



**NJSC «Kazakh National Research Technical University after
K.I.Satbayev»
Institute of Geology and Oil and Gas Business named after K. Turysov
«Geological survey, prospecting and exploration of mineral deposits»
Department**

EDUCATIONAL PROGRAM

**"GEOLOGY AND EXPLORATION OF SOLID MINERAL DEPOSITS"
(scientific and pedagogical direction (2 years))**

**Master of Engineering Science in the educational program "7M07206
Geology and exploration of solid mineral deposits "**

1st edition

in accordance with the State Educational Standards of Higher Education in 2018

Almaty 2021

Developed by:

Reviewed: meeting of the
Institute's Board

Approved by: UMC KazNRTU

The program is drawn up and signed by the parties:

From KazNRTU after K.Satpaev:

1. Head of GSPaEMD department
2. Director of K.Turysov IGOaM
3. Chairman of department's UMG, professor



А.А. Бекботаева
А.Х. СЫЗДЫКОВ
А.Б. Байбатша

From employers:

1. Chief Researcher of the Institute of Geological Sciences named after KI Satpayev, Candidate of Geological and Mineralogical Sciences Zhunusov A.A.
2. Director of LLP "ECC" GEO ", full member of PONEN – B.M. Kabaziev
3. Head of the geological prospecting site Pustynnoe JSC "AK Altynalmas", candidate of geological and mineralogical sciences Rassadkin V.V.

From partner university:

Professor of the Department of Geology of the Engineering School of Natural Resources of the Tomsk Polytechnic University, Doctor of Geological and Mineralogical Sciences Yazikov E.G.

Approved at a meeting of the Academic Council of the Kazakh National Research Technical University named after K.I. Satpayev. Minutes No. 3 dated June 25, 2021

Qualification:

Level 7 National framework of qualifications:

7M07 Engineering, manufacturing and construction industries

7M072 Manufacturing and processing industries (master):

Geology and exploration of solid mineral deposits

Professional competence: Management of the geological industry, organization, conduct and control of exploration work at all phases and stages of geological research, be competent in matters of geology and exploration of the subsoil, the state and prospects of development of the industry, the legal framework for subsoil use, as well requirements for the quality of mineral raw materials and the conditions of the world, regional and local markets; expert in research work in the field of prospecting, exploration, exploitation of solid mineral deposits; teaching skills for work at universities and colleges.

Short description of the program:

Designed for the implementation of scientific and pedagogical training of masters in the educational program «Geology and exploration of solid mineral deposits» at Satbayev University and developed as part of direction «Manufacturing and processing industries».

1. *The purpose of the master's education program «Geology and exploration of solid mineral deposits» is training, taking into account the country's development prospects, competitive highly qualified personnel with high spiritual and moral qualities, capable of independent thinking and ensuring the progressive scientific, technical, social-economic and cultural development of society.*

At the master's level, training in the specialty «Geology and exploration of solid mineral deposits» is carried out along trajectories involving the implementation of educational programs for the training of personnel in the geological sector, which have in-depth technical, analytical, scientific, pedagogical and prognostic training.

Types of work:

- scientific and research;
- scientific and production;
- project;
- organizational and management;
- scientific and pedagogical.

Master on specialty «Geology and exploration of solid mineral deposits» is depending on the type of professional activity prepared for the following professional tasks:

a. scientific and research activity:

- independent selection and justification of the goals and objectives of scientific research;
- independent selection and development of methods for solving the tasks in the field, laboratory, interpretation studies using modern equipment, instruments and information technology (in accordance with the focus (profile) of the master's program);
- analysis and generalization of the results of scientific research using modern achievements of science and technology, advanced Kazakhstani and foreign experience;
- evaluation of the scientific research works' results, preparation of scientific reports, publications, reports, preparation of applications for inventions and discoveries;

b. scientific and production activity:

- independent preparation and conduct of industrial and scientific-industrial field, laboratory and interpretation studies in solving practical problems (in accordance with the orientation (profile) of the master's program);
- independent selection, training and professional operation of modern field and laboratory equipment and instruments (in accordance with the focus (profile) of the master's program);
- collection, analysis and systematization of available specialized information using modern information technologies;
- complex processing and interpretation of field and laboratory information in order to solve scientific and production problems;
- determination of the economic efficiency of scientific and production work;

c. project activity:

- design and implementation of scientific and technical projects;
- participate in the examination of projects of scientific and research and scientific and production activities;
- participation in the development of normative methodological documents in the field of geological work;

d. organizational and management activity:

- planning and organization of scientific and research and scientific and production of field, laboratory and interpretation works;
- planning and organization of scientific and scientific and production seminars and conferences;

e. –scientific and pedagogical activity:

- participation in the preparation and conduct of seminars, laboratories and practical classes and practices;
- participation in the management of scientific and educational work of students in the field of geology.

Objects of professional activity of the graduate:

- earth, earth crust, lithosphere, rocks, solid mineral deposits;
- physical properties of rocks;
- minerals, crystals, geochemical fields and processes;
- geological environment, natural and technogenic geological processes; ecological functions of lithosphere.

PASSPORT OF EDUCATIONAL PROGRAM

1 Program volume and content

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

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

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

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

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

Content of «Geology and exploration of solid mineral deposits» EP 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 activity, aimed at maximizing customer satisfaction should ensure:

- obtaining a full and high-quality professional and scientific-pedagogical education in the field of geology of solid mineral deposits (MD), confirmed by the level of knowledge and skills, competencies, their assessment, both in content and volume
- providing training for masters for the geological industry who know the technology, organization and economics of the geological industry, methods and principles for its improvement and design.
- training of professional and competitive specialists in the field of geology, prospecting and exploration of mineral deposits;
- professional and competitive training - a high level of theoretical training in the field of socio-cultural, economic, legal and professional disciplines, taking into account

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the trends of modern scientific, pedagogical and professional social development, the inclusion of leading domestic and foreign experts in the field of services in geology;

- development of skills of design and research activities, implementation of projects aimed at the practical application of modern professional digital techniques and technologies for organizing the activities of geological production enterprises, research and educational organizations;

- optimal balance in the educational process of theoretical and practical training (due to the purposeful organization of research and production practices);

- a personal-oriented approach to the educational process, focused on developing a responsible attitude to the results of their professional activities;

- the aspect of self-development, where the emphasis is on the organization of professional activities, in which the master's student is focused on continuous professional self-improvement.

Objectives of the educational program:

- Readiness of specialists for research and project work in the field of prospecting, exploration, and exploitation of solid mineral deposits.

- Readiness of specialists for production and technological activities that ensure the introduction and operation of new geological technologies at the local level.

- Readiness of specialists to search for and obtain new information necessary for solving professional tasks in the field of knowledge integration in relation to their field of activity, to actively participate in the activities of an enterprise or organization.

- Readiness of specialists for scientific and informational, ideological and problematic communications in the professional environment and in the audience of non-specialists with a clear and deep justification of their position, to engage in organizational, managerial and service activities, to be aware of the responsibility for making their professional decisions.

- Readiness of specialists to self-study and continuous professional development during the entire period of scientific or professional activity.

2 Requirements for applicants

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

The procedure for admission of citizens to the master's program is established in accordance with the "Standard rules for admission to training in educational organizations that implement educational programs of postgraduate education».

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

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

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

3 Requirements for completing training and obtaining a diploma

Degree/ qualifications awarded: The graduate of this educational program is awarded the academic degree "master of technical Sciences" in the direction of "Production and processing industries" in the specialty - "Geology and exploration of solid mineral deposits».

A graduate who has completed master's programs must have the following General professional competencies:

- the ability to independently acquire, comprehend, structure and use new knowledge and skills in professional activities, develop their innovative abilities;
- ability to independently formulate research goals, establish a sequence of professional tasks;
- the ability to apply in practice knowledge of fundamental and applied sections of disciplines that determine the direction (profile) of the master's program;

- ability to choose professionally and creatively use modern scientific and technical equipment for solving scientific and practical problems;
- the ability to critically analyze, present, protect, discuss and disseminate the results of their professional activities;
- proficiency in drawing up and processing scientific and technical documentation, scientific reports, reviews, reports and articles;
- willingness to lead a team in the sphere of their professional activities, tolerant of social, ethnic, religious and cultural differences;
- readiness for communication in oral and written forms in a foreign language for solving professional tasks.

A graduate who has completed the master's program must have professional competencies that correspond to the types of professional activities that the master's program focuses on:

research activities:

- the ability to form diagnostic solutions to professional problems by integrating the fundamental sections of science and specialized knowledge obtained during the development of the master's program;
- ability to independently conduct scientific experiments and research in the professional field, generalize and analyze experimental information, draw conclusions, formulate conclusions and recommendations;
- the ability to create and research models of the studied objects based on the use of in-depth theoretical and practical knowledge in the field of Geology and exploration of solid mineral deposits;

research and production activities:

- the ability to independently conduct production and scientific-production field, laboratory and interpretative work in solving practical problems;
- the ability to professionally operate modern field and laboratory equipment and devices in the field of master's degree program;
- ability to use modern methods of processing and interpreting complex information to solve production tasks;

project activity:

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- ability to independently prepare and submit research and production projects;
- willingness to design interdisciplinary scientific research and scientific-production work in solving professional problems;

organizational and managerial activities:

- readiness to use practical skills in organizing and managing research and production activities in solving professional tasks;
- readiness for practical use of normative documents in the planning and organization of scientific and production works;
- *scientific and pedagogical activity:*
 - ability to conduct seminars, laboratory and practical classes;
- the ability to participate in the management of scientific and educational work of students in the field of Geology and exploration of solid mineral deposits;

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

4 Working curriculum of the educational program

4.1. Training period 2 years

MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN
KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY after K. SATBAYEV



WORKING CURRICULUM

of the educational program for 2021-2022 academic year admission
Educational program 7M07206 - "Geology and exploration of solid mineral deposits"
Group of Educational programs M121 - "Geology"

Full-time study

Study duration: 2 years

Academic degree: master of technical sciences

year of study	Code	Name of course	Component	Academic credits	Total hours	audience volume, lec/ lab/ pr	SIW (including SIWT) in hours	Prerequisites	Code	Name of course	Component	Academic credits	Total hours	audience volume, lec/ lab/ pr	SIW (including SIWT) in hours	Prerequisites
1	LNG210	Foreign language (professional)	BD IC	5	150	0/0/3	105		AAP244	Pedagogical practice	BD IC	4	120	0/0/2	90	
	HUM208	Management psychology	BD IC	4	120	1/0/1	90		HUM210	History and philosophy of science	BD IC	4	120	1/0/1	90	
	GEO209	Geological modeling of mineral deposits	BD OC	5	150	2/0/1	105		HUM209	Higher school pedagogy	BD IC	4	120	1/0/1	90	
	GEO218	Mineral deposits of Kazakhstan							GEO483	Actual problems of modern subsurface	PD OC	5	150	2/0/1	105	
	GEO220	Metallogeny and ore formations of Kazakhstan	PD OC	5	150	2/0/1	105		GEO210	Geological support of subsoil use						
	GEO208	The geological structure of ore fields and deposits							GEO484	Petrogenetic minerals	BD OC	5	150	2/0/1	105	
	GEO214	Advanced well logging	PD OC	5	150	1/0/2	105		GEO202	Actual problems of geology						
	GEO211	GIS uranium deposits							GEO485	Genesis of the main industrial deposits	BD OC	5	150	2/0/1	105	
	GEO285	Data Mining	PD OC	5	150	2/0/1	105		GEO224	Methods of stratigraphic studies						
	GEO211	Geology of the ore-bearing regions of Kazakhstan														
	AAP242	Master's student scientific research, including an internship and a master's thesis	MSSR	6					AAP242	Master's student scientific research, including an internship and a master's thesis	MSSR	6				
In total				35				In total				33				
2	3 semester								4 semester							
	GEO231	Basics of petrology	PD OC	5	150	2/0/1	105		AAP236	Research scientific training	PD OC	7				
	GEO306	Petrochemistry							ECA205	Registration and defense of the master's thesis (RaDMT)	FA	12				
	GEO240	Regional geology of the UIC	PD OC	5	150	2/0/1	105									
	GEO709	Geotectonics with geodynamics basics														
	GEO283	Actual problems of stratigraphy	PD OC	5	150	2/0/1	105									
	GEO305	Volumetric modeling and predictive evaluation of mineral deposits														
	GEO223	Methods of lithological research	PD OC	5	150	2/0/1	105									
	GEO212	Geochemistry of radioactive elements														
	GEO233	Basics of ecological geology	PD OC	5	150	2/0/1	105									
	GEO227	Mineralogy of radioactive and rare earth elements														
GEO714	Geology of uranium deposits															
AAP242	Master's student scientific research, including an internship and a master's thesis	MSSR	6					AAP242	Master's student scientific research, including an internship and a master's thesis	MSSR	6					
In total				31				In total				25				

Decision of the Academic Board of KazNRTU after K. Satbayev. Protocol No. 3 of "25" 06 2021

Decision of the Academic Board of the Institute GPMI. Protocol No. 5 of "24" 12 2020

Vice-Rector for Academic Affairs

B. Zhautikov

Director of the Institute

A. Syzdykov

Head of the Department

A. Bekbotayeva

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

5 Descriptors of the level and volume of knowledge, skills, competencies

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

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

Descriptors reflect learning outcomes that characterize the learner's abilities:

1) to demonstrate developing knowledge and understanding in the studied field of geology and exploration of solid mineral deposits, based on advanced knowledge of this field, in the development and (or) application of ideas in the context of research;

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

3) collect and interpret information to form judgments taking into account social, ethical and scientific considerations;

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

5) training skills necessary for independent continuation of further training in the studied field of geology and exploration of solid mineral deposits.

6 Competencies to complete the training

6.1 Requirements for the key competencies of graduates of scientific and pedagogical magistracy, should:

1) have an idea:

- on the role of science and education in public life;
- about modern trends in the development of scientific knowledge;
- on topical methodological and philosophical problems of the natural (social, humanitarian, economic) sciences;
- on the professional competence of a teacher of higher education;
- about the contradictions and socio-economic consequences of globalization processes;

2) know:

- methodology of scientific knowledge;
- principles and structure of the organization of scientific activity;
- Psychology of cognitive activity of students in the learning process;

- psychological methods and means of increasing the effectiveness and quality of training;

3) be able to:

- use the knowledge gained for the original development and application of ideas in the context of scientific research;
- critically analyze existing concepts, theories and approaches to the analysis of processes and phenomena;
- integrate knowledge gained in different disciplines to solve research problems in new unfamiliar conditions;
- through the integration of knowledge, make judgments and make decisions based on incomplete or limited information;
- apply the knowledge of pedagogy and psychology of higher education in their teaching activities;
- apply interactive teaching methods;
- to carry out information-analytical and information-bibliographic work with the involvement of modern information technologies;
- think creatively and be creative in solving new problems and situations;
- Fluent in a foreign language at a professional level, allowing for research and teaching of special disciplines in universities;
- summarize the results of research and analytical work in the form of a dissertation, scientific article, report, analytical note, etc .;

4) *have skills:*

- research activities, solutions to standard scientific problems;
- the implementation of educational and pedagogical activities on credit training technology;
- methods of teaching professional disciplines;
- the use of modern information technologies in the educational process;
- professional communication and intercultural communication;
- oratory, the correct and logical design of their thoughts in oral and written form;
- expanding and deepening the knowledge necessary for everyday professional activity and continuing education in doctoral studies.

5) *be competent:*

- in the field of research methodology;
- in the field of scientific and scientific-pedagogical activity in higher educational institutions;
- in matters of modern educational technologies;
- in the implementation of scientific projects and research in the professional field;
- in ways to ensure constant updating of knowledge, expansion of professional skills.

Competencies acquired by students in the development of the educational program "Geology and exploration of solid mineral deposits"

Core competencies (B)	
B1	Ability to abstract thinking, analysis, synthesis; willingness to act in non-standard situations, bear social and ethical responsibility for decisions made; readiness for self-development, self-realization, use of creative potential; the ability to use in-depth knowledge of legal and ethical standards in assessing the consequences of their professional activities, developing and implementing socially significant projects and using in practice the skills and abilities in organizing research and development, in managing a research team
B2	To possess knowledge of the philosophical concepts of natural science and the foundations of the methodology of scientific knowledge in the study of various levels of organization of matter, space and time; ability to active social mobility; willingness to lead a team in the field of their professional activity, tolerantly perceiving social, ethnic, religious and cultural differences
B3	The ability to apply modern computer technology in the collection, storage, processing, analysis and transmission of geographical information and for solving research and production and technological problems of professional activity; own methods for assessing the representativeness of the material, the volume of samples during quantitative research, statistical methods for comparing the data obtained and determining patterns
B4	The ability to freely use the state language and a foreign language as a means of business communication; ability to actively communicate in the scientific, industrial and socio-social spheres of activity; readiness for independent research work and work in a scientific team, the ability to generate new ideas (creativity)
Professional Competencies (PC)	
PC1	The ability to formulate problems, tasks and methods of scientific research, obtain new reliable facts based on observations, experiments, scientific analysis of empirical data, abstract scientific papers, compile analytical reviews of accumulated information in world science and industrial activity, summarize the results in the context of previously accumulated in science knowledge and formulate conclusions and practical recommendations based on representative and original research results
PC2	The ability to creatively use in scientific and industrial-technological activities the knowledge of fundamental and applied sections of special disciplines of the master's program. The ability to use modern methods of processing and interpretation of geological information when conducting scientific and industrial research
PC3	The ability to creatively use in scientific and industrial-technological activities the knowledge of fundamental and applied sections of special disciplines of the master's program. The ability to use modern methods of processing and interpretation of geological information when conducting scientific and industrial research
PC4	Own the basics of design, expert analysis and research using modern approaches, methods, equipment and computing systems. Ability to develop exploration projects, exploration, exploration, assessment and organization of such activities
	They will understand the features of metallogeny, mineralogy, industrial types of deposits in the regions of Kazakhstan. They will be able to analyze the structural diagram of various age-related formations; compile a metallogenic map according to the type of mineral; analyze metallogenic maps. They will know about the laws of formation and crystallization of magmatic melts, modern classification and nomenclature, chemical and mineral composition, structure and genesis of the main types and varieties of magmatites.

PC5	They will understand modern methods and materials of remote sensing of the Earth and photogrammetry; physical fundamentals of Earth remote sensing; technology and image enhancement methods. They will be able to select and use remote sensing data in combination with other source data to solve various applied problems; perform processing of aerospace images using special software; to choose and justify the necessary resolution of images correctly; apply various ways to improve the image and extract the necessary information from it during geological mapping and prospecting; to generalize and analyze the information received; own basic methods, methods and means of obtaining, storing, processing information; work with spatial data in geographic information systems
PC6	They will understand and know the regional structures of the earth's crust of the studied territory in four positions: the principle of tectonic zoning of regional structures; the boundaries of each considered structure; know the features of the geological structure of the structure in the aspect of its stratigraphy and tectonics (development history); highlight the mineral structure. Learn to analyze the tectonic map and the map of tectonic zoning. They will be able to independently analyze, compare the geological data of one territory with another, reproduce the history of the geological development of the region and highlight the structure and types of mineral deposits associated with them.

6.2 Requirements for the research work of a graduate student in scientific and pedagogical magistracy:

1) corresponds to the profile of the educational program of the magistracy, according to which the master's thesis is implemented and defended;

2) relevant and contains scientific novelty and practical significance;

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

4) is performed using modern methods of scientific research;

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

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

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6.3 Requirements for the organization of practices:

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

- 1) pedagogical in the database cycle - at the university;
- 2) research in the PD cycle - at the place of the dissertation.

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

The research practice of the undergraduate is carried out in order to familiarize with the latest theoretical, methodological and technological achievements of domestic and foreign science, modern methods of scientific research, processing and interpretation of experimental data.

Matrix of competencies of the educational program "Geology and exploration of mineral deposits"

Discipline Index	Name disciplines	Basic				Professional					
		B1	B2	B3	B4	PK1	PK2	PK3	PK4	PK5	PK6
Required component											
LNG202	English (professional)		x		x						
HUM201	History and philosophy of science	x	x	x							
HUM207	Higher education pedagogy		x								
HUM204	Psychology of management		x					x			
Elective courses											
GEO209	Geological modeling of mineral resources	x		x		x	x			x	x
GEO218	Mineral deposits of Kazakhstan	x		x		x	x			x	x
GEO220	Metallogeny and ore formations of Kazakhstan	x				x	x		x		
GEO208	Geological structures of ore fields and deposits	x				x	x		x		
GEO214	Well Logging (Advanced)			x		x	x	x		x	
GPH211	GIS of uranium deposits			x		x	x	x		x	
GEO285	Data mining			x	x		x	x		x	x
GEO211	Geology of ore-bearing regions of Kazakhstan	x				x			x		
GEO234	Petrogenic minerals	x				x			x		
GEO202	Actual problems of geology	x				x			x		
GEO207	Genesis of the main industrial deposits					x	x		x		x
GEO224	Stratigraphic research methods		x				x			x	
GEO203	Actual problems of modern subsoil use	x			x	x	x	x		x	
GEO210	Geological support of subsoil use		x			x	x	x			
GEO231	Fundamentals of Petrology			x		x	x		x		x
GEO306	Petrochemistry	x				x			x		
GEO240	Regional geology of the CIS countries					x	x	x			x
GEO709	Geotectonics with the basics of geodynamics		x			x	x			x	x
GEO223	Lithological research methods	x	x	x			x	x	x		
GEO212	Geochemistry of radioactive elements	x				x			x		
GEO706	Fundamentals of Ecological Geology	x	x	x			x			x	
GEO714	Geology of uranium deposits	x				x			x		
GEO227	Mineralogy of radioactive and rare earth elements	x				x			x		
State final certification											

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Discipline Index	Name disciplines	Basic				Professional					
		B1	B2	B3	B4	PK1	PK2	PK3	PK4	PK5	PK6
ECA203	Registration and defense of a master's thesis	x	x	x	x	x	x	x	x	x	x
Additional types of training											
AAP218	Research work of a master student	x	x	x	x	x	x	x	x	x	x
AAP244	Teaching practice	x	x	x	x	x	x	x	x	x	x
AAP233	Research practice	x	x	x	x	x	x	x	x	x	x

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7 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 is not valid. The purpose of filling out the European Annex 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, the functional purpose of the qualification, as well as information about the national education system. In the application model, which will be used to transfer estimates, the European system of transfers or credit transfer (ECTS) is used.

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

Foreign language (academic)

CODE - LNG202

CREDIT - 5 (0/0/3/2)

Prerequisite –Academic English, Business English, IELTS 5.0-5.5

GOAL AND OBJECTIVES OF THE COURSE

The goal of the course is to develop students' knowledge of the English language for their ongoing academic research and to increase the effectiveness of their work in the field of project management.

SHORT DESCRIPTION OF THE COURSE

The course aims to create vocabulary and grammar for effective communication in the field of project management and to improve reading, writing, listening and speaking skills at the Intermediate level. Students are expected to acquire replenishment of their vocabulary of business English and learn grammatical structures that are often used in the context of management. The course consists of 6 modules. The 3rd module of the course ends with an intermediate test, and the 6th module is followed by a test at the end of the course. The course ends with a final exam. Undergraduates also need to study on their own (MIS). MIS - independent work of undergraduates under the guidance of a teacher.

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

Developed by:	Reviewed: meeting of the Institute's Board	Approved by: UMC KazNRTU	
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History and philosophy of science

CODE – HUM210

CREDIT - 4 (1/0/1/2)

REQUISITES - no

GOAL AND OBJECTIVES OF THE COURSE

To reveal the connection between philosophy and science, highlight the philosophical problems of science and scientific knowledge, the main stages of the history of science, the leading concepts of the philosophy of science, modern problems of the development of scientific and technical reality.

SHORT DESCRIPTION OF THE COURSE

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

KNOWLEDGE, SKILLS, SKILLS FOR COMPLETION OF THE COURSE

To know and understand the philosophical issues of science, the main historical stages of the development of science, the leading concepts of the philosophy of science, to be able to critically evaluate and analyze scientific and philosophical problems, to understand the specifics of engineering science, to have the skills of analytical thinking and philosophical reflection, to be able to substantiate and defend one's position, to own techniques conducting discussions and dialogue, master the skills of communicative and creative in their professional activities

Higher Education Pedagogy

CODE - HUM 209

CREDIT - 4 (1/0/1/2)

Prerequisite - no

GOAL AND OBJECTIVES OF THE COURSE

The course is aimed at studying the psychological and pedagogical essence of the educational process of higher education; the formation of ideas about the main trends in the development of higher education at the present stage, the consideration of the methodological foundations of the learning process in higher education, as well as the psychological mechanisms affecting the success of training, interaction, and management of subjects of the educational process. The development of psychological and pedagogical thinking of graduate students.

SHORT DESCRIPTION OF THE COURSE

In the course of studying the course, undergraduates get acquainted with the didactics of higher education, the forms and methods of organizing education in higher education, the psychological factors of successful learning, the characteristics of the psychological impact, the mechanisms of educational influence, pedagogical technologies, the characteristics of pedagogical communication, and the learning process management mechanisms. They analyze organizational conflicts and ways of resolving them, psychological destruction and deformation of the personality of the teacher.

KNOWLEDGE, SKILLS, SKILLS FOR COMPLETION OF THE COURSE

At the end of the course, the undergraduate should know the features of the modern system of higher professional education, the organization of pedagogical research, the characteristics of the subjects of the educational process, the didactic foundations of the organization of the learning process in higher education, pedagogical technologies, the patterns of pedagogical communication, especially the educational impact on students, as well as the problems of pedagogical activity.

Psychology of management

CODE – HUM208

CREDIT - 3 (1/0/1/1)

Prerequisite - no

GOAL AND OBJECTIVES OF THE COURSE

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

GOAL AND OBJECTIVES OF THE COURSE

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

SHORT DESCRIPTION OF THE COURSE

Psychological education at the university. The psychological structure of the learning process, the psychology of cognitive activity, psychological methods and means of increasing the effectiveness and quality of education in modern conditions, the psychology of the individual and student community, the education and establishment of professional self-awareness, psychodiagnostics in higher education, the psychological characteristics of the pedagogical activity of a higher education teacher studying as a subject educational activities, psychological and pedagogical communication, psychology of pedagogical impact, the main psychological problems in pedagogical activity.

KNOWLEDGE, SKILLS, SKILLS FOR COMPLETION OF THE COURSE

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

Developed by:	Reviewed: meeting of the Institute's Board	Approved by: UMC KazNRTU	
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Geological modeling of MD

CODE - GEO209

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

Prerequisite: no

GOAL AND OBJECTIVES OF THE COURSE

The purpose of studying this discipline is to obtain knowledge, skills and abilities to work with software for three-dimensional geological modeling and evaluation of mineral reserves. To give theoretical and practical knowledge in the field of computer simulation of deposits: in relation to the tasks of geology. Deepening technological education in the field of computer technology.

SHORT DESCRIPTION OF THE COURSE

Introduction The need for computer programs for the visualization and interpretation of various geological exploration data in a 3D environment. Three-dimensional modeling of mineral deposits. Work with graphic applications. Field Modeling and Reserves Estimation with Micromine Software.

KNOWLEDGE, SKILLS, SKILLS FOR COMPLETION OF THE COURSE

To know: the methods and basic principles of geological modeling of mineral deposits as applied to problems solved in geology;

To be able to: interpret and create wireframe, block models of ore bodies based on primary geological materials; build digital surface models (DSC); visualize interpreted geological, geochemical, etc.

To have skills: apply GIS technology to solve the geological and evaluation work of minerals; evaluate ore reserves using various Micromine methods.

Metallogeny and ore formations of Kazakhstan

CODE - GEO220

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

Prerequisite: no

GOAL AND OBJECTIVES OF THE COURSE

The aim of the course is to study the basic principles of general metallogeny and familiarize with the content of regional, historical, special metallogeny for the development of the geological foundations of the mining business, as fundamental principles for the development of the mineral industry.

The main tasks of studying the discipline are to master the terminology and conceptual framework of metallogenic science and the doctrine of ore formations, the principles of metallogenic and ore-formation analysis; get acquainted with the most important types of ore formations and metallogeny elements of the oceans, platforms and folded systems from the point of view of tectonics of lithospheric plates; have an idea of the metallogenic zoning of the world, the CIS and Kazakhstan

SHORT DESCRIPTION OF THE COURSE

The concept of metallogeny and mineralogy. Total metallogeny. The concept of ore-forming processes and systems. The concept of ore formation analysis. Geological, ore, metasomatic and metallogenic formations. General principles of metallogenic research. Metallogeny of modern seas and oceans, folded-geosynclinal belts. The basics of metallogeny from the standpoint of modern geodynamics. Metallogeny of rift environments, subduction-orogenic environments, noble metals, non-metallic, ferrous, non-ferrous, radioactive, rare metals of Kazakhstan.

KNOWLEDGE, SKILLS, SKILLS FOR COMPLETION OF THE COURSE

To know: features of metallogeny and mineralogy in the regions of Kazakhstan.

To be able to: conduct an analysis of the structural diagram of various age-related formations; compile a metallogenic map according to the type of mineral; analyze metallogenic maps.

To have skills: a comparison of typical ore and geological formations in Kazakhstan compilation and analysis of geological and genetic models of typical ore formations in Kazakhstan: iron ore, gold ore, copper ore.

Petrogenic minerals

CODE – GEO484

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

Prerequisite: GEO122 Petrography

GOAL AND OBJECTIVES OF THE COURSE

is to give undergraduates knowledge about the patterns of propagation of light waves in a crystalline medium and to teach the ability to determine rock-forming minerals using a polarizing microscope.

SHORT DESCRIPTION OF THE COURSE

Refraction of light in minerals and related optical effects observed under a microscope; birefringence and optical indicatrix of minerals of various syngonies and the related optical properties of minerals; the passage of light in a polarizing microscope; conoscopic method for determining the optical axis, sign and angle of the optical axes of minerals; immersion method for determining the refractive indices of minerals; investigation and determination by the optical property of petrogenic minerals of igneous, sedimentary, metamorphic and metasomatic rocks using a polarizing microscope.

KNOWLEDGE, SKILLS, SKILLS FOR COMPLETION OF THE

COURSE To know: as a result of studying this discipline, undergraduates will gain knowledge about the laws of propagation, refraction, birefringence, and interference of light waves in a crystalline medium and the associated optical constants of minerals

To be able to: use a polarizing microscope, Fedorov's table.

To have skills: research and determination of petrogenic minerals using a polarizing microscope.

Genesis of the main industrial deposits

CODE - GEO 485

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

Prerequisite: no

GOAL AND OBJECTIVES OF THE COURSE

The aim of the course is to study the theory of the formation of deposits of various types of minerals and proposed models of formation. Objectives of the discipline: familiarity with existing ideas about the conditions for the formation of minerals; the study of individual atypical forms of ore deposits; mastering the basic principles of the theory of magmatism, metallogeny and ore formation; study of the mechanism of formation of igneous deposits; the study of the mechanism of formation of metamorphic deposits; theory of the formation of groundwater and oil and gas fields.

SHORT DESCRIPTION OF THE COURSE

Pyrite deposits of the world, pyrite-bearing provinces, ore regions and nodes, typical deposits. Classification of genetic types: Cypriot, Uralic, Brazilian type, the theory of their formation. Features of the formation of gold deposits in Kazakhstan. Spatio-temporal paragenetic relationship of uranium and gold deposits, models of their formation. Uranium deposits, iron ore, copper deposits of Kazakhstan, their world analogues and the theory of their formation.

KNOWLEDGE, SKILLS, SKILLS FOR COMPLETION OF THE COURSE

Know: industrial types of mineral deposits: iron, copper, gold, silver, lead, zinc and others. The theory of the formation of pyrite, stratiform, hydrothermal and other deposits.

To be able to: analyze the geological position of the deposit and ore occurrence, identify the structure of ore fields and bodies, draw up the order of mineral formation and recreate the tectono-stratigraphic conditions of the formation of the deposit.

Have the skills to analyze the geological, tectonic map, stratigraphic column, based on a comprehensive analysis, be able to recreate and describe the genesis of industrial types of deposits.

Modern problems of geology

CODE - GEO 202

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

Prerequisite: no

GOAL AND OBJECTIVES OF THE COURSE

About acquaintance of graduate students of the geological specialty with the main problems of modern geological science so that they know these problems, try to solve them, or at least take into account and skillfully navigate when solving theoretical and practical issues of geology during their labor activity.

SHORT DESCRIPTION OF THE COURSE

C the construction and composition of the Earth, a number of contradictions arising from the assumption of the metal composition of the inner and outer core of the earth; main sources of internal heat of the Earth; basic provisions of tectonics of lithospheric plates; The essence of thermal convection in the asthenosphere as a driving force of mobile lithospheric plates

KNOWLEDGE , SKILLS, SKILLS FOR COMPLETION OF THE COURSE

Know: BASIC e term s and course concepts SALT SNF basic laws of development of the Earth's lithosphere due to the energy and substance of the underlying layers of the planet, especially the asthenosphere .

To be able to: determine v reasons, especially manifestations action direction tectonic movement (stress) as regards the upper hard shells of the Earth - in the earth's crust and lithospheric mantle, identify the time and sequence of foundation, development and stabilization tectonic crustal structures of different rank (the structural elements of the earth crust) formed as a result of tectonic stresses and in various tectonic regimes.

Have skills: analysis causal x a connected her appearance endogenous activity of the Earth, especially manifestations tectonic stress in tectonosphere (in sections crust lithospheric mantle and Asthenosphere e as a whole), the assumption of roll and in the formation of tectonic structures of various ranks.

Actual problems of modern subsoil use

CODE – GEO483

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

Prerequisite: no

GOAL AND OBJECTIVES OF THE COURSE

The acquisition of the necessary knowledge , skills and abilities for qualified geological support and support of the subsoil use process (all types of subsoil use operations: geological exploration of the subsoil, exploration, production, use of the subsurface space and mining).

SHORT DESCRIPTION OF THE COURSE

Features of subsoil use in Kazakhstan. Analysis of modern subsoil use, taking into account the nation’s execution plan (74 and 75 steps) and Kazakhstan’s transition to international standards and rules in the field of studying and using subsoil. Studying the legislation on subsoil and subsoil use of the Republic of Kazakhstan and its regulatory legal acts, other laws of the Republic of Kazakhstan related to subsoil use and literature devoted to the problems of subsoil use.

KNOWLEDGE , SKILLS, SKILLS FOR COMPLETION OF THE COURSE

Learn from the left yat project 's contracts and licenses th at all kinds of mining operations on all types of mineral resources, work programs for exploration projects, search, evaluation, exploration plans, production, use of mineral resources and space to prospect for gold. Will be able to left yat project s geological study sites, exploration and production, as well as sites for the use of subsoil and to prospect for gold.

Basics of Petrology

CODE - GEO231

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

Prerequisite: GEO122 Petrography

GOAL AND OBJECTIVES OF THE COURSE

Most endogenous deposits are closely associated with igneous rocks, and they themselves are often the minerals. Therefore, for undergraduates in the specialty “Geology and Exploration of the MPI”, the main purpose of studying this discipline is to obtain knowledge about the composition, structure, conditions of formation of magmatites and the relationship of mineral deposits with them.

SHORT DESCRIPTION OF THE COURSE

Current data on magmas and their origin: physicochemical principles of crystallization of magmatic melts; the main causes of the diversity of magmatites; chemical and mineral composition, structures of magmatites and their genetic significance; rocks of ultramafic, basic middle, acid, foid composition and their types, varieties, conditions for the formation and connection with it of mineral deposits; their study using a polarizing microscope; igneous associations (formations) and series.

KNOWLEDGE , SKILLS, SKILLS FOR COMPLETION OF THE COURSE

Know : about the laws of formation and crystallization of magmatic melts, modern classification and nomenclature, chemical and mineral composition, structure and genesis of the main types and varieties of magmatites .

To be able to: analyze the chemical composition of rock-forming minerals, restore the conditions for the formation of igneous rocks, make an assumption about the thermodynamic, chemical and physical conditions of crystallization of rocks. Have skills: researching rock-forming minerals with a polarizing microscope .

Regional geology of the CIS countries

CODE - GEO240

CREDIT – 5 (2/0/1/2)

PREREQUISITES: Geology of mineral deposits

PURPOSE AND OBJECTIVES OF THE COURSE

Familiarization with the features of the geological structure, the history of geological development, patterns of distribution of mineral deposits and their geological position in the earth's crust of the vast territory occupied by the countries of the near abroad (CIS and Baltic States).

BRIEF DESCRIPTION OF THE COURSE

Fundamentals of tectonic zoning of the territory of the CIS and Baltic countries. Ancient platforms: Eastern European platform, Siberian platform. The folded region of the Ural-Mongolian belt: Ural-Novaya Zemlya folded area, Southern Tien-Shan. Kazakh-Kyrgyz folded region, Zaisan folded system, Altai-Sayan folded region, Sayan-Yenisei folded region. The Baikal region and Transbaikalia. Taimyr-Severozemelskaya area. Young epipleoneura plates of Eurasia: Scythian and the Turan plate, Western-Siberian plate. Areas of the Mediterranean zone of the Cenozoic (Alpine) folding within Europe: the Eastern Carpathians and the Mountainous Crimea, the Caucasus mountain region. Region of the Mediterranean belt in the Cenozoic (Alpine) folding within Asia, the Kopet Dagh and Pamir. Region of the Pacific belt of Mesozoic and Cenozoic (Alpine) folding: Verkhoyansk-Chukotsk and the Kamchatka-Koryak region. Areas of the Pacific belt of the Cenozoic (Alpine) folding: the Mongol-Okhotsk, Sikhote-Alin and Sakhalin folding areas of the Far East of Russia. Kuril and Commander islands.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

Know: the regional structures of the earth's crust of the studied territory in four positions: the principle of tectonic zoning of regional structures; the boundaries of each structure considered; know the features of the geological structure of the structure in terms of its stratigraphy and tectonics (history of development); identify the mineral structures.

Be able to: analyze the tectonic map and the map of tectonic zoning.

Have the skills to: analyze, compare the geological data of one territory with another, reproduce the history of the geological development of the region and identify structures and related types of mineral deposits.

Stratigraphic research methods

CODE - GEO 224

CREDIT – 5 (2/0/1/2)

PREREQUISITES: no

PURPOSE AND OBJECTIVES OF THE COURSE

Familiarization and assimilation of stratigraphic divisions of development within the geological structures of Kazakhstan by undergraduates.

BRIEF DESCRIPTION OF THE COURSE

Stratigraphy is a special field in the range of geological Sciences that covers the issues of historical sequence, primary relationships and geographical distribution of sedimentary, volcanogenic, volcanogenic-sedimentary and metamorphic rocks that make up the earth's crust and reflect various stages of development of the Earth. The discipline covers the stratigraphic structure, problems and correlations on the territory of Kazakhstan.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

Familiarization of undergraduates with the most important stratigraphic divisions of Kazakhstan; mastering the method of dividing sections of rock strata and identifying stratigraphic divisions of different ranks; familiarization with the principles of creating local, regional and interregional stratigraphic strata; conducting regional and interregional stratigraphic correlation.

Methods of lithological research

CODE - GEO 223

CREDIT – 5 (2/0/1/2)

PREREQUISITES: petrography

PURPOSE AND OBJECTIVES OF THE COURSE

Familiarization of students with the systematics of sedimentary rocks; methods of petrographic studies of sedimentary rocks; processes of lithogenesis, diagenesis, catagenesis and metagenesis. The General objectives of the discipline are: to study the petrography of sedimentary rocks, their accumulation processes and post-sedimentary changes; to study methods for studying sedimentary rocks; to study methods for describing sedimentary sections, constructing lithological columns and profiles, and ways to interpret them; to study methods for constructing lithological and paleogeographic maps.

BRIEF DESCRIPTION OF THE COURSE

Fundamentals of the theory of lithogenesis: hypergenesis, its factors, features of weathering in various climatic zones. Sedimentation: characteristics of transport and accumulation of sediments, sedimentary differentiation. The diagenesis of sediments. Catagenesis, compaction of sedimentary rocks and processes of mineral formation. Sedimentary facies and their types; features of sedimentary rocks of various facies. Methods of facies analysis: lithological, study of organic remains, study of the form of occurrence and structure of sedimentary rocks and their relationship with surrounding formations, methods of facies mapping.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

Know: the place of lithology in the cycle of geological Sciences; classification of sedimentary rocks, the main features of sedimentary rocks and their interpretation, stages of sedimentogenesis, processes and results of diagenetic, catagenetic and metagenetic transformations of sedimentary rocks, minerals of sedimentary Genesis. To be able to document the sedimentary sequence, to describe the lithological sections, to reconstruct on the basis of the observations of the conditions of their formation and transformation.

Have skills: graphical representation and geological interpretation of lithological data.

Fundamentals of ecological geology

CODE – GEO706

CREDIT – 5 (2/0/1/2)

PREREQUISITES: GEO 115 General geology

PURPOSE AND OBJECTIVES OF THE COURSE

The main goal of the course is to solve morphological problems related to the study of the composition, state, structure and properties of the analyzed system, its ecological and geological conditions as a whole. Retrospective tasks related to the study (or rather restoration) of the history of the formation of the object of research, the formation of its modern quality. Forecast tasks related to the study of the structure and development trends of the system under study in the future under the influence of various causes of natural and man-made origin.

BRIEF DESCRIPTION OF THE COURSE

Familiarization with the ecological functions of the lithosphere and the whole complex of environmental problems. Morphological, retrospective, and predictive tasks are solved. Theoretical basis of ecological Geology. Criteria for assessing the current state of ecosystems. Ecological, resource, ecological, geodynamic, geochemical functions of the lithosphere.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

Know: basic concepts, object, subject and tasks of ecological geology, the ratio of ecological geology and geoecology, ecological functions of the lithosphere, types of lithological systems and their ecological functions, criteria for assessing the current state of ecosystems, methodological foundations of ecological geology, the system of ecological and geological monitoring and methods of ecological and geological mapping, the content of engineering and environmental surveys, the role of environmental geology in the justification of environmental management.

Be able to: analyze the structure, historical development of ecological and geological systems, perform forecast constructions;

Have the following skills: building ecological and geological maps, organizing and conducting ecological and geological monitoring, and conducting engineering and environmental surveys.

Mineral deposits of Kazakhstan

CODE - GEO218

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

PREREQUISIT: GEO 115 General Geology

PURPOSE AND OBJECTIVES OF THE COURSE

The main task of the discipline is to obtain general information about mineral deposits in Kazakhstan, methods of their development, principles of mineral processing, etc.

BRIEF DESCRIPTION OF THE COURSE

State and prospects for the development of the mineral resource base of the Republic of Kazakhstan. Metallic minerals. Iron deposits. Manganese deposits. Deposits of chromium, titanium, vanadium. Deposits of copper. Deposits of lead and zinc. Deposits of aluminum, nickel, cobalt. Deposits of tungsten, molybdenum, tin. Deposits of tantalum, niobium, zirconium, rare earth elements. Deposits of noble metals (gold, silver). Deposit of radioactive metals. Uranium deposits. Non-metallic minerals. Deposits of building materials.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

Know: Basic concepts and definitions of mineral deposits; basic concepts used to characterize different series of deposits; Basic minerals

Be able to: Analyze data; apply different approaches to data processing, Separate ore and vein minerals; Draw up a description of the deposit; Basic minerals

Have skills: Methods for determining minerals, rocks; Skills of working with geological literature on mineral deposits of various types; Skills of working with information sources on mineral deposits of various types; Skills in working with geological, technical and legal documentation; Skills in working with information sources on mineral deposits of various types

Geological structures of ore fields and deposits

CODE - GEO208

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

PREREQUISIT: GEO 115 General Geology

PURPOSE AND OBJECTIVES OF THE COURSE

The aim of the course "Structures of ore fields and deposits" is to form undergraduates' ideas about the most important types of ore-bearing geological structures and the possibilities of using structural analysis to improve the efficiency of predictive research and prospecting and exploration.

Tasks - familiarization with the mechanisms of structure formation, mastering the methods of structural research in ore fields and deposits, the formation of skills in analysis ore-bearing structures.

BRIEF DESCRIPTION OF THE COURSE

The course examines the main types of pre-ore structures of ore fields and deposits that are most widespread and identified on the basis of structural-genetic classification. The role and main types of intra-ore and post-ore structures are analyzed, the characteristics of ore pillars are given. The necessary information from the theory of deformation as applied to rocks is given. The physicommechanical and other properties of rocks that affect the structural conditions for the localization of ore bodies and deposits are considered. The fundamentals of special methods of structural studies in ore fields and deposits are presented.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

Know: The main types of ore-bearing structures of deposits and ore fields, as well as the conditions and mechanisms of their formation and development.

Be able to: conduct a comprehensive analysis of ore-bearing structures of deposits for the purposes of forecasting, prospecting and exploration of ore bodies and deposits; predict the position of ore bodies and deposits in structures of different types.

Own: field and laboratory research methods at ore deposits.

Well Logging (Advanced)

CODE - GEO214

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

PREREQUISIT: no

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of the course is to acquaint master students with the current state of the borehole

geophysics and modern methods of interpretation of data from geophysical studies of various types of wells.

Objectives of the course: to provide advanced definitions that characterize and classify modern GIS methods; to acquaint with the physical foundations and the corresponding limitations of modern geophysical methods of well survey; consider the main aspects of metrological support and measurement accuracy of various geophysical methods; give a description of the features of the interpretation of well logs in various types geological sections

BRIEF DESCRIPTION OF THE COURSE

The course contains an information-cognitive lecture module and practical diagrams of various geophysical methods, both in the form of hard copies for visual analysis, and in digital form for acquaintance with interpretation techniques using examples of demonstration programs. The course focuses on the practical application of downhole modifications of geophysical methods, on the analysis of the conditions of their applicability and natural limitations. A number of typical problems, both purely geophysical and geological, solved by borehole geophysics are considered. The course is applied and serves to understand undergraduates the possibilities of using methods, the problems they solve and the possibilities of their application and development.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

Know: theoretical foundations of geophysical methods; relationships between petrophysical parameters and observed geophysical fields in the well; methods of geological interpretation of well logging data; rational integration of geophysical methods depending on geological and technical conditions and set practical tasks.

Be able to: conduct well logging using various geophysical methods;

- to interpret the results of processing the observed data.

Own: geophysical methods when performing well logging; modern GIS technologies; the skills of collecting, analyzing and using information necessary for making various management decisions.

GIS of uranium deposits

CODE - GEO211

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

PREREQUISIT: GEO 115 General Geology

PURPOSE AND OBJECTIVES OF THE COURSE

The main goal of the course is to familiarize the undergraduate with the theoretical and geological foundations of methods for controlling the development of mineral resources, the possibility of using methods of geophysical research to solve geological and geophysical problems in the construction and operation of oil and gas fields, as well as for production, technological, experimental research, design activities

BRIEF DESCRIPTION OF THE COURSE

Determination of parameters of productive formations and wells by geophysical methods; formation of students' theoretical foundations of methods of field geophysical research, development of students' ability to implement the acquired skills of conducting independent geophysical studies of wells and reservoirs; planning, carrying out and interpretation of the obtained results of geophysical studies for further application.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

The necessary conditions for mastering the discipline are:

Knowledge: the main indicators of the development of hydrocarbon deposits; basic properties of rocks; the basics of interpretation of well log data; the main instruments and equipment used in the conduct of geophysical research.

Ability: to use instruments and equipment for geophysical surveys of wells and reservoirs; interpret the results of geophysical studies of wells and reservoirs; determine the effectiveness of various GIS methods for solving specific operational and technical problems; to give recommendations on adjusting the well operation mode based on well logging data.

Possession: methods of calculating the main technological indicators in the development of oil and gas fields; the skills of conducting independent research of wells and reservoirs; the method of determining the composition of the fluid in the wellbore by the skills of scientific research.

Data mining

CODE - GEO285

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

PREREQUISIT: GEO 115 General Geology

PURPOSE AND OBJECTIVES OF THE COURSE

The main goal of the course is the concept of data mining as part of the information technology market, the main methodological issues of using various Data Mining tools are considered. The tasks and methods of data mining, as well as various aspects of the practical application of Data Mining are described in detail.

BRIEF DESCRIPTION OF THE COURSE

Basics of data mining. Data mining concept. Data Mining as part of the information technology market. A set of data and their attributes. Data Mining Tasks. Basics of data analysis. Data mining techniques. Data mining techniques. Classification and forecasting problems. Decision trees. Support vector machine. Nearest Neighbor Method. Bayesian classification. Clustering problem. The k-means algorithm. Search for association rules. Visualization task

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

Know: the basics of higher mathematics, physics, the basics of computing and Programming.

Be able to: solve standard professional problems using natural science and general engineering knowledge, methods of mathematical analysis and modeling.

Have skills: Possesses the skills of theoretical and experimental research of objects of professional activity.

Geology of ore-bearing regions of Kazakhstan

CODE - GEO211

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

PREREQUISIT: GEO 115 General Geology

PURPOSE AND OBJECTIVES OF THE COURSE

The main goal of the course is to familiarize future surveyors and geologists-prospectors with the geological structure of Kazakhstan, the principles of zoning, the main material complexes of rocks that determine the "face" of the main structural elements of the earth's crust in Kazakhstan, the history of their development and metallogenic specialization.

BRIEF DESCRIPTION OF THE COURSE

Regional geological and geophysical research (RGI) and geological survey work at the present stage (content, objectives, scale, mandatory methods, etc.). Elements of geological maps of various types. Types of regionalization and tasks. Definitions of the most important mining regions of Kazakhstan. Geodynamic settings of the most important mining regions of Kazakhstan and an assessment of their prospects at the present stage of study.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

A master's student can master the marked volume of knowledge in the process:

- mastering geological and metallogenic terminology, and basic definitions and concepts;
- in the learning process, read and understand the content of various geological maps (geological, tectonic, metallogenic, geochemical, etc.);
- as a result of the acquisition of skills to build stratigraphic columns, sections, various geological schemes using geophysical materials;
- with the acquisition of skills in drawing up metallogenograms for the purpose of carrying out a full-fledged metallogenic analysis and drawing up schemes of promising areas for predictive assessment of territories for certain types of minerals.

Geological support of subsoil use

CODE - GEO210

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

PREREQUISIT: no

PURPOSE AND OBJECTIVES OF THE COURSE

The main goal of the course is to familiarize with the problems of interaction between man and geological space, patterns and forecast of anthropogenic changes in the geological environment, rational subsoil use and nature protection, legislative and regulatory documents.

BRIEF DESCRIPTION OF THE COURSE

Man-made processes at mining facilities, leading to the pollution of rocks, air, water, disruption of the stability of the subsoil and changes in the landscape, are described, the methodology for choosing a rational technology for the extraction of minerals, information on the disposal of waste during the extraction of minerals and waste products. The article presents a qualitative and quantitative ecological and economic assessment of the development of deposits and the necessary environmental protection measures, an assessment of the impact of mining on the environment. An environmental analysis of the development of new deposits is given.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

must know:

- to understand and have theoretical knowledge about the ecological functions of the lithosphere and the impact of technogenic activities on the geological space

should be able to:

- to assess the impact of mining on the elements of the geological environment;

must own:

- to foresee the reasons influencing the consequences of the impact of technogenesis on the natural geological environment.

Petrochemistry

CODE - GEO306

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

PREREQUISIT: Petrography

PURPOSE AND OBJECTIVES OF THE COURSE

The aim of the course "Petrochemistry" is mastering knowledge for petrogenetic interpretation of the chemical composition of igneous rocks. Assimilation by students of knowledge about the composition and taxonomy of igneous rocks. Development of practical skills in applying modern methods of processing petrochemical data.

Tasks:

- 1.the development of basic concepts in modern concepts of the formation of rocks of various chemical composition;
2. development of the ability to control the quality of chemical analysis of rocks;
3. mastering the basic techniques for processing petrochemical data;
4. mastering the basic methods and approaches to the interpretation of petrochemical data for igneous rocks of various compositions.

BRIEF DESCRIPTION OF THE COURSE

The discipline "Petrochemistry" is aimed at mastering modern methods and approaches in the interpretation of petrochemical data for igneous rocks. Methods of chemical analysis of rocks and control of its quality, as well as sources of errors, are considered. Petrochemical modeling, Harker diagrams and trends on them, petrochemical coefficients and moduli, petrochemical recalculations, as well as statistical methods are considered. For each group of rocks (ultrabasic, basic, intermediate, granitoids), a complex of discriminant diagrams and approaches to the interpretation of petrochemical data is proposed.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

Know: basic concepts in modern concepts of the formation of rocks of various chemical composition, variations in the concentrations of rock-forming components in the chemical composition of the main groups of rocks and the main factors that determine these variations.

Be able to: evaluate the quality of chemical analyzes of rocks, competently prepare rock samples for the analysis of chemical composition.

Own: methods of petrochemical recalculations, statistical methods of processing petrochemical data, modern approaches to the interpretation of petrochemical data.

Geotectonics with the basics of geodynamics

CODE - GEO709

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

PREREQUISIT: Fundamentals of Geotectonics

PURPOSE AND OBJECTIVES OF THE COURSE

The main goal of studying the discipline is to form a coherent system of knowledge from undergraduates, borrowed from almost all areas of geological sciences and combine them into a single consistent geotectonic concept based on strict physical and chemical laws, the basis of such a concept is currently the theory of lithospheric plates.

BRIEF DESCRIPTION OF THE COURSE

geospheres (shells) as the most important structures of the Earth of a higher order; the main features of the structure, composition and development of the lithosphere, including the uppermost shells of the Earth; mechanisms of interaction of geospheres and their driving forces; methods for studying tectonic structures as the main components of the lithosphere; principles of tectonic zoning; the main tectonic structures of Kazakhstan and adjacent territories.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

Be able to:

- to carry out a joint analysis of geological and geophysical materials in order to determine the limitations in the subsequent determination of the type of geotectonic structure;
- to present geological and geophysical data as a basis for geotectonic constructions;
- logically link geological and geophysical materials when determining type of geotectonic structure.

Own:

- methods of modern tectonic analysis;
- methods of tectonic zoning.

Geochemistry of radioactive elements

CODE - GEO212

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

PREREQUISIT: GEO 115 General Geology

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of teaching the discipline is to train specialists in the field of uranium geology with in-depth knowledge of the geochemistry of radioactive elements.

The main tasks in the study of the discipline are:

- deep understanding of the conditions and factors of migration and concentration of radioactive elements in geological processes;
- to gain knowledge about the mechanisms and forms of transfer and concentration of uranium and thorium in endogenous and exogenous processes;
- to gain skills in the development of prospecting geochemical criteria and signs of uranium mineralization.

BRIEF DESCRIPTION OF THE COURSE

This discipline provides for a detailed study of the geochemistry of uranium and thorium minerals characterized by a complex and variable chemical composition, which determines the variability of their physical properties. Many of these minerals have similar external features and optical properties, are metamict and X-ray amorphous, are easily transformed under the influence of superimposed processes (metastable), and are found in fine intergrowths with other minerals.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

Know: the chemical composition of the Earth, its shells and the patterns of migration, concentration and dispersion of radioactive chemical elements in various geological processes and environments.

Be able to: analyze geochemical information and identify patterns of composition, structure and genesis of various geological formations.

Possess: the skills of thermodynamic assessment of the direction of geochemical processes and the environmental conditions necessary for their flow.

Geology of uranium deposits

CODE - GEO714

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

PREREQUISIT: no

PURPOSE AND OBJECTIVES OF THE COURSE

The main goal of this academic discipline is to gain knowledge about the deposits of radioactive raw materials and rare elements, their genesis and industrial significance.

BRIEF DESCRIPTION OF THE COURSE

Principles of classification of uranium minerals. Features of the physical and physicochemical properties of uranium minerals. Mineralogy of uranium. Conditions for the formation of primary and secondary uranium minerals. Prevalence of radioactive elements. Geochemistry of uranium in endogenous and exogenous processes. Isotope geochemistry. Radiogeochemical mapping. Geological and industrial types of uranium deposits. Classification of deposits of rare and radioactive metals.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

Having mastered the theoretical course and completing a set of laboratory tasks, the student will be able to solve the following tasks:

- classify: deposits of rare and radioactive elements; geological and industrial types of deposits;
- determine: genetic models of the formation of various types of deposits;
- to establish patterns in the placement of deposits in the continental blocks of the Earth's crust

Mineralogy of radioactive and rare earth elements

CODE - GEO227

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

PREREQUISIT: Mineralogy

PURPOSE AND OBJECTIVES OF THE COURSE

Training of specialists in the field of uranium geology with obtaining in-depth knowledge of the mineralogy of radioactive elements and their diagnostics. Students will gain knowledge on the mineral forms of finding radioactive and rare earth elements, methods of their diagnostics. Learn to distinguish paragenetic mineral associations according to the conditions of formation of specific minerals, assess the prospecting and industrial significance of the corresponding associations with the analysis of ore types and their belonging to the genetic classification of deposits.

BRIEF DESCRIPTION OF THE COURSE

This discipline provides for a detailed study of uranium and thorium minerals characterized by a complex and variable chemical composition, which determines the variability of their physical properties. Many of these minerals have similar external features and optical properties, are metamict and X-ray amorphous, are easily transformed under the influence of superimposed processes (metastable), and are found in fine intergrowths with other minerals. Evaluation of external properties and signs, even supplemented by an optical characteristic, for individual minerals may be insufficient. In such cases, diagnostics and characterization of minerals are carried out on the basis of a complex of modern analysis methods.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

Know: history, subject, tasks and methods of studying crystalline matter; fundamentals of mineralogy and methods for the determination of uranium minerals (physical,

morphological) and their classification; possession of fundamental knowledge in the field of uranium geology and related disciplines at a high level;

Upon completion of the course, students should be able to: interpret the geochemical data of rare metal and radioactive elements (uranium and thorium and REE), determine by the optical, physicochemical characteristics of the minerals of the ores of rare and radioactive elements, master the methods of visual diagnostics of common minerals; generalize the parameters of elementary cells of minerals and diagnose them by their characteristic properties; carry out independent

Master's thesis defense

CODE – ECA 203

The CREDIT – 12

The purpose of the master's thesis is:

demonstration of the level of scientific/research qualification of a master's student, the ability to independently conduct scientific research, checking the ability to solve specific scientific and practical problems, knowledge of the most general methods and techniques for solving them.

BRIEF DESCRIPTION

Master thesis – graduation qualification scientific work, which is a generalization of the results of independent studies undergraduates one of the pressing problems of a particular specialty relevant branch of science that has internal unity and reflects the progress and results of the development of the chosen topic.

Master's thesis-the result of research /experimental research work of a master's student, conducted during the entire period of study of the master's student.

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

- the work should be carried out research or solve current problems in the field of geology and exploration of solid mineral deposits
- the work should be based on the identification of important scientific problems and their solution;
- decisions must be scientifically based and reliable, have internal unity; - the dissertation work must be written individually;

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