105		GPH130
		Total:		22					

Year of study	Code	Name	Cycle	Credits	Semester
Mandatory types of training with an assessment of P/NP					
1	AAP184	Educational practice	E	2	2
2	AAP166	Industrial internship I	IT	4	4
3-4	AAP1167	Industrial internship II	IT	6	6
Additional types of training					
1	AAP107	Sports club sectional	O	0	5-7
2-3	AAP5001	Military training	O	0	3-6

Cycles of disciplines	Credits: required	additional		Total:
Cycle of general education disciplines (O)	58			58
Cycle of basic disciplines (B)	110	2		112
	20	40		60
Total for theoretical training:	188	42		230
	12			12
TOTAL:	200	42		242

Protocol № 5 from "24" 12 2020

Mining

B.A. Zhautikov

A.K. Syzdykov

7.1 Competence matrix of the educational program 6B07201- " oil And gas and ore Geophysics»

Disciplineindex	NameOfDisciplines	Generalcultural									Generalprofessional					Professional											
		GC-1	GC-2	GC-3	GC-4	GC-5	GC-6	GC-7	GC-8	GC-9	GP-1	GP-2	GP-3	GP-4	GP-5	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9	PC-10	PC-11	PC-12
Requiredcomponent																											
LNG 1051	Beginner (A1)	+				+		+																			
LNG 1052	ElementaryEnglish (A1)	+						+																			
LNG 1053	GeneralEnglish 1 (A2)	+																									
LNG 1054	GeneralEnglish 2 (A2)	+																									
LNG 1055	AcademicEnglish (B1)	+					+	+																			
LNG1056	BusinessEnglish (B2)	+					+	+																			
LNG1012	Казахский (русский) язык (A2)	+						+	+																		
LNG1012.1	Академический казахский (русский) язык (B1)	+					+	+																			
LNG1012.2	Деловой казахский (русский) язык (B2)	+					+	+	+																		
LNG 1057	ProfessionalEnglish (B2+)	+					+	+																			
HUM113	Современная история Казахстана			+					+																		
HUM124	Философия		+		+				+																		
CSE174	Информационно-коммуникационные технологии (англ)										+	+	+	+													
MAT00110	Алгебра и введение в мат. анализ					+							+	+													
PHY110	Введение в физику					+							+														
GEN101	Инженерная и компьютерная графика										+	+	+	+													
LNG108	Английский язык					+							+														
LNG104	Казахский (русский) язык					+				+			+														

Disciplineindex	NameOfDisciplines	Generalcultural									Generalprofessional					Professional											
		GC-1	GC-2	GC-3	GC-4	GC-5	GC-6	GC-7	GC-8	GC-9	GP-1	GP-2	GP-3	GP-4	GP-5	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9	PC-10	PC-11	PC-12
MAT101	Математика I					+				+			+														
MAT102	Математика II					+				+			+														
MAT103	Математика III					+							+														
PHY111	Физика I					+							+														
PHY112	Физика II												+			+	+										
HUM129	Культурология															+											+
GEN177	Инженерная и компьютерная графика															+							+				
HUM100	Современая история Казахстана (гос.экзамен)															+							+				
HUM128	Политология					+							+	+	+												
CHE495	Общая химия					+							+	+	+												
HUM132	Философия																										
HUM122	Психология																										
MNG487	Основы предпринемательства, лидерства и антикоррупционной культуры																										
GPH183	Основы Физики Земли																										
GEO423	Минералогия и петрография																										
GPH130	Геоинформационные системы в геологии и геофизике																										
CSE677	Информационно-коммуникационные технологии (англ)																										
HUM127	Социология																										
CHE452	Экология и устойчивое развитие																										
GPH173	Техногенная геофизика																										
GPH184	Разведочная геофизика																										

Disciplineindex	NameOfDisciplines	Generalcultural									Generalprofessional					Professional											
		GC-1	GC-2	GC-3	GC-4	GC-5	GC-6	GC-7	GC-8	GC-9	GP-1	GP-2	GP-3	GP-4	GP-5	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9	PC-10	PC-11	PC-12
GPH185	Петрофизика																										
GPH165	Теория поля																										
GPH148	Основы ядерной геофизики																										
Professionalcomponent																											
GPH121	Теоретические основы, регистрация и обработка сейсмических данных															+	+						+				
GPH180	Геофизические исследования скважин урановых месторождений															+	+										
GPH122	Методы электроразведки на постоянном и переменном электрическом токе															+				+							+
GPH167	Теоретические основы гравиразведки																+						+			+	
GPH174	Теоретические основы обработки геофизических данных (ТООГИ)																+	+	+			+		+			
GPH182	Современные геофизические технологии при подсчете запасов месторождений урана																+	+	+		+	+		+	+		
GPH181	Теоретические основы и прикладные аспекты ГИС																+	+	+		+	+		+	+		
GPH187	Методы интерпретации гравитационных аномалий и оценки параметров объектов																+		+	+	+	+			+	+	
GPH186	Методы интерпретации электромагнитных полей и применение электроразведки при решении геолого-геофизических задач																+	+	+		+	+		+	+		
GPH189	Магниторазведка 1 (физико-геологические основы магниторазведки)																+	+	+			+		+	+		
Statefinalattestation																											

Disciplineindex	NameOfDisciplines	Generalcultural									Generalprofessional					Professional											
		GC-1	GC-2	GC-3	GC-4	GC-5	GC-6	GC-7	GC-8	GC-9	GP-1	GP-2	GP-3	GP-4	GP-5	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9	PC-10	PC-11	PC-12
ECA003	Writing and defense of the thesis	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
ECA103	Defense of the thesis (project)																										
Additionaltypesoftraining																											
AAP106,118	Физическая культура I,II																										
AAP122,132	Физическая культура III,IV (по выбору)																										
AAP184	Учебная практика																										
AAP166	Производственная практика I																										
AAP1167	Производственная практика II																										
AAP500	Военная подготовка																										
AAP107	Спортклуб секционные																										
Electivedisciplines																											
GPH188	Интерпретация и моделирование по сейсмическим данным	+				+		+	+																		
GPH190	Магниторазведка 2 (обработка и интерпретация данных магниторазведки)	+				+		+	+																		
GPH166	Введение в сейсмологию	+				+		+	+																		
GPH123	Комплексные исследования НГ скважин по данным каротажа и лабораторных анализов керна	+				+		+	+																		
GPH192	Введение в комплексирование геофизических методов															+		+			+		+				
GPH191	Компьютерные технологии при моделировании месторождений твердых полезных ископаемых															+	+		+	+	+					+	+

8. Policy on additional education Minor

When mastering at least 12 credits in the disciplines of the program, including the following compulsory disciplines:

M1 - Crystallography and Mineralogy - 3 credits.

M2 - Petrography - 3 credits.

M3 - Structural Geology - 3 credits.

M4 - General and Historical Geology - 3 credits.

M5– Geology and industrial types of mineral deposits - 3 credits.

Assign an additional specialty Minor in "Applied Geology» with the issuance of an appendix to the diploma of the established sample.

9. ECTS Diploma Supplement

The application is 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 confirmation of an educational certificate. Without a diploma of higher education, it is not valid.

The purpose of filling out the European application is to provide sufficient information about the holder of the diploma, the qualifications obtained by him, the level of this qualification, the content of the training program, the results and functional purpose of the qualification, as well as information about the national education system. The application model, which will be used for the transfer of estimates, uses the European system of transfers or credit transfer (ECTS).

The European Diploma application provides the opportunity to continue their education in foreign universities, as well as to confirm the national higher education for foreign employers. When traveling abroad for professional recognition, additional legalization of a diploma of education will be required. The European Diploma application is completed in English upon individual request and is issued free of charge.

According to the industry qualifications framework for bachelors of geophysicists, geological exploration includes regional and large-scale geophysical and other surveys, various types of prospecting, exploration, hydrogeological and engineering-geological works, the implementation of which is carried out within the framework of the Code of the Republic of Kazakhstan “On Subsoil and Subsoil Use. The Code of the Republic of Kazakhstan from December 27, 2017, No. 125 VI SAMS (as amended by the Law dated 24.05.2018 No. 156)and the Decree of the Government of the Republic of Kazakhstan dated August 13, 2012 No. 1042 “On the Concept for the Development of the Geological Industry of the Republic of Kazakhstan until 2030” .

The technological sequence of work for the realization of this mission involves for companies / organizations conducting geological and geophysical work, preparing materials and equipment for their realization, project, conducting pre-field and field

geophysical work, as well as desk processing and processing of the results of complex and specialized geophysical works, which require involvement of geophysicists at levels 4-6 (geophysicist, petrophysicist, gravity prospector, magnetic prospector, electrical prospector, seismic interpreter, logger, geophysical testing operator, technic-geophysicist).

9.1. Specialist oil and gas and ore geophysics -6 level of the industry qualifications framework (IQF):

Knowledge - a wide range of geophysical (theoretical and practical) knowledge (including innovative). Independent search, analysis and assessment of professional activity.

Skills and abilities - the solution to problems of a technological or methodological character related to geophysics, involving the choice and variety of solutions. Development, implementation, monitoring, evaluation and correction of components of geophysical surveys. Abilities and skills to carry out research and innovative activities to develop new knowledge and procedures for integrating knowledge in various areas and logically formulate your thoughts in written and oral form, apply practical theoretical knowledge in geophysics.

Personal and professional competencies

Independence: participates in geophysical work at all stages and stages of their implementation, is responsible for the collection and processing of primary materials, makes graphic and text reports. Planning activities for the field work of the enterprise.

Responsibility: for the planning and development of business processes that can lead to significant changes or development, responsibility for improving the professionalism of workers.

Difficulty: activities aimed at solving problems involving the choice and variety of solutions

The ways to achieve the qualification of the corresponding sublevel -are higher education, bachelor's degree and practical experience.

Recommended job titles – geophysicist.

9.2 Specialist oil and gas and ore geophysics - level 5 of the industry qualifications framework (IQF):

Knowledge -is a wide range of geophysical (theoretical and practical) knowledge (including innovative). Independent search, analysis and assessment of professional activities.

Skills and abilities - solving practical problems of oil and gas and ore geophysics, involving a variety of solutions and their choice. Creative approach (or abilities and skills to independently develop and put forward various, including alternative, solutions to the problems of geophysics using theoretical and practical knowledge)

Personal and professional competencies

Independence: under the guidance of a specialist or engineer, performs work on the collection of processing of primary materials for field and office work, selects, and processes geophysical data, processes graphic and textual reporting materials. Participates in geophysical research at the stage of preparatory, field work.

Responsibility: for the assessment and improvement of their own work, their own education and training of others.

Difficulty: solving various typical practical geophysical problems requiring an independent analysis of working situations.

Ways to achieve the qualifications of the corresponding sublevel - post-secondary education, practical experience; at least two years of undergraduate studies or three years of mastering special higher education programs, practical experience.

Recommended job titles - geophysicist. Petrophysicist, gravity prospector, magnetic prospector, electrical prospector, seismic interpreter, geophysicist logger.

9.3 Specialist in oil and gas and ore geophysics - Level 4 of the industry qualifications framework (IQF):

Knowledge - professional (practical and theoretical) knowledge for the realization of activities and practical experience gained in the process of professional education and independently.

Skills and abilities - the solution of the typical practical tasks of a wide range of oil and gas and ore geophysics, requiring an independent analysis of the working situation and its predicted changes. The choice of technological ways to carry out activities. Current and final control, assessment and correction of activities

Personal and professional competencies

Independence: under the guidance of a specialist or engineer, performs alignment and reference work, locating, locating project profiles, collecting geological and geophysical information, and conducting laboratory work.

Responsibility: for the results in the implementation of the norm; for their safety and the safety of others; for compliance with environmental requirements.

Difficulty: solving various typical practical geophysical problems requiring an independent analysis of working situations.

Ways to achieve the qualifications of the corresponding sublevel - post-secondary education, practical experience; at least two years of undergraduate studies or three years of mastering special higher education programs, practical experience.

Recommended job titles: geophysicist, logger geophysicist, laboratory assistant in a physical and mechanical testing.

Satbayev Kazakh National Research Technical Uniuversity
Қ.И.СәтбаевatындағыҚазақҰлттықтехникалықуниверситеті

DIPLOMA SUPPLEMENT
 # _____

This Diploma Supplement follows the model developed by the European Commission, Council of Europe and UNESCO/CEPES. The purpose of this supplement is to provide sufficient independent data to improve the international 'transparency' and fair academic and professional recognition of qualifications (diplomas, degrees, certificates, etc.) It is designed to provide a description of the nature, level, context, content and status of the studies that were pursued and successfully completed by the individual named on the original qualification to which this supplement is appended. It should be free of any value - judgements, equivalence statements or suggestions about recognition. Information should be provided in all eight sections. Where information is not provided, a reason should be given.

1	INFORMATION IDENTIFYING THE HOLDER OF THE QUALIFICATION	
1.1	Family Name	
1.2	Given Name	
1.3	Date of Birth (Day/Month/Year)	
1.4	Student Identification Number	
2.	INFORMATION IDENTIFYING QUALIFICATION	
2.1	Title of Qualification and the Title Conferred	Bachelor in Technics and Technology. Level 6
2.2	Major	«Oil and Gas and Ore Geophysics»
2.3	Minor	«AppliedGeology»
2.4	Name and Status of Awarding University in original language	Қ.И.СәтбаевatындағыҚазақҰлттықтехникалықзерттеууниверситеті
2.5	Name and Status of Awarding University in English	Satbayev Kazakh National Research Technical Uniuversity
2.6	Language of Instruction	
3	INFORMATION ON THE LEVEL OF THE QUALIFICATION	
3.1	Level of Qualification	Bachelor’s level/ first-cycle degree of higher education
3.2	Official Length of Program	4 or 3 years
3.3	Access Requirements	
4	INFORMATION ON THE CONTENTS AND RESULTS GAINED	
4.1	Mode of Study	Full-Time
4.2	Program Requirements	129 credits of the Republic of Kazakhstan (240 ECTS credits), including General Studies – 30 (56 ECTS) credits, Basic Engineering Studies – 59 (110 ECTS) credits, Professional Studies – 40 (74 ECTS) credits, Elective Courses – 60 (112 ECTS) credits. Additionally, Practical Trainings – 6 (11 ECTS) credits, a Final Diploma Thesis – 3 (6 ECTS) credits
4.3	Program Details	*Attached in transcript of records*

<table>
<tr><td>4.4</td><td>Grading Scheme</td><td>
<table>
<tr><th>Evaluation</th><th>GPA</th><th>Point %</th><th>Appreciation</th></tr>
<tr><td>A</td><td>4</td><td>95-100</td><td>"Excellence"</td></tr>
<tr><td>A-</td><td>3,67</td><td>90-94</td><td>"Excellence"</td></tr>
<tr><td>B+</td><td>3,33</td><td>85-89</td><td>"Good"</td></tr>
<tr><td>B</td><td>3</td><td>80-84</td><td>"Good"</td></tr>
<tr><td>B-</td><td>2,67</td><td>75-79</td><td>"Good"</td></tr>
<tr><td>C+</td><td>2,33</td><td>70-74</td><td>"Pass"</td></tr>
<tr><td>C</td><td>2</td><td>65-69</td><td>"Pass"</td></tr>
<tr><td>C-</td><td>1,67</td><td>60-64</td><td>"Pass"</td></tr>
<tr><td>D+</td><td>1,33</td><td>55-59</td><td>"Pass"</td></tr>
<tr><td>D</td><td>1</td><td>50-54</td><td>"Pass"</td></tr>
</table>
</td></tr>
<tr><td>5</td><td colspan="2">INFORMATION ON THE FUNCTION OF THE QUALIFICATION</td></tr>
<tr><td>5.1</td><td>Access to Further Study</td><td>Eligible for second-cycle higher education, graduate programs in master</td></tr>
<tr><td>5.2</td><td>Professional Status</td><td>Under legislation of the Republic of Kazakhstan, a person who was taken Bachelor in Technics is qualified for posts or positions in the industrial, public and scientific sectors for which the qualification requirement is a first higher education degree in major study. In some cases, the qualification requirement also includes the completion of studies in certain specified fields of minor study.

The degree is also satisfied and corresponded to the Article 11 of the Directive of the European Parliament on the recognition of professional qualifications under level D of The European Union.</td></tr>
<tr><td>6</td><td colspan="2">ADDITIONAL INFORMATION</td></tr>
<tr><td>6.1</td><td>University Address</td><td>22 Satpayev Street, Almaty, 050013, Kazakhstan
allnt@ntu.kzwww.satbayev.university</td></tr>
<tr><td>6.2</td><td>Further information source</td><td>http://edu.gov.kz/ru</td></tr>
<tr><td>7</td><td colspan="2">CERTIFICATION OF THE SUPPLEMENT</td></tr>
<tr><td>7.1</td><td>Place and Date</td><td>“____’ _____ 201__ Almaty, Kazakhstan</td></tr>
<tr><td>8</td><td colspan="2">INFORMATION ON THE NATIONAL HIGHER EDUCATION SYSTEM</td></tr>
<tr><td colspan="3">The education system of the Republic of Kazakhstan consists of basic secondary education, general upper secondary education, vocational upper secondary education, higher education and graduate education. The basic education consists of a 9-year compulsory school for all children from 6 to 15 years of age.
Post-compulsory education is given by general upper secondary schools for 2 or 3 years and vocational upper-secondary institutions. The general upper secondary school provides a 2- or 3-years, at the end of which the pupil takes the Unite National Test (UNT) examination for 2-year study and the Matriculation examination for 3-year study. Vocational institutions provide 3-year programs, which lead to upper secondary vocational qualifications with further the Complex Test Attestation (CTA).

General eligibility for higher education is given by the UNT for a 4-year study, the Matriculation examination or the upper secondary vocational qualification with gained CTA results for a 3-year higher education.</td></tr>
</table>

Higher education studies are measured in credits. Study courses are qualified according to the workload required. One year of studies is equivalent to 1600 hours of student work on the average and is defined as 36 National credits or 60 ECTS credits. The credit system after recalculation complies fully with the European Credit Transfer and Accumulation System (ECTS).		
8.1	University Degree	The Government Decree on University Degrees (GOSO/2016) defines the compulsory objectives, extent and overall structure of degrees. The universities decide on the detailed contents, curricula, forms of instruction and structure of the degrees they award.
8.2	First-Cycle (Bachelor)	The first-cycle university degree (Bachelor) consists of 99 (184 ECTS) credits for 3 years of full time study or 129 (240 ECTS) credits for 4 years. The degree is called Bachelor in Technics (Техникабакалавры) in all fields of study except Medicine and Architecture. The determined English translation for all the degrees corresponds to Bachelor of Science in the European countries and USA. Studies forwarding to the degree provide the student with: (1) functional knowledge of the fundamentals of the major and minor subjects or corresponding study entities or studies included in the degree program as well as the prerequisites for following study in the field; (2) functional knowledge and experimental skills needed for scientific thinking and the use of scientific methods for research needs; (3) functional knowledge and learning skills needed for studies leading to graduate university degrees and continuous learning; (4) professional skills and capacity for applying the acquired learnings to professional work at the field and beyond; (5) three-lingual language capacity (Kazakh / English / Russian) and communication skills. Studies forwarding to degree include at least General Studies – 30 (56 ECTS) credits, Basic Engineering Studies – 59 (110 ECTS) credits, Professional Studies – 40 (74 ECTS) credits, Elective Courses – 60 (112 ECTS) credits. Additionally, Practical Trainings – 6 (11 ECTS) credits, a Final Diploma Thesis – 3 (6 ECTS) credits.

Math I

CODE- MAT101
CREDIT- 5 (1/0/2/2)
PREREQUISITES-Elementary mathematics-school course / diagnostic test

PURPOSE AND OBJECTIVES OF THE COURSE

The main purpose of the course is to give the future specialist a certain amount of knowledge on the sections of the course "Math-I", necessary for the study of related engineering disciplines. Introduce students to the ideas and concepts of mathematical analysis. The main attention should be paid to the formation of basic knowledge and skills with a high degree of understanding of differential and integral calculus.

Course objective:

acquisition of knowledge necessary for effective use of rapidly developing mathematical methods; acquisition of skills of construction and research of mathematical models; possession of fundamental sections of mathematics necessary for solving research and practical problems in the professional field.

BRIEF DESCRIPTION OF THE COURSE

The course "Math-I" provides a presentation of sections: introduction to analysis, differential and integral calculus

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

The study of this discipline will allow the student to apply the course "Math-I" to solving simple practical problems, to find tools sufficient for their research, and to obtain numerical results in some standard situations.

Math II
CODE- MAT102
CREDIT-5(1/0/2/2)
PREREQUISITES-Math I

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of teaching the course "Math II" is the formation of bachelors ' ideas about modern mathematics as a whole as a logically coherent system of theoretical knowledge.

The objectives of the course-to instill in students solid skills of solving mathematical problems with bringing the solution to a practically acceptable result. Develop primary skills of mathematical research of applied issues and the ability to independently understand the mathematical apparatus contained in the literature related to the specialty of the student.

BRIEF DESCRIPTION OF THE COURSE

The course "Math-II" provides an accessible presentation of the sections: elements of linear algebra and analytical geometry, differential calculus of functions of many variables, multiple integrals. "Math II" is a logical continuation of the course "Math I".

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

The study of this discipline will allow to apply in practice the theoretical knowledge and skills obtained with a high degree of understanding of the sections of the course, to use them at the appropriate level; to translate into mathematical language the simplest problems posed in terms of other subject areas; to acquire new mathematical knowledge, using educational and information technologies; to solve applied problems in the field of professional activity.

Math III (Ordinary differentiation equations)
CODE- MAT103
CREDIT-5 (1/0/2/2)
PREREQUISITES-Math I, Math II

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of teaching the course "Math-III" is the formation of basic knowledge and skills with a high degree of understanding of the sections of the course, helping to analyze and solve theoretical and practical problems.

Objectives of the course: instilling in students the ability to independently study the educational literature, to carry out theoretical, probabilistic and statistical analysis of applied problems; the development of logical thinking and increase the overall level of mathematical culture.

BRIEF DESCRIPTION OF THE COURSE

The course "Math-III" includes sections: series theory, elements of probability theory and mathematical statistics and is a logical continuation of the discipline "Math II".

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

Student need to know:
- the theory of numerical series;
- theory of functional series;
- Fourier series;
- elements of probability theory and mathematical statistics;

must be able:
- to solve problems for all sections of the theory of series;
- find probabilities of events;
- find numerical characteristics of random variables;
- use statistical methods to process experimental data;

Physics I, II

CODE- PHYS111-112
CREDIT-5 (1/1/1/2)
PREREQUISITE-diagnostic test/PHYS110-111

PURPOSE AND OBJECTIVES OF THE COURSE
the main purpose of teaching the course Physics I and Physics II is to form ideas about the modern physical picture of the world and scientific Outlook.

BRIEF DESCRIPTION OF THE COURSE
The disciplines of Physics I and Physics II are the basis of theoretical preparation for engineering and technical activities of graduates of the higher technical school and represent the core of physical knowledge necessary for an engineer operating in the world of physical laws. The course "Physics 1" includes sections: physical basics of mechanics, the structure of matter and thermodynamics, electrostatics and electrodynamics. Discipline "Physics II" is a logical continuation of the study of the discipline "Physics 1", and forms a holistic view of the course of General physics as one of the basic components of General theoretical training of bachelors of engineering and technical profile. Discipline "Physics II" includes sections: magnetism, optics, nanostructures, fundamentals of quantum physics, atomic and nuclear physics.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE
The ability to use knowledge of fundamental laws, theories of classical and modern physics, as well as the use of methods of physical research as the basis of the system of professional activity.

Contemporary History of Kazakhstan

CODE- HUM100
CREDIT-5 (1/0/2/2)
PREREQUISITES – no

PURPOSE AND OBJECTIVES OF THE COURSE

The aim of the course is to familiarize students of technical specialties with the main theoretical and practical achievements of national historical science on the problems of history of modern Kazakhstan, a comprehensive and systematic study of the main stages of formation and development of Kazakhstan society.

- to analyze the features and contradictions of the history of Kazakhstan in the Soviet period;
- to reveal the historical content of the foundations of the laws of political, socio-economic, cultural processes at the stages of formation of an independent state;
- to contribute to the formation of civil position of students;
- to educate students in the spirit of patriotism and tolerance, belonging to the people, the Fatherland.

BRIEF DESCRIPTION OF THE COURSE

The course Modern history of Kazakhstan is an independent discipline and covers the period from the beginning of the twentieth century to the present day. The modern history of Kazakhstan studies the national liberation movement of the Kazakh intelligentsia at the beginning of the XX century, the period of creation of the Kazakh ASSR, as well as the process of formation of a multinational society.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

- knowledge of events, facts and phenomena Of modern history of Kazakhstan;
- knowledge of the history of ethnic groups inhabiting Kazakhstan;
- knowledge of the main stages of formation of the Kazakh statehood;
- ability to analyze complex historical events and predict their further development;
- ability to work with all kinds of historical sources;
- ability to write essays and scientific articles on the history of the Fatherland;
- ability to operate with historical concepts;
- ability to conduct a discussion;
- skills of independent analysis of historical facts, events and phenomena;
- public speaking skills.

English

Code – LNG108
Credit – 5 (0/0/3/2)
Prerequisite – diagnostic test/LNG1051-1056

LNG1051
GOAL AND OBJECTIVES OF THE COURSE

The discipline in English "Beginner English" is intended primarily for learning from scratch. This course is also suitable for those who have only general basic knowledge of the language. After passing this level, the student will be able to confidently communicate on basic topics in English, learn the basics of grammar and lay a certain foundation that will improve his skills at the next stage of learning English.

Post requisites of the course: Elementary English.

LNG1052
GOAL AND OBJECTIVES OF THE COURSE

The discipline "Elementary English" is the foundation for learning English, which is aimed at developing the receptive skills of students (reading and listening) and productive skills (writing and speaking), the analysis of basic knowledge, the use and memorization of basic grammar rules and the development of pronunciation and elementary vocabulary as well as encouraging self-study and critical thinking.

Prerequisites for the course: Beginner.

Post requisites of the course: General 1.

LNG1053
GOAL AND OBJECTIVES OF THE COURSE

The goal of the "General English 1" course is to provide students with the opportunity to gain sufficient knowledge to become more free in everyday social and academic conditions. Students work on improving pronunciation, expanding vocabulary, and grammar. At this level, the main task will be to consolidate the skills acquired earlier, to learn how to compose and correctly apply complex syntactic constructions in the English language, and also to achieve a really good pronunciation.

Prerequisites for the course: Elementary English.

Post requisites of the course: General 2.

LNG1054
GOAL AND OBJECTIVES OF THE COURSE

The General English 2 course is designed for students who continue to study General English 1. The course is focused on the ability to actively use in practice most

aspects of the English language, conditional sentences, passive phrases, etc. At this stage, the student will be able

PURPOSE AND OBJECTIVES OF THE COURSE

The English language discipline "Beginner English" is designed primarily for learning from scratch. This course is also suitable for those who have only general elementary knowledge of the language. After passing this level, the student will be able to confidently communicate on basic topics in English, learn the basics of grammar and lay a certain foundation that will allow them to improve their skills at the next stage of learning English.

Post-requirements of the course: Elementary English.

LNG1081

PURPOSE AND OBJECTIVES OF THE COURSE

The discipline "Elementary English 1" is the foundation of learning English, which is aimed at developing students' receptive skills (reading and listening) and productive skills (writing and speaking), analyzing basic knowledge, using and memorizing the main grammatical rules and mastering the features of pronunciation and elementary vocabulary, as well as encouraging independent learning and critical thinking.

Course prerequisites: Beginner.

Post-requirements of the course: General 1.

LNG1082

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of the course "Elementary English 2" The course develops students' receptive (reading and listening) and productive skills (writing and speaking), presents basic grammar and vocabulary, while encouraging independent learning and creative thinking skills. The course also focuses on completing tasks using simple texts, as well as creating short paragraphs, monologues and dialogues on various everyday topics.Course prerequisites: Elementary English.

Post-requirements of the course: General 2.

LNG1083

PURPOSE AND OBJECTIVES OF THE COURSE

The course "General English 1" focuses on communication skills with a curriculum that focuses on the development of all four language aspects - listening, speaking, reading and writing, focusing on independent learning and creative and critical thinking skills. The course is aimed at further development of language skills and strategies in reading, writing, listening and speaking to improve communicative competencies and prepare students for the transition to the next level.

Specific objectives of the course:

1. The ability to output for

2. Information about the main ideas and supporting details of various written and oral texts of the CEFR A2 level.

2. The ability to conduct a conversation using appropriate grammatical structures and an active vocabulary (glossary, lexical minimum -400 words, including technical terminology).

3. Writing various types of text in the form of a logical and structured paragraph in the volume of 130-150 words.

4. Possession of a number of grammatical structures with minor inconsistencies.

LNG1084

PURPOSE AND OBJECTIVES OF THE COURSE

The course "General English 2" is intended for students who continue to study "General English 1". The course focuses on the ability to actively use in practice most aspects of the tenses of the English language, conditional sentences, phrases in the passive voice, etc. At this stage, the student will be able to maintain a conversation with several interlocutors or express his point of view. The student significantly expands his vocabulary, which will allow him to freely express his thoughts in any situation. At the same time, the speech will be replenished with various synonyms and antonyms of already familiar words, phrasal verbs and stable expressions.

Course prerequisites: General 1. Course

prerequisites: Academic English

LNG1085

QËLLIMI DHE OBJEKTIVAT E KURSIT

Qëllimi kryesor i kursit të gjuhës angleze" anglishtja Akademike " është zhvillimi i aftësive gjuhësore akademike. Disiplina është një stil gjuhësor që përdoret kur shkruhet

punime akademike (paragraf ,abstrakt, ese, prezantim, etj.) Ky kurs është krijuar për të ndihmuar studentët të bëhen më të suksesshëm dhe efektivë në studimet e tyre, duke zhvilluar aftësi të të menduarit kritik dhe të mësuarit e pavarur.

Parakushtet e kursit: Të Përgjithshme 2.

Post-kërkesat e kursit: anglisht Profesionale.

LNG1086

PURPOSE AND OBJECTIVES OF THE COURSE

"Business English" is the English language for business communication, business and career. Knowledge of business English is useful for conducting negotiations and business correspondence, preparing presentations and informal communication with business partners.

The specifics of the training are that it is necessary not only to master vocabulary, but also to master new skills: presentation, communication, language, professional.

Course prerequisites: IELTS score 5.0 and/or Academic English

Post-requirements of the course: Professional English, IELTS score 5.5-6.0

LNG1087

PURPOSE AND OBJECTIVES OF THE COURSE

The "Professional English" course is designed for students of the B2+ level, the purpose of which is to increase the language competence of students in the relevant professional fields. The main purpose of the course is to teach students how to work with texts, both audio and written, in their specialty. The curriculum is based on the necessary vocabulary (words and terms), often used in English for special purposes. Students will acquire professional English language skills through integrated content- and language-based learning, master vocabulary in order to read and understand original sources with a high degree of independence, and practice various communication models and vocabulary in specific professional situations.

Course prerequisites: Business English.

Post-requirements of the course: any elective course.

Kazakh/Russian language

CODE – Kazakh language(A1)- LNG104.1;
Russian language(A1) - LNG104.2
CREDIT – 5 (0/0/3/2)
PREREQUISITE – diagnostic test

GOAL AND OBJECTIVES OF THE COURSE

Providing a language of initial training for a person who is able to build communication in colloquially significant situations, including:

- To teach students to listen to statements on well-known topics related to home, study, free time;
- understand texts on personal and professional topics containing the most frequent words and phrases;
- be able to conduct a conversation on everyday topics; describe your experiences; tell your opinion; retell and evaluate the content of the book you've read, the movie you've seen;
- Be able to create simple texts on known topics, including those related to professional activities.

SHORT DESCRIPTION OF THE COURSE

- Alphabet, sounds and letters, phonetic and intonational means of the language, basic word-building, morphological and syntactic units and conditions for their use;
- requirements for the level of proficiency in such types of speech activities as listening, reading, writing and speaking are presented;
- Topical topics, situations, tasks and main ways of their implementation for a given level;
- a lexical minimum is presented, the assimilation of which is necessary for adequate communication in current communication situations.

Thus, the language material of the course is selected so that the student studying the Kazakh / Russian language acquires reading, writing and understanding of sounding speech based on the simultaneous mastery of the basics of grammar (phonetics, morphology and syntax) and word usage during constant repeated repetition with the gradual complication of tasks .

The main emphasis of training is shifted from the process of transferring knowledge to teaching the ability to use the studied language in the course of the implementation of various types of speech activity, such as reading (assuming reading comprehension), listening (under the same condition) and producing texts of a certain complexity with a certain degree of grammatical and lexical correctness.

Wherein, assimilating the lexical and grammatical minimum, the student has the opportunity to get acquainted with typical communicative situations and he himself

found himself in such situations, was able to correctly evaluate them and choose the appropriate model (strategy) of speech behavior.

KNOWLEDGE, SKILLS, SKILLS FOR COMPLETION OF THE COURSE

The student, subject to the active organization of work in the classroom and conscientious fulfillment of homework at the end of the first semester, acquires skills corresponding to the pan-European level A2 (Threshold according to ALTE classification), that is, he is on the verge of independent language proficiency.

Engineering and computer graphics
CODE - GEN177
CREDIT -5 (1/0/2/2)

Discipline is a mandatory component. The course develops the following skills among students: to depict all possible combinations of geometric shapes on a plane, to carry out research and their measurements, allowing for image transformations; to create technical drawings, which are the main and reliable means of information that provides communication between the designer and the designer, technologist, builder. Introduces students to the basics of automated preparation of the graphic part of design documents in the AutoCAD environment.

HUM129 Cultural Studies
CODE - GEN177
CREDIT -2(1/0/0/)

The discipline "Cultural Studies" is designed to familiarize students with the cultural achievements of mankind, to understand and assimilate the basic forms and universal laws of the formation and development of culture, to develop their aspirations and skills to independently comprehend the wealth of values of world culture for self-improvement and professional growth. The course of cultural studies examines the general problems of the theory of culture, the leading cultural concepts, universal patterns and mechanisms of formation and development of culture, the main historical stages of the formation and development of Kazakh culture, its most important achievements.

Political Science
CODE - HUM129
CREDIT -2(1/0/0/)

The purpose of the discipline "Political Science" is to form students' systematic knowledge about the political sphere of public life, a consistent and comprehensive study of the origins and evolution of the political thought of the Kazakh people at a long stage of its historical development on the materials of its richest spiritual culture, political heritage and its most prominent representatives.

Objectives of the discipline: to determine the place of the system approach in the methodology of the study of politics and the regime of government; to reveal its specifics; to analyze the main provisions of the theory of systems and the theory of the political system; to form scientific ideas about the structure, principles, functions of the political system, the mechanism of its functioning; to identify factors contributing to the legitimacy, stability, adaptation of the political system; to study modern models of political systems; to analyze the main types of political regime, their varieties; to form the ability to analyze the features of the development of the political system and the

political life of peoples and states, the Republic of Kazakhstan, their transition to democracy.

General chemistry
CODE - CHE495
CREDIT -5 (1/1/1/2)

Basic concepts and laws of chemistry; fundamental laws of chemical thermodynamics and kinetics; quantum mechanical theory of atomic structure and chemical bonding. Solutions and their types, redox processes, coordination compounds: formation, stability and properties. The structure of matter and the chemistry of elements.

Psychology
CODE - HUM122
CREDIT -2 (1/0/0)

The course is devoted to the study of fundamental concepts in the field of general psychology. The general idea of psychology as a science, methodology and methods of psychology are considered. The discipline contributes to the formation of a holistic view of a person's personal characteristics as a factor of success in mastering and implementing their educational and professional activities, the ability to make decisions more effectively based on knowledge of the psychological nature of a person and society.

The possibility of using the studied methods in the future professional activity of students is considered. The object of the discipline is the mental processes, properties and states of a person in various fields of human activity, interpersonal and social interactions, ways and forms of their organization and changes under external influence.

During the course, students acquire theoretical knowledge, practical skills and skills, forming their professional orientation from the perspective of psychological aspects.

Fundamentals of Entrepreneurship, leadership, and Anti-corruption culture
CODE - MNG487
CREDIT -3 (1/0/1/1)

The purpose of the discipline is to gain practical skills in entrepreneurial activity, familiarization with the theories and types of leadership, and understanding the basics of anti-corruption culture. Students will study the theory and practice of entrepreneurship as a system of economic, organizational and legal relations of business structures. They will develop their leadership and teamwork skills. They will also study the causes of corruption and methods to combat it.

Life safety
CODE – CHE451
CREDIT –2 (1/0/0/1)

The purpose of the discipline "Life safety" is to form students' ability to recognize and evaluate negative factors of the human environment, to determine the consequences for humans of harmful and damaging factors, to implement reliable ways to protect against them, to choose the optimal solution and correct behavior, safety and preservation of life in emergency situations of natural, man-made and social nature.

Mineralogy and petrography
CODE – GEO423
CREDIT –5 (2/1/0/2)

The course studies the basic concepts and laws of crystallography; classification of crystals based on their symmetry; geometric crystallography, which studies the external and internal structure of crystals; crystal chemistry or structural chemistry; crystal physics. Also, the influence of the structure on the external shape and physical properties of crystals, the main motives for the construction of structures; the conditions of origin and location of minerals in nature; the main groups of minerals, their composition, physical properties and practical application, the processes of mineral formation and their corresponding mineral paragenesis; the basic laws of crystal structure, physical properties and conditions of crystal formation.

Geoinformation systems in geology and geophysics
CODE – GPH130
CREDIT –5 (2/1/0/2)

The purpose of the course is to familiarize students with the existing PR, teaching the typical structure of modern PR and its functionality. As a result of this course, students will be able to use the basic elements of the PR structure, databases used in the VOP; Be able to design information systems using the PR technology, learn how to work with the PR using the example of the ArcGIS package.

Information and communication technologies (Eng)
CODE – CSE677
CREDIT –5 (2/1/0/2)

Required component. The task of studying the discipline is to acquire theoretical knowledge about information processes, about new information technologies, local and global computer networks, methods of information protection; to acquire skills in using

text editors and tabular processors; to create databases and various categories of application programs.

Sociology
КОД – CSE677
КРЕДИТ –2(1/0/0/1)

The main purpose of the course "Sociology" is to form students' understanding of sociology as an academic and applied discipline - mastering the system of basic sociological concepts, mastering the basic methods of empirical sociology, familiarization with the application of sociological approaches to the study of social phenomena and processes.

The study of the basics of sociology plays an important role from the point of view of personal development and socialization, helps students to scientifically comprehend complex phenomena and processes of social life, their essence, content, dynamics of development, as well as to understand existing sociological theories that explain these social phenomena and processes and reveal the mechanisms of their research.

Экология и усточивое развитие
КОД – CHE452
КРЕДИТ –2(1/0/0/1)

The aim of the course is to form an idea of the basic laws of sustainable development of nature and society. The course examines the ecology of individuals, populations and communities, biogeocenosis. Ecosystem. The biosphere and its stability. Principles of sustainable development. Modern global and topical environmental problems of Kazakhstan and ways to solve them. The best available technologies as effective ways of sustainable development. Overview of advanced domestic industries, ways and means of protecting the environment from the negative impact of human production activities.

Radiometry and nuclear geophysics
КОД – GPH109
КРЕДИТ –5 (2/1/0/2)

The course is designed to study the physical foundations of traditional methods of nuclear geophysics (field and laboratory) for use in geological and geophysical research to solve geological and in the search for mineral deposits. The sections of the course include ideas about the fundamentals of nuclear and geophysical methods, the structure of nuclei, radioactive transformations, ionizing radiation, their excitation and measurement. Special attention is paid to the types of nuclear geophysical equipment

and work with it, the methodology of methods and techniques for interpreting the results of nuclear geophysical research.

Geophysical studies of wells of uranium deposits
КОД – GPH180
КРЕДИТ –5 (2/1/0/2)

This discipline forms knowledge about the physical nature and scope of the methods of geophysical well surveys (GIS) in the search and exploration of uranium deposits. Highlights the role of GIS in solving geological problems – lithological and stratigraphic dismemberment of well sections, isolation of uranium deposits and determination of their physical properties and inter-well correlation. Describes the geochemical and nuclear-physical properties of uranium, petrophysical models of uranium deposits of the main industrial types, geophysical methods of research in wells during exploration and development of uranium deposits by the method of underground borehole leaching.

Modern geophysical technologies in the calculation of reserves of uranium deposits
КОД – GPH182
КРЕДИТ –5 (2/1/0/2)

This discipline instills skills in the use of personal computers and software technologiesin the processing of GIS data and the possibility of using GIS results in the development and extraction of uranium by underground borehole leaching.

The discipline highlights the general methodological provisions of the calculation of reserves of ore deposits and the specifics of the calculation of reserves of uranium deposits, the features of the selection of conditioned indicators, the principles of delineation of ore deposits, the calculation of average parameters.

Introduction to Seismology
КОД – GPH166
КРЕДИТ –5 (2/1/0/2)

The course examines the physical concepts underlying modern structural and focal seismology: the theory of elasticity with an application to the theory of waves, rheology and the fundamentals of the theory of destruction of materials. The sections of the discipline include: modern methods of describing the mechanical properties of materials, techniques for solving dynamic problems of mechanics of elastic-viscous media, ideas about the physics of fracture and strength theory of heterogeneous materials, elements of tensor analysis, deformations and stresses in a continuous medium, equations of motion, elasticity, equations of motion of an elastic medium, elastic waves, elementary rheological bodies, linear rheological bodies, the nature of viscosity of solids, fundamentals of physics of strength and fracture of materials.

Comprehensive studies of NG wells based on logging and laboratory core analysis
КОД – GPH123

КРЕДИТ –5 (2/1/0/2)

Course Description: 3.1 The course is intended for students of the following OP: 6B07201 Oil and gas and ore Geophysics

3.2 Upon completion of the course, the student must demonstrate the ability to ... basic skills for analyzing the results of interpretation of logging data, skills for monitoring the technical condition of wells and the development of oil and gas fields.

3.3 The student should be able to: use the acquired information on the interpretation of GIS data on the recognition of the lithological composition of rocks; perform qualitative and quantitative interpretation of GIS materials; use information on the determination of filtration-capacitance properties based on laboratory core analyses, apply in practice algorithms for geological processing and interpretation of GIS data.

3.3 The student should know: the physical basics of borehole observation methods, algorithms for geological processing and interpretation of GIS data for the geological study of well sections, basic information about the physical and petrographic properties of rocks, GIS methods, basic information on monitoring the technical condition of wells and the development of oil and gas fields. Compile and execute scientific, technical and service documentation, data collection techniques;

Introduction to the integration of geophysical methods

КОД – GPH192

КРЕДИТ –5 (2/1/0/2)

Course Description: 3.1 The course is intended for students of the following OP: 6B07201 Oil and gas and ore Geophysics

3.2 Upon completion of the course, the student must demonstrate the ability to ... basic skills for analyzing the results of interpretation of logging data, skills for monitoring the technical condition of wells and the development of oil and gas fields.

3.3 The student should be able to: use the acquired information on the interpretation of GIS data on the recognition of the lithological composition of rocks; perform qualitative and quantitative interpretation of GIS materials; use information on the determination of filtration-capacitance properties based on laboratory core analyses, apply in practice algorithms for geological processing and interpretation of GIS data.

3.3 The student should know: the physical basics of borehole observation methods, algorithms for geological processing and interpretation of GIS data for the geological study of well sections, basic information about the physical and petrographic properties of rocks, GIS methods, basic information on monitoring the technical condition of wells and the development of oil and gas fields. Compile and execute scientific, technical and service documentation, data collection techniques;

General and Structural geology

CODE – GEO482
CREDIT– 5 (2/1/0/2)
PREREQUISITE– NO

COURSE OBJECTIVE

The purpose of the course: familiarization and understanding by students of the theoretical foundations of history and the patterns of development of the earth's crust, from the oldest stages to the modern era. Application of basic methods for determining the age, conditions of formation and sequence of bedding of rocks. As a result of studying the course, students are able to analyze various geological phenomena.

COURSE OBJECTIVES

- gaining knowledge about the internal structure of the Earth,
- geological activity of the main factors of its external and internal dynamics,
- forms of occurrence of rocks,
- tectonic movements and methods of their study,
- types of structures of the tectonic and lithosphere,
- the history of the development of the universe.

SHORT DESCRIPTION OF THE COURSE

The course "General and Historical Geology" examines the structure of the Earth and the earth's crust; material (chemical, mineral and petrographic) composition of the earth's crust; the main structural elements of the earth's crust with characteristic rock complexes; the main results of the most important endogenous and exogenous geological processes and their role in the formation of the earth's crust; forms of occurrence of rocks in the earth's crust, types of tectonic disturbances; the general course of development of life on Earth, aeons, eras and periods, geochronological (stratigraphic) scales, methods for their depiction on geological maps and sections, their general characteristics and sequence of manifestations in the history of the geological development of the Earth, the main stages of the history of the geological development of the earth.

KNOWLEDGE, SKILLS, SKILLS FOR COMPLETION OF THE COURSE

As a result of mastering the discipline, students should

1) **know**:

- internal structure of the Earth,
- geological activity of the main factors of its external and internal dynamics,
- forms of occurrence of rocks, tectonic movements and methods for their study,
- types of structures of the tectonic and lithosphere,
- The history of the development of the universe.

2) **be able to**:
- restore the history of the inorganic and organic nature of the Earth.
- determine the nature of the origin of the rock.

3) **own skills**:
–Construction of geological maps of simple structure;
–Definition of the most common minerals and rocks;
– works with a mountain compass and reading simple geological maps.

Минералогия и петрография
CODE – GEO423
CREDIT – 3 (2/1/0/2)
PREREQUISITE – GEO115 General geology

COURSE OBJECTIVE

Course objective: Students gaining knowledge on the main theoretical and applied issues of crystallography and mineralogy, which is the fundamental geological discipline that underlies the study of rocks, ore and non-metallic minerals, processes that occur in the earth's crust, as well as in space bodies

COURSE OBJECTIVES

- mastering the fundamentals of crystallography, which is closely connected with industry, the development of which requires specialists in-depth knowledge in the field of crystallography;
- the acquisition of skills in determining the elements of symmetry in crystalline polyhedra, in recognizing simple forms that are found in nature;
- knowledge of the methods of visual diagnosis of common minerals;
- gaining knowledge on the diagnosis of minerals by morphological features;
- the ability to use paragenetic associations of minerals for the diagnosis of minerals;
- gaining knowledge on the conditions for the formation of major minerals.

SHORT DESCRIPTION OF THE COURSE

The course "Crystallography and Mineralogy" studies the basic concepts and laws of crystallography; classification of crystals based on their symmetry; geometric crystallography, which studies the external and internal structure of crystals; crystal chemistry or structural chemistry; crystallophysics. He understands the influence of the structure on the external form and physical properties of crystals, the main motives for constructing structures are wire-frame, sheet, ribbon, chain, with isolated groups of atoms; conditions of origin and location of minerals in nature; the main groups of minerals, their composition, physical properties and practical application, mineral formation processes and the corresponding mineral paragenesis; basic laws of the crystal structure, external forms, chemical composition, physical properties and conditions for the formation of crystals in the relationship.

As a result of mastering the discipline, students should

1) know:

- the history of crystallography and mineralogy as a science, the relationship with other exact and natural sciences, the main modern problems and development prospects, the basic laws of crystallography;

- the state of aggregation of a mineral as a solid, the concept of a crystal and crystalline substance, their basic properties;
- symmetry and classification of crystals;
- common simple forms of crystals, their parameters and indices, combinations of simple forms;
- the fundamentals of the theory of crystal growth, factors affecting crystal growth, the shape of real crystals;
- general theoretical concepts of the basics of mineralogy, determination of the mineral and its chemical composition, physical properties4
- geological processes of mineral formation, basic terms and definitions;
- principles of classification of minerals.

2) be able to:

- identify the natural crystal of the mineral, its genetic affiliation;
- apply the methods of visual diagnosis of the mineral, determine the common ore and rock-forming minerals in the samples;
- to analyze the paragenetic association of the mineral and reconstruct the chemistry of the environment of mineral formation.

3) own skills:

- methods for determining the symmetry of crystals, their crystallographic classification, parameters and indices of simple forms;
- methods of visual diagnosis of minerals, analysis of paragenetic associations;
- methods for diagnosing minerals, including the determination of their crystallomorphological, physical properties, analysis of mineral associations and the chemistry of the environment of mineral formation.

Fundamentals of Earth Physics
КОД–GPH183

КРЕДИТ – 5 (2/1/0/2)
ПРЕРЕКВИЗИТ –

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of the discipline "Physics of the Earth" is the formation of modern ideas about the physical processes occurring in the bowels of the Earth, its structure, evolution and methods of study.

The objectives of the discipline are to acquire the necessary skills, apply the acquired knowledge to solve scientific and practical problems of geophysics.

BRIEF DESCRIPTION OF THE COURSE

The questions of the origin and development of the Earth are considered, explanations of solar-terrestrial and lunar-terrestrial relations are given. The main sections of the physics of the Earth are considered in detail: modern ideas about the internal structure of the Earth and the physical properties of matter inside the Earth, large elements of the Earth's crust and questions of the movement of continents. The features of the structure and structure of the physical fields of the Earth (magnetic, electric, gravitational, thermal, radiation, seismic) are consistently described. Much attention is paid to the study of seismicity, the causes of earthquakes, the dangers associated with them and the possibilities of seismic earthquake prediction.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

The student must:

Know: The

theory of the origin of the Earth and the Solar System. Modern ideas about the internal structure of the Earth, physical properties of substances inside the Earth, large structural elements, questions of the movement of continents. To know the physical basis of the emergence of gravitational, electromagnetic, thermal and radioactive fields of the Earth.

Be able to: use the knowledge gained during the study of the discipline, when performing geophysical work to solve practical and scientific and technical problems of the geology of prospecting and exploration of mineral deposits.

Possess: methods of studying the physical fields of the Earth and planets, as well as the interpretation of data obtained during field work.

Computer technologies for modeling solid mineral deposits

КОД– GPH191

КРЕДИТ – 5 (2/1/0/2)

ПРЕРЕКВИЗИТЫ – MAT102, PHY112, GEO177

OBJECTIVES OF THE DISCIPLINE.

The purpose of studying the discipline is to master the modern methodology of constructing and using geoinformation systems in geophysics, which are the main tool for the synthesis and generalization of geological and geophysical information obtained by various methods, with the help of which the resulting geological information is formed in a convenient way for further decision-making.

TASKS OF THE DISCIPLINE

The objectives of the discipline are the formation of students' knowledge about the basics of architecture, the elements of the device controlling a personal computer (PC), the principles of their organization, existing methods of software, hardware organization of the PC interface and control and measuring geophysical equipment, theoretical foundations, methodological techniques of geoinformation technologies, experience in the formation and application of geophysical information systems in the search and exploration of minerals.

BRIEF DESCRIPTION OF THE COURSE

This course examines the issues of automated problem solving of geophysical methods of prospecting and exploration of minerals, the use of computer technologies at the stage of registration, processing and interpretation of geophysical data. The discipline belongs to the basic part of the professional cycle. To study the course, you need to have knowledge: obtained in physics, mathematics, and geology courses.

With the help of acquired new knowledge and skills of using them in practice, the student will master:

- the main methods, methods and means of obtaining, storing, processing information, having data processing skills and working with a computer as a means of information management;

-modern automation technologies for the design of systems and their maintenance in geophysics;

-the ability to find, analyze and process information using modern information technologies;

-the ability to develop algorithms of programs that implement the transformation of geological and geophysical information at various stages of geological exploration;

-the ability to carry out mathematical modeling and research of geophysical processes and objects with specialized geophysical information systems, including standard software packages ;

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

As a result of mastering the discipline , the student must

To know:

- about the achievements of modern computer technologies;

- basic methods, methods and means of obtaining, storing, processing information, having data processing skills and working with a computer as a means of managing research information;

- properties of information and the basics of its processing;

- GIS functions, possibilities of their integration with other technologies and methods of practical application in various fields of geophysics;

Be able to:

- work with basic geoinformation packages, be able to use them correctly when solving spatial problems;

-to search, process, collect and store data;

-install, test, test and use software components of information systems;

-to ensure the protection and safety of information.

Own:

- methods of searching and processing information both manually and with the use of modern information technologies.

- personal computer skills and application of knowledge in professional activities;

-skills of working with the main professional GIS packages, technologies and features of GIS application in various branches of geophysics, the possibilities of adapting new technologies and methods to the GIS environment.

Field theory

КОД– GPH165

КРЕДИТ – 5 (2/1/0/2)

ПРЕРЕКВИЗИТЫ – MAT102, PHY112

PURPOSE OF THE COURSE

The aim of the course is to generalize the physical laws and mathematical equations representing them, which determine the theory of fields used in exploration geophysics (gravitational, magnetic, electromagnetic) and are the basis of the theory of methods of exploration geophysics. When studying the discipline, the unity of the physical and mathematical theory of fields of different nature is considered. "Field theory" is a link between general theoretical disciplines (physics, mathematics) and special geophysical disciplines.

COURSE OBJECTIVES

The task of studying the discipline is determined by the need for students to master the basic mathematical laws describing the behavior of static, stationary and time-varying fields of various nature, as well as the development by students of some methods for solving direct problems of geophysics.

BRIEF DESCRIPTION OF THE COURSE

The course studies the basic laws of propagation of electromagnetic, thermal, radiation and acoustic fields in various media and their mathematical description, discusses the basic concepts of field theory, studies the theoretical foundations of gravitational, electric, electromagnetic fields, as well as elastic stresses and deformations in a solid. The sections of the discipline are devoted to the main processes of propagation of fields in the medium and their interaction with matter, as well as the mathematical description of these processes. The basic laws and relations of the theory of physical fields are studied.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Students enrolled in this course should know the basics of mathematical analysis, linear algebra, general physics course, differential equations, theory of functions of a complex variable.

As a result of mastering the discipline , the following professional competencies of the student are formed:

- has an idea of the modern scientific picture of the world based on knowledge of the basic provisions of philosophy, basic laws and methods of natural sciences (PC-1);
- is able to use basic knowledge of natural sciences, mathematics, computer science, geological sciences in professional activities.

Petrophysics
CODE- GPH 185
CREDIT - 5 (2/1/0/2)
PREREQUISITES - MAT102, PHY112, GE0113

COURSE OBJECTIVES

The purpose of the course is an in-depth study of the basic physical properties of rocks, methods of their measurement, internal relationships, patterns of their change under the influence of various geological conditions and applied significance in the interpretation of GIS data.

COURSE OBJECTIVE

To acquaint students with the causes and laws of changes in petrophysical quantities by well sections; with laboratory methods for determining petrophysical quantities; with the main physical and physico-chemical processes occurring in rocks, petrophysical quantities (coefficients of porosity, permeability, water, gas, oil saturation, electrical conductivity, radioactivity, etc.); with methods for constructing the basic petrophysical connections necessary to determine the reservoir properties of rocks to justify a rational complex solution of the geological task.

BRIEF DESCRIPTION OF THE COURSE

The course is designed for in-depth study of the physical and mechanical properties of rocks. Petrophysical quantities (density, porosity and permeability coefficients, electrical conductivity, magnetization, radioactivity, etc.) are considered. The dependences of petrophysical characteristics on the main physical processes in rocks, conditions of formation and occurrence of geological objects are studied. The issues of interrelation of reservoir, magnetic, electrical, elastic, thermal, nuclear-physical properties, the role of petrophysical parameters in the interpretation of geophysical data in solving geological problems are considered.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

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

To know:

- basic physical properties of rocks, their units of measurement; physico-chemical processes occurring in rocks and

determining the nature and numerical values of their properties;

- methods for determining the physical properties of rocks;

- the influence of the composition, structure and texture of rocks on their physical properties;

Be able to:

- determine the physical properties of rocks;

- to study the distribution of values of physical properties of rocks,

- give an estimate of the parameters of these distributions;

- describe the relationship of the physical properties of rocks with each other and with the values measured during geophysical studies of wells.

- analyze the relationship of the physical properties of rocks with the composition and conditions of their formation and show the possibility of using petrophysical characteristics in the study of regional tectonics, geological mapping, prospecting and exploration of minerals.

- to form a rational complex of geophysical works for the study of the geological section on the basis of petrophysical analysis of rocks:

Own:

- laboratory methods and equipment used to measure the main reservoir properties (porosity, permeability, residual water-oil saturation, void space structure), density;

- methods and techniques of petrophysical studies, density, elastic, magnetic, electrical and other properties of chemical elements, minerals, rocks, oil and gas reservoirs, metal ores, coal.

- methods of studying the main petrophysical dependencies.

Exploration geophysics
CODE - GPH184
CREDIT - 5 (2/1/0/2)
PREREQUISITE – GPH 108

PURPOSE OF THE COURSE

The objectives of the discipline "Exploration geophysics" are:

- study of the possibilities of geophysical methods for their use in solving a wide range of geological problems, the end result of which is the search and exploration of mineral deposits;
- acquisition of knowledge about methods used in oil and gas and ore geophysics, geophysical fields and methods of their measurements.

COURSE OBJECTIVES

The objectives of the discipline are:

- study of methods of processing and interpretation of geological and geophysical information obtained as a result of the application of these methods;
- acquisition of necessary skills, application of acquired knowledge to solve scientific and practical problems of exploration geophysics.

BRIEF DESCRIPTION OF THE COURSE

The course is based on the study of the internal structure of the Earth, mainly for searching and clarifying the structure of mineral deposits, as well as identifying the prerequisites for their formation by various geophysical methods. The physical characteristics of geophysical fields and the basics of their theory, methods of measuring geophysical fields, principles of operation of field geophysical equipment and its main characteristics, the basics of methods of processing and interpretation of geophysical information, geological and geophysical problems solved by methods of exploration geophysics are considered. A special role is assigned to the identification of a causal relationship between geological objects and observed physical fields.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

The student must:

To know:

- physical bases of application of geophysical methods, measuring instruments and installations, methodological issues of field observations;
- causal relationship between geological objects and observed physical fields;
- physical characteristics of geophysical fields and the basics of their theory, methods of measuring geophysical fields, principles of operation of field geophysical equipment and its main characteristics, the basics of methods of processing and interpretation of geophysical information, geological and geophysical problems solved by methods of exploration geophysics;

Be able to:

- to use the knowledge gained during the study of the discipline, when performing geophysical work to solve practical and scientific and technical problems of geology, prospecting and exploration of mineral deposits;

- analyze the possibilities of using various geophysical exploration methods to solve specific geological problems, present the results of geological research in the form of sections, maps and other images.

Own:

- skills of measurement work, principles of processing and geological interpretation of data obtained during field work;

- skills of analyzing the quality of information used in geological exploration.

Theoretical foundations of geophysical data processing
CODE-GPH 174
CREDIT - 5 (2/1/0/2)
PREREQUISITES - MAT103, GPH139, GPH141
PURPOSE AND OBJECTIVES OF THE COURSE
As a result of mastering this discipline, the student acquires knowledge, skills and abilities that contribute to achieving the following goals and objectives– - graduates
' readiness for production, technological and project activities that ensure the modernization of geophysical exploration technologies;
-readiness of graduates for interdisciplinary experimental research activities to solve problems related to the development of innovative technologies in the exploration field;
- readiness of graduates to be able to substantiate and defend their own conclusions and conclusions in classrooms of varying degrees of interdisciplinary professional training;
- readiness of graduates for self-study and continuous professional self-improvement in a competitive environment, modernization of production and globalization of the economy.
BRIEF DESCRIPTION OF THE COURSE
This course covers the basics of obtaining geophysical data (measurements), technical means for obtaining them (digital equipment) and as a result, geophysical information is digital measurement information that delivers quantitative information about any physical property, physical field or phenomenon of the geological environment, geological object. The purpose of processing geophysical data is to extract useful information from the results of measurements (observations) of individual geophysical methods (mainly seismic exploration) and their complexes. Solves the problems of transformation, filtering and analysis in

order to suppress interference, isolate and separate useful signals (anomalies). Special attention is paid to the basis of the theory of signal processing - Fourier theory. In fact, the study of the course "Theoretical foundations of geophysical information processing" is reduced to the study of the mathematical apparatus underlying the processing and filtering algorithms.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

The student must

To know:

The physical basis of the emergence of gravitational, electromagnetic, thermal and radioactive fields of the Earth. Correlation-regression, variance and factor analysis in the processing of geophysical data; correlation functions of geofields; spectral analysis of geophysical signals; linear filtering, optimal linear filters; theory of statistical solutions in problems of weak signal extraction, pattern recognition in complex geodata analysis.

Be able to:

to use the knowledge gained during the study of the discipline, when evaluating statistical and gradient attributes of geophysical fields, using methods of correlation and regression analysis and linear optimal filtering of geofields, using spectral and wavelet analysis of geophysical observations.

Possess:

deterministic and statistical methods in the analysis and processing of geophysical data and the application of these methods when choosing an interpretative geological and geophysical model.

Theoretical foundations and applied aspects of GIS
CODE - GPH181
CREDIT - 5 (2/1/0/2)
PREREQUISITES – GPH108, GEO177, GPH103
PURPOSE OF THE COURSE

The purpose of studying the discipline is to form students' correct understanding of the possibilities of methods of geophysical research of wells and their place in the overall complex of works related to the exploration and development of oil and gas fields.
COURSE OBJECTIVES
The objectives of the discipline are to study the relationship of geological characteristics of the section with their physical properties, studied by remote methods in geophysical studies of wells; their use for the interpretation of logging curves in order to determine the calculation parameters of reservoir formations.
BRIEF DESCRIPTION OF THE COURSE
The course is based on the study of a set of geophysical methods designed to study rocks in the near-well and inter-well spaces. The physical foundations of electrical, radioactive, acoustic and other methods of geophysical well research, the technique and technology of conducting borehole research in drilling and operating oil and gas wells are considered. The range of geological and technical problems solved by GIS in the well is studied. A special role is assigned to the consideration of the most rational GIS complex for the lithological dissection of the section, the study of the geological section, the reliable allocation of productive horizons and the determination of field parameters.
KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE
As a result of mastering the discipline , the student must:
To know:
Electrical, radioactive, acoustic and other methods of geophysical and hydrodynamic studies of wells, the technology of conducting borehole studies in drilling and operating oil and gas wells.
Be able to:
–based on the analysis of the available geological and geophysical materials for the deposit (development object), it is correct to choose a rational GIS complex and appropriate equipment for lithological dissection of the section, reliable allocation of productive horizons and working intervals in the section;
- to evaluate the formation development, to determine the optimal technology for increasing oil recovery of reservoirs and recoverable reserves of the deposit;
- based on the data of borehole measurements to build computer models of field development.
Possess skills:

- the methodology of work on wells, interpretation of measurement data of various GIS methods and work on the development of wells;
-computer programs for solving spatial geological problems to optimize the development of oil and gas fields, underground gas storage facilities.

Theoretical foundations of gravity exploration
CODE - GPH167
CREDIT - 5 (2/1/0/2)
PREREQUISITES - GEO177, GPH103, GPH108

PURPOSE OF THE COURSE
The purpose of the discipline is to familiarize students with the theoretical and methodological foundations of the gravimetric method of prospecting and exploration of minerals. The study of the discipline should be considered as the most important and integral part of the theoretical training of students of the profile "gEophysics".
COURSE
OBJECTIVES:
- obtaining information about normal and abnormal gravitational fields, about the law of gravity for point masses;
- familiarity with the methods of measuring the gravitational field;
- study of the device of the main devices used in gravity exploration;
- familiarity with the methods of registration of the gravitational field.
BRIEF DESCRIPTION OF THE COURSE
Gravimetric exploration is one of the main methods of solving geological problems: geocarting, searching for structures promising for mineral deposits, detailed volumetric study of identified structures to which deposits are confined, searching for deposits. Newton's theory of gravity, as the mathematical basis of gravity exploration, serves as the fundamental foundation of the science of the laws of spatial propagation of any physical fields. Therefore, the study of the course "Gravity Exploration" is necessary not only to master the method itself, but also to facilitate understanding of the laws of gravitational, magnetic and electric fields that are excited by geological bodies.
KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE
As a result of mastering the discipline , the student must:
To know:
Parameters, the structure of the Earth's gravitational field, the nature of normal and anomalous fields, the nature and classification of time variations of the field, the principle of operation and device of the main modern field gravimeters and magnetometers, the rules of organization of the methodology of field field work in solving various geological problems.
Be able to:
Determine the capabilities of the equipment in accordance with the requirements of the survey when solving specific geological problems, set the basic parameters of the survey methodology, determine the position of observation points (profiles), carry out primary processing of field material and calculate the values of anomalies at observation points and build graphs or maps of anomalies.

Possess: skills of working with basic modern field gravimeters, skills of organizing field field surveys of various types (profile, area, ground, underground marine and aerial surveys), techniques of primary processing of field material and methods of calculating the anomalous field of a given condition.

Methods of interpretation of gravitational anomalies and estimation of object parameters

CODE - GPH187
CREDIT - 5 (2/1/0/2)
PREREQUISITES – GPH135, GEO177, GPH108

PURPOSE AND OBJECTIVES OF THE COURSE

Theoretical and practical development of methods for solving direct two-dimensional and three-dimensional problems of gravity exploration, methods for extracting a useful signal from observed fields, finding parameters of objects that create anomalies and geological interpretation of the results obtained.

BRIEF DESCRIPTION OF THE COURSE

The course is a continuation of the discipline "Fundamentals of Gravity exploration". Designed to study the issues of geological interpretation of gravimetric data. The basis of the discipline is the petrophysical substantiation of information for the preparation of data for qualitative and quantitative interpretation, the construction of density sections and depth maps of structural-density boundaries. The principles of joint analysis with geological and structural maps, geological sections constructed from drilling data, and laboratory density determination data for various rocks are considered. A special place is given to the methods of field transformations, solving direct and inverse problems of gravity exploration, obtaining additional information about the geological nature of gravitational anomalies.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

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

To know: theoretical foundations of interpretation of gravitational field anomalies.

Be able to: use methods and programs for the interpretation and geological interpretation of gravitational anomalies.

Possess: skills of working with methods of geophysical and geological interpretation of field anomalies using modern computing software.

Methods of electrical exploration on direct and alternating electric current

CODE- GPH122

CREDIT - 5 (2/1/0/1)

PREREQUISITES - GEO177, GPH103, GPH108

GOALS AND OBJECTIVES OF THE DISCIPLINE

The purpose and objectives of studying the discipline "Electrical Exploration" is to gain knowledge about the physical and geological foundations of electrical exploration methods, the study of equipment, methods of field work and methods of interpreting the results of electrical exploration.

The acquired knowledge and skills should allow the trained specialist to navigate in the choice of a particular method of electrical exploration, to solve specific production and research tasks. Perform independently the necessary processing and interpretation of electrical survey data, perform all calculations and graphical constructions.

BRIEF DESCRIPTION OF THE COURSE

The discipline is taught to form students' system of ideas, knowledge, skills in the main sections of the subject:

Fundamentals and essence of electrical exploration. Basic concepts. Classification of electromagnetic methods. Physical and mathematical foundations of methods. methods of sounding (MTZ, CHZ, ZSP) and profiling (NP, MPP, DC, DIP, SDVR, RP), modern electrical exploration devices and stations, methods of field and laboratory measurements, processing, presentation and interpretation of observations, the possibilities of methods in the study of the geological structure of territories. The place of electrical exploration in the integration of geophysical methods in solving the problems of searching for ore, oil and structural-geological problems.

The process of studying the discipline is aimed at the formation of the following competencies:

- the student's ability to professionally apply methods and modifications of electrical exploration in solving geological problems;

-to operate modern electrical exploration equipment, office equipment and measuring instruments;

-apply knowledge about modern methods of electrical exploration;

-plan and conduct geophysical scientific research by the method of electrical exploration, evaluate their results;

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

As a result of mastering the discipline , the student must

To know:

- physical and mathematical foundations of electromagnetic sensing methods (MTZ, CHZ, ZSP) and profiling (NP, MPP, DC, DIP, SDVR, RP), methods and techniques of field observations, normal, primary fields of sources and anomalous fields of bodies of regular shape.

- patterns of electromagnetic energy propagation in the geological environment;

Be able to:

- understand geological problems solved by electrical exploration methods of exploration geophysics;
- to produce electromagnetic sensing and profiling (methods of work, equipment);
- process and present the results of field measurements;

Own:

- the main methods, methods and means of obtaining, storing, processing information, have the skills of processing electrical intelligence data and working with a computer as a means of information management

Methods of interpretation of electromagnetic fields and application of electrical exploration in solving geological and geophysical problems

CODE- GPH187

CREDIT - 5 (2/1/0/2)

PREREQUISITES - GEO177, GPH103, GPH108

COURSE OBJECTIVES

The objectives of mastering the discipline are:

- theoretical development of the main sections of methods of electrical exploration with a constant and variable electromagnetic field and a physically sound understanding of the possibility and role of various methods of electrical exploration in solving geological problems.

- understanding of the main features of the inverse problems of electrical exploration and knowledge of techniques that ensure their detailed and sustainable solution.

COURSE OBJECTIVES

Objectives of the discipline: study of the main problems and methods of interpretation of electrical exploration data, development of skills for solving inverse problems of determining the structure of the Earth from geophysical data, taking into account the incorrectness of their classical formulation.

BRIEF DESCRIPTION OF THE COURSE

Basic ideas of processing and interpretation of electrical data. Direct and inverse problems. The concept of inversion. Physical and mathematical foundations of processing and interpretation of electrical data. Modern interactive software for electrical data exploration.

The development of the discipline is aimed at acquiring knowledge about the physical foundations of electrical exploration, technology for measuring elements of the electromagnetic field of artificial and natural nature, obtaining skills in the geophysical and geological interpretation of the results obtained. The acquired knowledge will ensure the professional development of future specialists who are equally proficient in the theory and practice of geological and geophysical research.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

As a result of mastering the discipline , the student must

To know:

- Theoretical foundations of interpretation of the results of observations;

- classical and conditionally correct formulation of inverse problems of electrical exploration; theory of regularized solution of inverse problems; theoretical foundations of methods for solving linear and nonlinear problems.

Be able to:

- carry out primary processing of field material and calculate the values of apparent resistances at observation points and build graphs or maps of anomalies of electrical parameters, use methods and programs for the interpretation of anomalous fields.

- to build a class of geophysical models of the Earth, in which the search for a solution to the inverse problem will be performed; to determine the best way to stabilize the solution of the inverse problem; to choose optimal methods for minimizing the discrepancy between model and observed data, taking into account a priori limitations on the electrical exploration model.

Own:

- methods of primary processing of field material and methods of calculating apparent resistances and conductivities, methods of geophysical and geological interpretation of the obtained anomalies of the electromagnetic field using modern computing software.

- approaches to parametrization of geophysical models; techniques for constructing a stabilizing functional and choosing a regularization parameter; methods for minimizing the Tikhonov functional.

Magnetic exploration 1 (physical and geological fundamentals of magnetic exploration)

CODE - GPH189

CREDIT - 5 (2/1/0/5)

PREREQUISITE – GEO177, GPH103, GPH108

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of the discipline "Field magnetic exploration" is to study the Earth's magnetic field as a tool for solving geological problems, including prospecting and exploration of mineral deposits.

The objectives of the discipline are to acquire the necessary skills, apply the acquired knowledge to solve scientific and practical problems using magnetic observation data.

BRIEF DESCRIPTION OF THE COURSE

"Field magnetic exploration" is one of the main methods of exploration geophysics used to solve geological problems of mapping, prospecting and exploration of deposits of ore minerals, hydrocarbons and non-metallic raw materials. The content of the course covers the theory and practice of studying the Earth's magnetic field, the physical and geological foundations of the method, the methodology and technique of conducting magnetic exploration.

The objects of study are the magnetic field of geological structures and its various transformations used to solve geological problems.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

The student must:

To know: The

theory and practice of studying the magnetic field, the physical basis of the method, measuring instruments, methodological issues of field observations. Ideas about the causal relationship between geological objects and observed magnetic fields.

Be able to: use the knowledge gained during the study of the discipline, when performing geophysical work to solve practical scientific and technical problems of geology, prospecting and exploration of mineral deposits.

Own:the skills of designing magnetic surveys, preparing equipment, carrying out measurement work, principles and technology of processing and interpretation of data obtained during field work.

Magnetic exploration 2 (processing and interpretation of magnetic exploration data)
CODE - GPH190
CREDIT – 3 (2/1/0)
PREREQUISITE – GPH138, GEO177, GPH103, GPH108

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of the discipline "Processing and interpretation of magnetic exploration data" is to study the Earth's magnetic field as a tool for solving geological problems, including prospecting and exploration of mineral deposits.

The objectives of the discipline are to acquire the necessary skills, apply the acquired knowledge to solve scientific and practical problems using magnetic observation data.

A BRIEF DESCRIPTION OF THE COURSE

"Processing and interpretation of magnetic exploration data" is an important and high-tech stage of the application of magnetic exploration to solve geological problems of mapping, prospecting and exploration of deposits of ore minerals, hydrocarbons and non-metallic raw materials. The content of the course covers the theory and practice of studying the structure (composition) of the Earth's magnetic field, the division of the field into components and its transformations, principles and methods of interpretation of magnetic data.

The objects of study are the magnetic fields of geological structures and their various transformations used to solve geological problems.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

The student must:

To know: the content and sequence of procedures for processing the observed magnetic field, the causal relationship between geological objects and the observed magnetic fields.

Be able to: use the knowledge gained during the study of the discipline, when performing geophysical work to solve practical and scientific and technical problems of geology, prospecting and exploration of mineral deposits.

Possess: skills of input and processing of field data, principles and technology of their interpretation in specialized computer programs.

Theoretical foundations, registration and processing of seismic data

CODE - GPH121

CREDIT - 5 (2/1/0/2)

PREREQUISITE – GEO177, GPH103, GPH108

COURSE OBJECTIVES

As a result of mastering the discipline, students should have knowledge of the fundamental physical and geological fundamentals of seismic exploration, know the principles of seismic equipment, understand the methodology and technology of seismic exploration, know the basics of procedures and algorithms of computer processing of seismic data, the ability to use the knowledge gained in practice.

TASKS OF THE DISCIPLINE

The objectives of the discipline are to study the propagation of elastic vibrations; kinematics and dynamics of waves of different types; seismic equipment, digital seismic stations; sources of vibrations; field observation systems, processing of seismic materials on a computer; solving structural problems of mineral deposits search.

BRIEF DESCRIPTION OF THE COURSE

As a result of studying the discipline, the student must acquire knowledge of: physical and geological fundamentals of seismic exploration; dynamic theory of elasticity; principles of geometric seismic exploration; initial and boundary conditions; waves in absorbing media; types of real media; elastic waves in homogeneous media; basic principles of geometric seismics - principles of Huygens, Fresnel, Fermat and principles of reciprocity, superposition; seismic models of the medium and seismic boundaries; seismic waves and hodographs in multilayer, gradient and layered gradient media.

Much attention is paid to the methods and modifications of seismic exploration; classification of methods, scope of application, tasks to be solved; the use of interference systems in seismic exploration; the theory of grouping and the method of multiple overlaps, as well as seismic equipment; classifications of technical means; seismic receivers and linear recording systems; frequency and time characteristics, analog and digital recording of vibrations.

The basics of digital registration of seismic signals; telemetric seismic recording systems; sources of elastic waves and their classification; pulsed explosive and non-explosive sources; methods of field seismic surveys; observation systems and their parameters; design of observation systems; linear and areal observation systems are presented.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

The student must

To know:

- the main provisions of the theory of elasticity and elastic waves, geometric seismics, kinematics and dynamics of elastic waves in geological media;
- types of seismic exploration according to the conditions of the survey, land and sea work;
- equipment and equipment of field seismic exploration, including the principles of the device recording seismic acoustic equipment;
-principles of excitation and registration of elastic waves; seismic source, types of seismic sources, seismic receiver, types of waves on seismic recording.
- techniques and methods of conducting seismic exploration of 2D, 3D, 4D, CMV, vertical seismic profiling,seismic logging;
- the main directions and trends of field seismic research.

Be able to:

- work with modern seismic recording equipment, conduct field observations;
- apply knowledge about modern methods of seismic research.

Own:

- skills in obtaining seismic information, including the principles of designing seismic survey observation systems;
- procedures used in the modern graph of seismic data processing.

Interpretation and modeling based on seismic data
CODE - GPH188
CREDIT – 3 (2/1/0)
PREREQUISITE – GEO177, GPH103, GPH108, GPH139

COURSE OBJECTIVES

The objectives of mastering the discipline are:

- mastering the basic techniques of processing, interpretation and modeling of seismic materials in order to solve geological problems of seismic surveys;
- the ability to use the acquired knowledge in practice;
- application of mathematical modeling of the acoustic field, methods of its processing and interpretation.

COURSE OBJECTIVES

As a result of mastering the discipline, students should have knowledge of the fundamental physical and geological fundamentals of seismic exploration, know the basics of procedures and algorithms for computer processing of seismic data, understand the principles of geological interpretation of the information received

BRIEF DESCRIPTION OF THE COURSE

As a result of studying the discipline, the student must acquire knowledge of: the physical and geological foundations of seismic exploration; the basics of seismic data processing and solving the inverse problem of seismic exploration; mathematical model of the environment, static corrections, calculation methods and basic algorithms of correction, calculation and correction of kinematic corrections, muting; filtration of seismic vibrations, parameters of seismic waves and spectral analysis; application of frequency filters for processing seismic signals; reverse filtration (deconvolution); linear frequency filters; multi-channel filtering.

Great attention is paid to the seismic images of geological environments building reflecting and refracting boundaries hodographs; time sections and cubes; seismic demolished; the basics of seismic migration; kinematic and dynamic interpretation; follow-up and stratification of seismic borders; the identification of tectonic disturbances interruptions and disagreements; preparation and analysis of seismic cards; correlation horizons to the time of incision; stratigraphic binding of reflections.

KNOWLEDGE AND SKILLS UPON COMPLETION OF THE COURSE

The student must

To know:

- basic concepts and methods of the sections included in the course program;
- technologies for constructing a seismogeological model and stratigraphic binding, structural interpretation and resolution of seismic exploration;
- methods of mathematical modeling of seismic wave fields;
- attribute analysis;
- Quantitative forecasting of the FES using seismic data.

Be able to:

-apply methods related to all sections of the course in solving professional tasks, including the processing and interpretation of field seismic data;

-to search for and evaluate the possibilities of implementing computerized systems (including the implementation of software, graphical modeling) for the management of geological exploration technologies by seismic exploration methods;

- to understand the meaning of field seismic information, to collect and systematize a variety of information from numerous sources and, based on the collected information, to uncover cause-and-effect relationships for solving geological problems;

-to carry out mathematical modeling and research of seismic processes and objects by specialized geophysical information systems, including standard software packages.

Own:

- skills of obtaining seismic information
- the main methods of processing and interpretation of seismic materials.

Introduction to the integration of geophysical methods

CODE - GPH192

CREDIT - 5 (2/1/0/2)

PREREQUISITES - GEO177, GPH103

GOALS AND OBJECTIVES OF THE DISCIPLINE

The aim of the course is to achieve the most reliable effect of solving the set geological tasks with a set of the most informative geophysical methods, determining the sequence of their application.

BRIEF DESCRIPTION OF THE COURSE

The course "Methodological foundations of integration of geophysical methods" introduces bachelors to the sequence of development of ideas and methods of integration of geophysical methods at various stages of the exploration process. The organization of geological and geophysical research, the principles of physical and geological modeling in order to select the most effective set of methods, the sequence of studying promising areas for various types of mineral deposits, methods of work, equipment, processing technology and principles of complex interpretation are also considered.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

To know: the fundamental principles of the integration of geophysical methods, typical geophysical complexes; the methodology of geological and geophysical mapping, complex search and evaluation and exploration work at various stages of research.

Be able to: determine a rational set of geophysical methods for various types of deposits, in engineering-geological, geoecological studies.

Possess: basic operations of processing the results of complex geological and geophysical studies, techniques for drawing up appropriate maps for subsequent interpretation of the results in geoinformation systems.

ORGANIZATIONS OF PRACTICES AND REQUIREMENTS FOR THEM

In accordance with the order of the Ministry of Education and Science of the Republic of Kazakhstan dated October 31, 2018 "On approval of state mandatory standards of education at all levels of education" in the field of training "Oil and gas and ore geophysics", the section of the basic educational program of the bachelor's degree "Educational and industrial practices" is mandatory and is a type of training sessions directly focused on the professional and practical training of students.

Practitioners consolidate the knowledge and skills acquired by students as a result of mastering theoretical courses, develop practical skills and contribute to the complex formation of general cultural (universal) and professional competencies of students.

During the implementation of the educational program "Oil and gas and ore geophysics", it is planned to conduct educational geological and geophysical practices, industrial and pre-graduate practices.

Educational geological and geophysical practices

CODE – AAP184

CREDIT - 2

Educational geological practice is conducted at the Karataussky landfill.

The purpose of the educational practice in geology is to strengthen the theoretical knowledge gained by students in the first year of study by listening to lectures on geological disciplines, first of all, "General and historical geology".

The objectives of the educational practice in general geology are:

- observation and documentation of modern and ancient endogenous and exogenous geological processes, natural and anthropogenic geological objects;

- acquisition of skills in conducting field geological documentation;

- familiarity with the methods of selection and preparation of rock samples and paleontological remains for the simplest types of analyses;

- acquisition of skills of geological survey work - measurement of elements of occurrence and reflection of the obtained data on geological diagrams;

- familiarity with the main types of environmental pollution in anthropogenic landscapes, as well as methods of environmental control;

- obtaining the skills of desk processing of factual material.

During the practice, the student acquires both universal (socio-personal and instrumental) competencies, as well as general professional and professionally

specialized competencies necessary for the practical work of a bachelor in the field of training "Oil and gas and ore geophysics".

Students are provided with field equipment, geological equipment, have access to special Office rooms for processing field information, computer classes with Internet access.

Certification based on the results of the practice includes writing and defending a report on the practice.

The defense of the reports (in the form of an oral collective report) takes place before a commission consisting of the heads of the practice and teachers of the departments. Team members make reports on all sections of the report. According to the results of the defense, a set-off is set.

Specialized geophysical practice is conducted on the basis of the laboratory of the Department of Geophysics of Satbayev University

The objectives of the profile geophysical practices are the acquisition of skills in field geophysical work, the operation of geophysical equipment, as well as the acquisition of skills in the field of processing and interpretation of geophysical information.

During the practice, the student acquires both universal (socio-personal and instrumental) competencies, as well as general professional and professionally training "Oil and gas and ore geophysics.

Production geophysical practice I, II

CODE – AAP166, 1167

CREDIT – 4, 6

I production geophysical practice is carried out in production organizations with the objectives of:

- consolidate the theoretical knowledge gained during classroom classes and educational geological practices;

- acquire professional skills and gather geological material for writing a qualifying work (WRC).

An important task of the First industrial practice is to introduce the student to the social environment of the enterprise (organization) in order to acquire social and personal competencies necessary for work in the professional field.

The following production and service companies, research institutes, thematic divisions of natural resources organizations are the places of industrial practice: Institute of Seismology of the Ministry of Education and Science of the Republic of Kazakhstan, Institute of Geological Sciences named after K. I. Satpayeva, Kaznipimunaygas, Karachaganak Petroleum Operating, tEngizchevroil, kAzgeologiya, PGD SERVICES, DANK, PGS, Geoken SPC, Geo Energi Group, Tatarka, Kazakstankaspiyshelf, Kazakh Geophysical Company, Batys Geofiz.service", "GIS Company", "Azimut Energy Services", "kAzakhmys", "KAZZINC", Eurasian Industrial Association, "Kazphosphor", "Maykayyn-gold", "Kazatomprom", "Zhayremsky GOK", "Asemtas", "Izdenis", "gEoincenter" Alstron LLP, Azimut Geology LLP, Anega Kazakhstan LLP, vOlgovgeologiya JSC -" Geotechnocenter", "GISS" LLP, "DP Ortalyk" LLP, zHanros Drilling LLP, Izdenis LLP, Karakudukmunai LLP, kArazhanbasmunai JSC, Kazgiiz LLP,kAzakhoil Aktobe LLP, Kyzylkum LLP, KOR Oil Company JSC, Uzenpromgeofizika JSC, KATKO Joint Venture LLPJSC "KazMunayGas", JSC "PetroKazakhstan", LLP "Bapymining", JSC "NAC KazAtomProm", "KAZ MineralsPLS", JSC "MMC Kazakhaltyn", LLP "GEOENERGYGROUP", etc.

Certification based on the results of the production practice includes the evaluation of materials collected in practice and the protection of the report. The defense of the report on industrial practice takes place before a special commission in the 7th semester no later than 1 month after the beginning of classroom classes. According to the results of the defense, a set-off is set.

The volume of production geophysical practice is 8 credits in the fourth semester of the educational program in the direction of "Oil and gas and ore geophysics".

Thesis defense

CODE - ECA103

CREDIT – 4

The purpose of the thesis is:

1) systematization, consolidation and expansion of theoretical knowledge and practical skills in the specialty and their application in solving specific scientific, technical, economic and production tasks, as well as cultural tasks;

2) development of skills of conducting independent work and mastering the methodology of scientific research and experimentation in solving the problems and issues being developed;

3) finding out the student's readiness for independent work in the conditions of modern production, science, technology, culture, as well as the level of his professional competence.

SHORT DESCRIPTION

The procedure for defending a thesis (project) is determined by the Rules for conducting ongoing monitoring of academic performance, intermediate and final state certification of students in educational institutions, approved by the orders of the Ministry of Education and Science of the Republic of Kazakhstan. The thesis (project) is defended at an open meeting of the state attestation commission with the participation of at least half of its members. The defense of the thesis (project) is organized in a public form, with the presence of students, teachers of the graduating department. The supervisor, representatives of the organization on the basis of which the thesis research was conducted and other interested persons may also be invited to the defense. The duration of the defense of one thesis, as a rule, should not exceed 30 minutes per student. To defend the thesis, the student makes a report to the state attestation commission and those present for no more than 15 minutes. Everyone present can take part in the discussion of the thesis (project) in the form of questions or speeches. After the discussion, the secretary of the commission reads out the review (if the supervisor is present, he can speak personally) and the review. If there are comments in the review and /or review, the student must give a reasoned explanation of their essence. According to the results of the defense of the thesis (project), an assessment is made according to the point-rating letter system. At the same time, the level of theoretical, scientific and practical training, the review of the supervisor and the reviewer's assessment are taken into account. The results of the thesis defense are drawn up by the minutes of the meeting of the state attestation commission individually for each student and are announced on the day of the defense