

*Federal State Autonomous Educational Institution for Higher Education
«Peoples' Friendship University of Russia»*

Engineering academy

SUMMARY OF THE ACADEMIC COURSE

Educational program

05.04.01 «Geology». Innovative technologies in search and investigation of solid minerals

05.04.01 «Geology». Innovative technologies in search and investigation of oil and gas deposits

Course name	<i>Foreign language for engineering students</i>
Course volume	6 ECTS credits (216 academic hours)
Summary of the course	
Names of course units	Summary of course units:
Institute of science and technology (Foreign countries) 1st semester	Special character of science and technology institute in foreign countries and in Russia. The ability to compare this knowledge in communication.
Specific culture 1st semester	Rules and standards of communication in a professional scientific-technical sphere in foreign countries and in Russia.
Understanding oral reports 1st semester	Developing the ability to understand oral reports and long-lasting' discourses in a foreign language on topics of engineering.
Articles 1st semester	Written general scientific/highly technical articles in the sphere of engineering specialty in a foreign language.
Patents 1st semester	Engineering patents in a foreign language.
Formal letter 1st semester	Complex argumentation in formal letters in a foreign language.
Unprepared talk 2 nd semester	The ability to conduct an unprepared conversation on general scientific and technical topics in the engineering sphere.
Prominent scientists in engineering (with regard to the field of study) 2nd semester	Prominent scientists in science and technology. History and development trends of science and technology in foreign countries and in Russia.
Discussion 2nd semester	Discussion on general scientific and highly technical problems. The ability to express opinion in a foreign language.
Argumentation 2nd semester	Logical argumentation in a foreign language. Arguments and counterarguments.
Report 2nd semester	Report on the given general scientific topic in a foreign language.
Presenting scientific and technical terms in a professionally oriented discourse 2nd semester	Scientific and technical terms in the field of engineering in a foreign-language-and Russian texts.
Logic of scientific reasoning 3rd semester	Composition, motives, pragmatic attitude of a scientific text in a foreign language.
Text abstracting 3rd semester	Finding key sentences in the text. Getting information. Abstract review.
Main idea and author's position 3rd semester	Finding the main idea of the text. Author's attitude to the problem described.

Abstract 3rd semester	Abstracting a text on engineering in a foreign language. The ability to express one's own attitude to the problem under discussion.
Review 3rd semester	Review with a presentation of latest developments in engineering.
Formal talk 3rd semester	Conversation on professional/scientific /production topics.

Developers:

D. Ed, Prof..

FLD EA

N.N. Gavrilenko

senior teacher

FLD EA

V.A. Chauzova

Head.

FLD EA

S.V. Dmitrichenkova

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SUMMARY OF THE DISCIPLINE

Educational program

05.04.01 «Geology». Innovative technologies in search and investigation of solid minerals

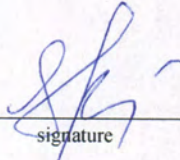
05.04.01 «Geology». Innovative technologies in search and investigation of oil and gas deposits

Name of discipline	<i>Foreign language for engineering students (course 2: Russian for foreign students)</i>
Discipline volume	6 ECTS credits (216 academic hours)
Summary of discipline	
Name of sections (subjects) of discipline	Summary of sections (subjects) of discipline:
Section 1. Scientific speech and its features	1) Scientific style of the speech and its substyles: actually scientific; popular scientific; educational and scientific; scientific and business; scientific and help. Lexical features of scientific style of the speech. Terminological lexicon of scientific prose. Grammar of the scientific speech. Ways of statement in scientific style (functional and semantic types of the speech): description, narration, reasoning. 2) Oral form of the scientific speech. Oral scientific genres: monological (the scientific report, the scientific message, a protective word, a lecture, the oral answer at examination) and dialogical (a scientific discussion, a seminar, poll). Idiosyncrasies of oral scientific communication.
Section 2. Specific types of activity in the sphere of science	1) Organization of work with scientific literature. Rules of drawing up bibliography. The first scientific work. How to write the scientific article. Standards of creation of the scientific publication: - introduction; - indication of methods of researches; - main results and their discussion; - conclusion (conclusions); - the list of the quoted sources 2) Oral report. Computer programs for the presentations (PowerPoint, Persuasion, etc.)
Section 3. Creation of secondary scientific texts	Concept about secondary scientific texts. Concept of secondary informational content. Types of secondary texts: scientific and information (abstract) and scientific and critical (estimating). Communicative mediatorial function of secondary texts.

	Theses as scientific genre. Regulatory requirements: substantial compliance to in advance announced problem subject; scientific and informative validity, relevance and value of information; rubrification; concept of stylistic purity and uniformity of a speech manner; the modal claiming judgment or conclusion. Summary as oblate, logically accurate and clear statement of the main ideas of the text original. Three stages of preparation of the summary of the scientific text: reading, semantic analysis and reflection. Compression and editing. How to write the summary. Composition structure and substantial filling: statement of a problem; problem solutions; the received results; conclusions. Ability to define a subject of each substantial element. The syntactic designs used for writing of the summary.
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Developers:

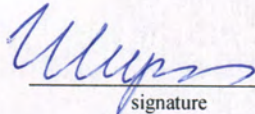
professor of department of Russian language
of Engineering academy


signature

L.P. Yarkina

Department director

Russian language of Engineering academy


signature

I.A. Pugachev

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Educational program

05.04.01 «Geology». Innovative technologies in search and investigation of solid minerals

05.04.01 «Geology». Innovative technologies in search and investigation of oil and gas deposits

Name of discipline	<i>Natural sciences philosophy (Philosophy of science)</i>
Discipline volume	2 ECTS credits (72 academic hours)
Summary of discipline	
Name of sections (subjects) of discipline	Summary of sections (subjects) of discipline:
Science in the system of modern culture.	The place of science in the system of culture. Natural science as a branch of scientific knowledge. The concept of the relationship of philosophy and science. The mechanism and forms of interconnection of modern science and philosophy. Science, pseudoscience and parascience. Natural science and morality. Change of value orientations and the problem of humanization of science. The role of science and scientific knowledge in solving global problems of modern civilization.
The specifics of scientific knowledge, its structure and dynamics.	Scientific knowledge as a complex developing system. Empirical and theoretical levels, their structure. The ratio of empirical and theoretical in science. Theoretical models and laws. The method of hypotheses in the construction of theories. Structure of scientific explanation. Subject, object, subject of knowledge. The driving forces of knowledge. The problem of truth in scientific knowledge. Truth as a mode of existence of knowledge. The evolution of concepts of understanding truth and its criteria. Science is classical, non-classical, post-non-classical.
Genesis and evolution of the natural science picture of the world.	The concept and function of the scientific picture of the world. The concept of scientific revolution (T.Kun) and research programs (I.Lakatos). The concept of a paradigm research program. The main types of scientific revolutions and the change of world pictures (mechanical, electromagnetic, quantum-relational, synergistic). Ontological and epistemological significance of the theory of relativity A. Einstein.

The problem of the unity of the world: a synthesis of philosophical and natural science approaches.	The problem of the unity of the world in philosophical ontology. Ontology as a search for common between specific objects of different spheres of being. Differences ontological and physical pictures of the world. The evolution of the concepts of matter, motion, space and time in philosophy and natural science.
The specifics of the implementation of the principles of evolution, system, determinism and self-organization in modern natural science.	System ideas in philosophy and science. The concept of natural science objects as systems (simple, complex, self-regulating, and complex self-organizing). The problem of the penetration of evolutionary ideas into science. The principle of causality from Democritus to the present day. Causality and birth of new knowledge. Synergetics and global evolutionism as the basis of modern science.
The problem of the origin of life and the diversity of its forms. Determination of the place and role of man in the nature-society-man system.	The role of philosophical reflection in the development of life sciences. The concept of "life" in the natural science and philosophical discourses. The variety of approaches to the definition of the phenomenon of life. VI Vernadsky about "living matter" ("living matter"). The doctrine of the biosphere and the noosphere.

Developers:

Lead Educator of the department of ontology and theory of knowledge


signature

O.G. Arapov

Head,
department of ontology and theory of knowledge


signature

V.N. Belov

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Engineering academy

SUMMARY OF THE DISCIPLINE

Educational program

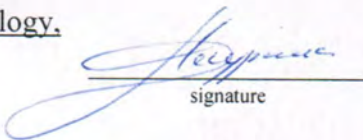
05.04.01 «Geology». Innovative technologies in search and investigation of solid minerals

05.04.01 «Geology». Innovative technologies in search and investigation of oil and gas deposits

Name of discipline	History and methodology of geological sciences
Discipline volume	2 ECTS credits (72 academic hours)
Summary of discipline	
Name of sections (subjects) of discipline	Summary of sections (subjects) of discipline:
Section 1. Introduction.	Geology as part of world culture. Becoming of geology. Definition of methodology of geological sciences.
Section 2. History of geological sciences.	Geology history from an extreme antiquity up to now. Fundamental value of geological sciences in development of humanity. Origin of the separate branches of geology as self-contained scientific directions. Becoming of scientific concepts.
Section 3. Historical stages of development of geology.	Prescientific stage of development of geology. Scientific stage of development of geology. The second half of the 13th century. The newest period of development of geology (the 60th years of the XX century – the recent period).
Section 4. Methodology in geology and mining.	Method and methodology. Classification of methods. Main models of a ratio of philosophy and geological sciences. Functions of philosophy in scientific knowledge. General scientific receptions of researches. Comprehension and explanation. Methodology and methods in investigation of fields.

Developers:

Associate Professor of department of geology,
mining and oil and gas engineering


signature

D.L. Neguritsa

Department director

geology, mining and oil and gas engineering


signature

E.V. Kiselevskiy

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05.04.01 «Geology». Innovative technologies in search and investigation of solid minerals

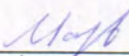
05.04.01 «Geology». Innovative technologies in search and investigation of oil and gas deposits

Name of discipline	<i>Computer technologies in geology</i>
Discipline volume	2 ECTS credits (72 academic hours)
Summary of discipline	
Name of sections (subjects) of discipline	Summary of sections (subjects) of discipline:
Section 1. General issues of computer processing of geological information.	Sources and types of geological information, formalization of geological data. Computer representation of raster, vector, numerical and text data, formats of files, transformation of formats, converters.
Section 2. The specialized computer programs used for the solution of geological tasks.	Graphic and text editors commercial and the free use. Programs for the analysis and display of numerical data. Vectorizers. Programs of creation of cards in isolines, columns of boreholes. Programs of data processing of remote sensing of Earth.
Section 3. Geographic information systems in geology.	Geographic information systems of general purpose commercial and the free use. Specialized mining-and-geological information systems.

Developers:

Senior lecturer of department of geology,

mining and oil and gas engineering


signature

V. E. Markov

Department director

geology, mining and oil and gas engineering


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E. V. Kiselevskiy

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05.04.01 «Geology». Innovative technologies in search and investigation of solid minerals

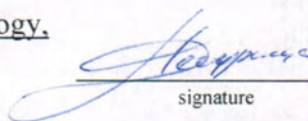
05.04.01 «Geology». Innovative technologies in search and investigation of oil and gas deposits

Name of discipline	Modern problems of geology
Discipline volume	2 ECTS credits (72 academic hours)
Summary of discipline	
Name of sections (subjects) of discipline	Summary of sections (subjects) of discipline:
Section 1. Introduction	The purpose and objectives of the course. Methodology of science. The history of the formation of ideas about the geological development of the planet. Leading scientists who have made the most significant contribution to the development of modern concepts and the formation of geology. The relationship of geology with other sciences in the system of Earth sciences. Planets and asteroids. The origin of the Earth and planets.
Section 2. Modern problems of geodynamics	Modern geodynamic theories and history of the Earth's crust. The concept of tectonics of lithospheric plates. The concept of plume tectonics. The general direction and cyclical evolution of the Earth. Petrochemical composition and structure of the Earth's shells as a reflection of the endogenous differentiation of its substance
Section 3. Mantle-crust ore-forming systems.	Magmatism and geodynamics. Global features of the magmatism of hot spots and fields. Magma and ore. Problems in connection magmatism and mineralization.
Section 4. Problems of metamorphism and metasomatism.	Metamorphism and geodynamics. Metasomatism and its role in the formation of the modern appearance of the crust.
Section 5. Problems of stratigraphy. Biosphere	The origin of life on Earth. The evolution of life. The causes of the great extinctions. Continuity, gradual or discontinuous, spasmodic geological processes and the evolution of life on Earth. The evolution of the organic world. Uniformism and catastrophism. Ecological communities.
Section 6. The evolution of the environment and the biosphere.	Evstatic fluctuations in sea level. Gas composition of the atmosphere and ozone screen. Paleoclimate evolution. General provisions of aleoclimatology. History of paleoclimate. Great glaciations on Earth: their

	number and causes. Ocean currents, upwelling and stagnation. waters Ion-salt composition and salinity of the waters of the world ocean. Magnetic field inversions and cosmic radiation. Fall of planetesimals and asteroids. Paleobiogeographic zoning and evolution of ecological communities.
Section 7. Mineral Resources	Types of mineral raw materials. Mineral resources at the end of the xx century. Mineral resources of Russia. The problem of recreating the reserves of strategic types of minerals. The main tasks for improving and strengthening the mineral resource base. The problem of integrated use of raw materials. Innovation activity as a factor in expanding the resource base of the mineral industry.
Section 8. Objects of geoecology.	Ecogeology. New tasks of geology. The main sources of pollution. The problem of environmental pollution.

Developers:

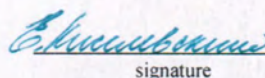
Associate Professor of department of geology,
mining and oil and gas engineering


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D.L. Neguritsa

Department director

geology, mining and oil and gas engineering


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E.V. Kiselevskiy

*Federal State Autonomous Educational Institution for Higher Education
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Engineering academy

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05.04.01 «Geology». Innovative technologies in search and investigation of solid minerals

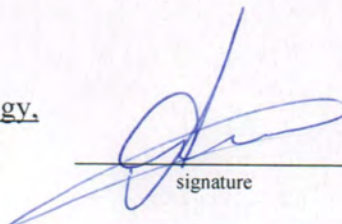
05.04.01 «Geology». Innovative technologies in search and investigation of oil and gas deposits

Name of discipline	The modern problems of economy, organization and management in exploration works and subsoil use
Discipline volume	2 ECTS credits (72 academic hours)
Summary of discipline	
Name of sections (subjects) of discipline	Summary of sections (subjects) of discipline:
Section 1. Characteristics of the mineral resource base (exploration and production)	Russia's position in the mineral complex of the world. State and use of the mineral base of Russia. The value and role of modern' technology in the search, exploration and production of mineral raw materials. The role of secondary raw materials in the balance of stocks. External factors affecting the development of the mineral industry (high energy intensity of raw materials processing, the raw material nature of the economy, the crisis state of the world economy, geopolitical factors).
Section 2. Problems of reproduction of the mineral resource base of the Russian Federation.	Incomplete compensation of production by increment of reserves. Reduced search backlog. The issue of personnel in the geological industry. Uneven distribution of mineral resources (shortage of raw materials, unallocated deposits and "frozen deposits", depletion of reserves within the old areas of raw materials extraction).
Section 3. Problems of pricing and financing of exploration.	Methodology of formation and pricing of products of geological study of the subsoil in the conditions of market relations. The concept of improving the pricing system for geological study of mineral resources and the reproduction of the mineral resource base, financed by the federal budget.
Section 4. Mineral resources and subsoil use in a globalized economy.	The mineral resource base of the Russian Federation in a globalized economy. Geological service and mineral resource base of the Russian Federation at a new stage of development. Priorities of the mineral resource policy of the Russian Federation.

Section 5. The raw material security of the Russian Federation in the 21st century.	Mineral resources base and geological service in ensuring raw material security. Vulnerable side of the mineral resource policy of the Russian Federation. Destabilizing factors.
Section 6. Subsoil use problems.	The question of the organization of subsoil use processes. Licensing practice. The problem of reproduction of reserves and resources (investment in exploration). Reserves to improve the efficiency of subsoil use.
Section 7. Objectives of legislation in the field of subsoil use.	Resource potential as an object of state regulation. The tasks of legislative support of the mineral complex. The basic principles of the new legislation on subsoil.
Section 8. Improvement of mining legislation	Legal aspects of subsoil use in Russia. Taxation in the field of subsoil use. The impact of world prices for minerals and financing of mining projects.

Developers:

Assistant professor of department of geology,
mining and oil and gas engineering
position, name of department



signature

V. Yu. Abramov
initials, surname

Department director

geology, mining and oil and gas engineering
position, name of department



signature

E. V. Kiselevskiy
initials, surname

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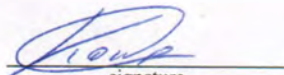
05.04.01 «Geology». Innovative technologies in search and investigation of solid minerals

05.04.01 «Geology». Innovative technologies in search and investigation of oil and gas deposits

Name of discipline	<i>Geological principles of mineral exploration</i>
Discipline volume	6 ECTS credits (216 academic hours)
Summary of discipline	
Name of sections (subjects) of discipline	Summary of sections (subjects) of discipline:
Subject, history, main questions	Subject and objects of a research. The place of discipline in the system of sciences. Relation of the course with disciplines of geological and economic cycles. The history of development of the doctrine about exploration of mineral deposits. The major concepts and terms.
Geology of mineral deposits	Classification of mineral deposits. Industrial types of metallic mineral deposits. Deposits of ferrous, colored (non-ferrous), precious, rare and rare-earth, radioactive metals. Deposits of non-metallic minerals. General information about industrial deposits of non-metallic minerals. Chemical and agronomic raw materials Industrial raw materials. Industrial rough semi-precious stones. Industrial minerals (construction materials). Hydrocarbon fields.
Mineral exploration	Stages of exploration works. Search geological criteria (prerequisites) and signs. Search of mineral deposits. Classification of search on the conditions and methods of work. Methods of search (mineralogical, geochemical, geophysical, etc.). Search of the overlapped deposits.

Developers:

associate professor of department of geology,
mining and oil and gas engineering


signature

A. E. Kotelnikov

associate professor of department of geology,
mining and oil and gas engineering


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E.V. Karelina

Department director
geology, mining and oil and gas engineering


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Educational program

05.04.01 «Geology». Innovative technologies in search and investigation of solid minerals

05.04.01 «Geology». Innovative technologies in search and investigation of oil and gas deposits

Name of discipline	<i>The study of facies</i>
Discipline volume	2ECTS credits (72academic hours)
Summary of discipline	
Name of sections (subjects) of discipline	Summary of sections (subjects) of discipline:
Introduction	Subject, the place of discipline in geological sciences. The concept of facies.
Depositional environments, the field of sedimentation. Litoral.	Marine depositional environments. Litoral basins with terrigenous sedimentation. Litoral basins with carbonate sedimentation
The shelf is a relatively shallow region	Shelf basins with terrigenous sedimentation. Shelf basins with carbonate sedimentation
Relatively deep-water region - the continental slope and its foot	The processes of sedimentation, and models of sections of sediment gravity flows and bottom. Depositional environments; types of accumulative structures and collects their deposits. Transitional (pelagic) types of precipitation. Clinoform oil accumulation structure
The abyssal region of the ocean	Environment and the types of precipitation. Ore formation on the ocean floor. Ancient facies of pelagic sedimentation
Continental area of sedimentation	Accumulative plain humid climate. Accumulative plain of arid climate. Region foothill plains and intermountain hollows. The continental glaciation. The area of terrestrial volcanism
The transitional region of sedimentation.	Oculonasal lagoon. Presstexas lagoon.

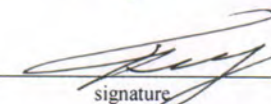
Developers:

Assistant professor of department of geology,
mining and oil and gas engineering


signature

V.M. Bugina

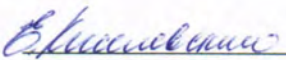
Professor of department of geology,
mining and oil and gas engineering


signature

A.F. Georgievsky

Department director

geology, mining and oil and gas engineering


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E.V. Kiselevsky

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Educational program

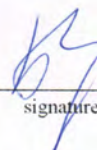
05.04.01 «Geology». Innovative technologies in search and investigation of solid minerals

05.04.01 «Geology». Innovative technologies in search and investigation of oil and gas deposits

Name of discipline	<i>Lithofacies analysis at exploration and development</i>
Discipline volume	2 ECTS credits (72 academic hours)
Summary of discipline	
Name of sections (subjects) of discipline	Summary of sections (subjects) of discipline:
Introduction	The concept of facies and their correlation with genetic types of deposits. The role of the principle of actualism and comparative - lithological method in the formation of facies analysis. The application of the law Walter to correlate facies and possible limitations of its use.
Depositional environments, the field of sedimentation	The shelf is a relatively shallow region. Continental area of sedimentation. Relatively deep-water region - the continental slope and its foot. Litoral. The abyssal region of the ocean.
The reconstruction of the Genesis of sedimentary rocks and sediments. The main stages of facies analysis	Species-indicators of facies, according to the peculiarities of the mineral composition, structures and textures, geochemical parameters, paleontological remains. The technique to build lithological columns, diagrams, correlations, lithofacial profiles, lithological, facies and paleogeographic maps.

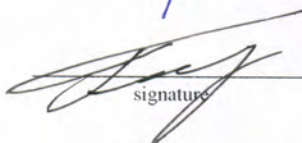
Developers:

Assistant professor of department of geology,
mining and oil and gas engineering
position, name of department


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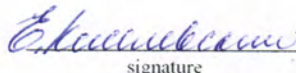
V.M. Bugina
initials, surname

Professor of department of geology,
mining and oil and gas engineering
position, name of department


signature

A.F. Georgievsky
initials, surname

Department director
geology, mining and oil and gas engineering
position, name of department


signature

E.V. Kiselevsky
initials, surname

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05.04.01 «Geology». Innovative technologies in search and investigation of solid minerals

05.04.01 «Geology». Innovative technologies in search and investigation of oil and gas deposits

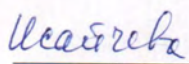
Name of discipline	Innovative technology of application of a nuclear magnetic resonance method
The amount of discipline	2 ECTS credits (72 academic hours)
Summary of the discipline	
Name of sections (topics) of the discipline	Summary of sections (topics) of the discipline:
1. Physical basis of nuclear magnetic resonance (NMR) in a "strong" field.	Bloch equations for magnetization. Equipment and methods of NMR measurements. The orientation of the protons. The deviation of the spins. Ermolova frequency. Gyromagnetic ratio. Precession. Skew. Free induction attenuation. Refocusing. Spin echoes. Spin-lattice and spin-spin relaxation. The Carr-Parsell-Meibum-Gill pulse sequence (CPMG). Diffusion in inhomogeneous magnetic fields. Experimental methods of observation of nuclear magnetic resonance effects.
2. Petrophysical bases of NMR.	Surface relaxation. Diffusion relaxation. Volume relaxation.
3. Fields of application of NMR and solved geological problems.	The selection of the collectors. Pore size distribution, porosity, permeability. Typing of hydrocarbons. Determination of fluid saturation.
4. Model of capacitive space	Treatment of the relaxation curve. Relaxation time. Multi-exponential decline. Differential and integral distribution. The range of porosity distribution in relaxation times. Components of porosity: the porosity of the clay, capillary bound, residual, effective, cavernoma, the pore capacity. Integration of differential spectra in time intervals with petrophysical justified boundaries.
5. Permeability models.	Timur's Model. Coates Model. Model of logarithmic mean relaxation time. Lattice model.
6. Fluid saturation model.	Special measurement modes. Magnetization time and delay time between pulses. Typing of hydrocarbons. Evaluation of the contribution of bulk relaxation. The diffusion coefficient and viscosity of fluid. Assessment of the saturation. The residual (irreducible) water saturation. Influence viscosity and wettability on the oil signal in the

	relaxation time distribution. The influence of the gas.
7. Petrophysical provision of NMR.	Laboratory studies of fluids, core and sludge. The definition of porosity, permeability and characteristics of displacement in capillarimetry (with change of conductivity by pressure stages).
8. The integration of NMR with other methods GIS.	Refinement of the parameters of the interpretation model. Evaluation of the hydrogen content of the solid phase with the refinement of the mineral composition. Clarification of mineralogical density of rocks. Total porosity of the clays (the coefficients of porosity of cement, the relative clay content on). Estimation of oil and gas saturation coefficients. Model of electrical conductivity of clay sandstones. The relationship "GIS""GIS".

Developers:

senior lecturer

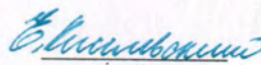
geology, mining and oil
and gas engineering


signature

E.G. Isaycheva

**Department
director**

geology, mining and oil
and gas engineering


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E. V. Kiselevskiy

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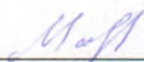
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05.04.01 «Geology». Innovative technologies in search and investigation of oil and gas deposits

Name of discipline	Math modeling of geological tasks
Discipline volume	6 ECTS credits (216 academic hours)
Summary of discipline	
Name of sections (subjects) of discipline	Summary of sections (subjects) of discipline:
Section 1. General information about the mathematical modeling of geological objects	The concept of geological objects, their properties and a selective method of study. Principles of mathematical modeling, types of mathematical models used in geology, examples of mathematical models.
Section 2. One-dimensional geological model and its application in geology.	Statistical characteristics of a random variable, laws of distribution of random variables, geological applications of a one-dimensional statistical model.
Section 3. Two-dimensional geological model and its application in geology.	Statistical characteristics of a system of two random variables. Correlation and regression analyzes. Geological applications of the two-dimensional statistical model.
Section 4. Multidimensional geological model and its application in geology.	The system of sets of random variables and its statistical characteristics. Multiple regression, dispersion, discriminant, factor and cluster analyzes.
Section 5. Mathematical modeling of spatial geological patterns.	Deterministic and probabilistic models of geological fields (linear, polynomial and other interpolation models, time series analysis), basics of geostatistics.

Developers:

Senior lecturer of department of geology,
mining and oil and gas engineering


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V.E. Markov

Department director

geology, mining and oil and gas engineering


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E.V. Kiselevskiy

*Federal State Autonomous Educational Institution for Higher Education
«Peoples' Friendship University of Russia»*

Engineering academy

SUMMARY OF THE DISCIPLINE

Educational program

05.04.01 «Geology». Innovative technologies in search and investigation of solid minerals

Name of discipline	Integration of geophysical methods for search of mineral deposits
Discipline volume	9 ECTS credits (324 academic hours)
Summary of discipline	
Name of sections (subjects) of discipline	Summary of sections (subjects) of discipline:
Section 1. Methodological basis for the integration of geophysical methods	Basic concepts and definitions. The purpose and objectives of the guidelines for the integration and staged implementation of geophysical, hydrodynamic and geochemical studies of the fields of PI.
Section 2. Complex analysis and complex interpretation of geophysical data	Tasks of complex analysis and complex interpretation. Evaluation of the informativeness of geophysical methods and their complex. Comprehensive analysis of geophysical data in the presence / in the absence of reference objects. Quantitative methods for complex interpretation of geophysical data. Geological interpretation of complex geophysical data.
Section 3. Definition of a complex of geophysical studies at various stages of geological exploration	Stages of geological and geophysical works. Principles of choosing a complex at various stages. Integration of geophysical methods as a means of reducing the degree of ambiguity of geological interpretation of geophysical data and material costs for geological exploration. Typical geophysical complexes in geological mapping. Evaluation of the geological and economic efficiency of the complex as a whole.
Section 4. Choosing a geophysical complex	The basic principles of the choice of the geophysical complex. Selection of a typical complex of geophysical methods. The choice of a rational complex of geophysical methods. Selection of the optimal complex of geophysical methods.
Section 5. Physical-geological modeling	The formation of FGM and their classification. Petrophysical modeling. Geometric parameters of sources of geophysical anomalies. Interference effect Accuracy of observations and a network of geophysical surveys.

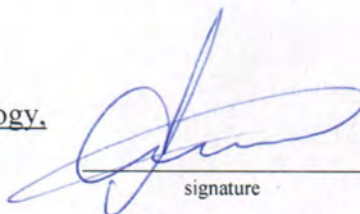
Section 6. Geophysical methods for studying the tectonics and geodynamics of regions	Basics of tectonics and geodynamics. The main provisions of the tectonics of lithospheric plates. The location of the continents in the geological past. Paleogeographic schemes. Igneous, metamorphic rocks and mineragenic specialization of various zones of the earth's crust.
Section 7. Geophysical methods in the study of the deep structure of territories and waters. Tectonic zoning of the territory of Russia.	The role of geophysical research in the study of the deep structure of the continental and oceanic crust. Integration of geophysical methods in the study of the earth's crust. Rheological and seismic stratification of the earth's crust. Tectonic zoning of the territory and shelf regions of the Russian Federation. Regional mineral forecasting.
Section 8. Physical heterogeneity of the "upper crust" and sedimentary rocks	Rheological properties, seismic and electromagnetic boundaries of the upper crust. The dependence of the physical properties of crystalline rocks on their composition and structure. Petrophysical characteristics of the upper part of the oceanic crust. Patterns of physical heterogeneity and geophysical anomalies. Global zoning of sedimentation.
Section 9. Complexes of geophysical methods in the search for, evaluation and exploration of solid minerals	GKZ requirements for the completeness of geophysical research by stages. Complexes of geophysical methods in the search, evaluation and exploration of noble metals, ferrous metals, non-ferrous metals.
Section 10. Integration of geophysical methods in the search and exploration of coal deposits, oil shale, sedimentary deposits	Integration of geophysical methods in the search and exploration of combustible minerals (peat, brown and black coal), sedimentary mineral deposits. Typical complexes of geophysical methods at the stage of prospecting. Deposits of the weathering crust. Bauxite deposits. Types of work on bauxite. Residual deposits of the weathering crust of ultrabasic rocks.
Section 11. Geophysical and geochemical methods for prospecting and exploration of ore deposits	Geophysical and geochemical methods for prospecting and exploration of magmatic and metamorphogenic deposits. Main geotectonic zones and ore formation processes. Geological factors controlling the location of deposits and the localization of ore bodies, their mapping in physical fields. Physical-geological models of ore fields and deposits of chromite, copper-nickel sulfide ores, iron metamorphogenic ores. Integration of geophysical and geochemical methods for prospecting and exploration of self-magmatic and metamorphogenic mineral deposits.
Section 12. Integration of geophysical methods in the search and exploration of uranium deposits	Deposits of uranium. Typification and placement of deposits. Background natural radioactivity and anomalies of radioactivity over deposits. Integration of geophysical methods at

	various stages of prospecting and exploration of uranium deposits.
Section 13. Integration of geophysical methods in the search for diamondiferous kimberlites	Kimberlite pipes. Yakut kimberlite-bearing province. Features of the method works. Field localization factors. Ring structures. The manifestation of the Arkhangelsk diamondiferous province in geophysical fields. Methods of exploration. Methods of screening anomalies. The use of modern processing algorithms. Typical sets of methods at various stages of exploration.
Section 14. Complexes of geophysical methods in the search, evaluation and exploration of hydrocarbons.	Contouring and studying the morphology of sedimentary basins. Exploratory work aimed at identifying oil and gas structures within the basins. Geological, regional and methodological features of oil and gas exploration. Development and enhancement of the role of gravity prospecting, magnetic prospecting, electrical exploration and geochemical exploration methods in the complex of exploration and exploration of hydrocarbon raw materials. Nature and habitats of gas hydrates. Prospects for the development of gas hydrates as an energy raw material. Methods for mapping gas hydrates deposits.
Section 15. Integration of geophysical methods in the regional study of the seas of Russia and the determination of the prospects for their petroleum potential	Осадочные бассейны морей РФ. Формирование современных представлений о геологическом строении и истории развития регионов. Структура осадочного чехла регионов. Геофизические поля и плотностные модели земной коры. Изучение строения земной коры на геотраверсах. Структура земной коры и размещение месторождений газа и нефти. Анализ вещественного состава фундамента. Осадочные бассейны центральной области Северного Ледовитого океана. Проблема определения внешней границы шельфа Российской Федерации.
Section 16. Geophysical methods in the search for groundwater and engineering-geological research	Geophysical methods in the search for groundwater and engineering-geological research. The search for groundwater. Searches and exploration of fresh water in arid areas. Artesian water. Permafrost groundwater. Study of the dynamics of groundwater. The study of areas dangerous for landslides. Irrigation survey. Engineering and geological tasks. The study of the upper part of the section in connection with the construction of buildings and structures. Mapping of voids and fractures. Geophysical manifestation of karst. Seismic micro zoning.

Section 17. Integrating geophysical methods for solving practical problems. Deep geophysics.	Earth's structure according to geophysical data. The structure of the subsoil under the oceans. Tectonics of lithospheric plates and continental drift.
Section 18. Regional and search mapping geophysics	Regional geophysical studies. Medium / large scale mapping.
Section 19. Oil and Gas Geophysics	Search for oil and gas. Exploration of hydrocarbon deposits. Oil and gas reservoir modeling.
Section 20. Ore, non-metallic and coal geophysics.	Prospecting and exploration of ore deposits. Searches and exploration of non-metallic minerals. Searches and exploration of coal deposits.
Section 21. Engineering geophysics.	Geological environment and features of its research by geophysical methods. Hydrogeological and soil-meliorative geophysics. Engineering geological geophysics. Glaciological geophysics. Archaeological and technical geophysics.
Section 22. Environmental geophysics.	Methods of geophysical research in geocology. Ecological and geophysical studies and monitoring of geodynamic natural and man-made processes. Ecological and geophysical studies and monitoring of material (geochemical) environmental pollution. Technogenic physical pollution. Medical geophysics.
Section 23. Geoecological studies.	Depletion of natural resources. Typical tasks. Technique ecogeophysical work. The role of traditional geophysical methods in ecology. Ecogeochemical studies. Radar sensing. Laser remote monitoring. The use of laser luminescence in assessing the direction and speed of movement of groundwater or currents in water bodies. Geoecological studies in the search and development of offshore hydrocarbon fields.

Developers:

Assistant professor of department of geology,
mining and oil and gas engineering



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V.Yu. Abramov

Department director

geology, mining and oil and gas engineering



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E.V. Kiselevskiy

*Federal State Autonomous Educational Institution for Higher Education
«Peoples' Friendship University of Russia»*

Engineering academy

SUMMARY OF THE DISCIPLINE

Educational program

05.04.01 «Geology». Innovative technologies in search and investigation of solid minerals

Name of discipline	Innovative technologies of researches of petrophysical properties
Discipline volume	9 ECTS credits (324 academic hours)
Summary of discipline	
Name of sections (subjects) of discipline	Summary of sections (subjects) of discipline:
Section 1. Types of physical fields of the Earth	Study of the natural and artificial fields of the Earth
Section 2. The effect of density properties of minerals and rocks on the gravitational field.	Studying the properties of minerals and rocks, determining the influence of density properties of minerals and rocks on the gravitational field.
Section 3. Effective density and porosity and methods of its measurement.	Innovative methods for measuring the density of rocks, innovative methods for measuring the porosity of rocks
Section 4. Densitometry	This section discusses what densitometry is, how it is performed. The advantages of conducting densitometry.
Section 5. Study of the effect on the geomagnetic field.	Effect of magnetic properties of minerals on the geomagnetic field. The influence of magnetic properties of rocks on the geomagnetic field.
Section 6. Innovative methods of studying minerals and rocks.	Effective magnetic susceptibility and residual magnetization. The essence of the paleomagnetic method. The study of the influence of electrical properties of minerals on electric fields. The study of the influence of electrical properties of rocks on electric fields. Methods for determining the effective and apparent electrical conductivity. The technology of measuring the dielectric constant. Polarizability and its measurement by laboratory methods.
Section 7. Electrochemical Activity.	Methods of measurement and the use of electrochemical activity.
Section 8. The physical meaning of different parameters.	Физический смысл кажущегося удельного сопротивления и поляризуемости. Физический смысл модуля Юнга, коэффициента Пуассона, констант Ламэ. Способы лабораторного измерения. Физический смысл микро- и макроскопического сечения взаимодействия.

Section 9. Technology of studying radioactive radiation.	The law of radioactive decay. Radioactive equilibrium. Principles of nuclear dating. Methods of detection of ionizing radiation. Interaction of alpha, beta, gamma and neutron radiation with matter.
Section 10. Technologies for constructing petrophysical reservoir models.	The study of reservoirs, the determination of filtration-capacitive properties. Conductivity model. Model of diffusion-adsorption activity. Model of natural radioactivity. Model of neutron porosity. Acoustic model.

Developers:

Assistant professor of department of geology,
mining and oil and gas engineering



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V. Yu. Abramov

Department director

geology, mining and oil and gas engineering



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Engineering academy

SUMMARY OF THE DISCIPLINE

Educational program

05.04.01 «Geology». Innovative technologies in search and investigation of solid minerals

Name of discipline	<i>Applied geochemistry</i>
Discipline volume	6 ECTS credits (216 academic hours)
Summary of discipline	
Name of sections (subjects) of discipline	Summary of sections (subjects) of discipline:
1. Subject, history, methodology of application-oriented geochemistry	Subject and objects of a research in application-oriented geochemistry. The place of application-oriented geochemistry in system of sciences. History of application-oriented geochemistry. Use of methods of science by searches of minerals. The major concepts and terms of retrieval geochemistry. Need of a study of influence of communication of the people with the nature.
2. General fundamentals of application-oriented geochemistry	Structure of Earth and its chemical composition. Prevalence of chemical elements in the Earth Crust. Macro- and micro-elements. Rare and rare scattered elements. Geochemical classification of elements by V. M. Goldshmidt. Various types of forms: mineral and non-mineral; concentrated and disseminated. Value of a condition of dispersion. Migration of chemical elements. Geochemical barriers.
3. Methods of searches of mineral deposits	Hydrochemical method of searches of mineral deposits. Atmochemical (gas) searches of mineral deposits. Biogeochemical searches of mineral deposits. Geochemical searches of oil and gas deposits.
4. Noosphere geochemistry	Interaction of the person with the nature. Equilibrium state between life and the environment. Balance violations: instant - catastrophic and slow - evolutionary. Sizes of the phenomena of environmental pollution. Technogenic anomalies and their types. Threshold limit values of elements. Main sources of pollution and their characteristic (mining entities, industrial production, energy

	production, household waste, agricultural industry).
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Developers:

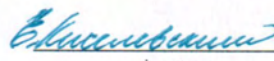
Assistant professor of department of geology,
mining and oil and gas engineering
position, name of department


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A. E. Kotelnikov
initials, surname

Department director

geology, mining and oil and gas engineering
position, name of department


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E.V. Kiselevskiy
initials, surname

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Engineering academy

SUMMARY OF THE DISCIPLINE

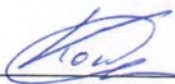
Educational program

05.04.01 «Geology». Innovative technologies in search and investigation of solid minerals

Name of discipline	<i>Geochemical methods of prospecting for mineral deposits</i>
Discipline volume	6 ECTS credits (216 academic hours)
Summary of discipline	
Name of sections (subjects) of discipline	Summary of sections (subjects) of discipline:
Section 1. General information	Clark. Geochemical field and its parameters. Classification of fields by fineness. Landscape and geochemical division into districts. Migration of chemical elements. Geochemical barriers. Stages and stages of prospecting process, scales of geochemical mapping.
Section 2. Bases of geochemical search	Stages and stages of prospecting process, scales of geochemical mapping. Methods of geochemical search of minerals. Primary halos of ore fields. Secondary halos of ore fields. Dispersion trains. Geochemical background. Anomalies.
Section 3. Field, laboratory and office analysis by geochemical search	Shooting scale. Sampling. Sample preparation. Laboratory analysis. Processing of results of laboratory analysis.

Developers:

Assistant professor of department of geology,
mining and oil and gas engineering


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A. E. Kotelnikov

Department director

geology, mining and oil and gas engineering


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E.V. Kiselevskiy

*Federal State Autonomous Educational Institution for Higher Education
«Peoples' Friendship University of Russia»*

Engineering academy

SUMMARY OF THE DISCIPLINE

Educational program

05.04.01 «Geology». Innovative technologies in search and investigation of solid minerals

Name of discipline	3D mineral deposit modeling
Discipline volume	5 ECTS credits (180 academic hours)
Summary of discipline	
Name of sections (subjects) of discipline	Summary of sections (subjects) of discipline:
Introduction	The basic principles of computer 3d modelling and estimation of reserves of deposits of solid minerals. Comparison with traditional methods. Overview of modern Software.
Source data, their presentation, storage and display in 3D modeling programs	Requirements for input information, the creation and updating of databases, visualization of drilling wells and mining, statistical analysis of the results of ore bodies testing.
Frame modeling of ore bodies	Construction of sections, the allocation of ore intervals (composition), creating and displaying wireframes of ore bodies, estimates for the frames.
Block modeling of ore bodies and reserves calculation	Creating block models. Methods of interpolation of results of approbation. Modeling of semivariograms. Calculation of reserves, assessment of reliability.
Planning of open - pit mining	Design and optimization of open pit.

Developers:

Senior lecturer of department of geology,
mining and oil and gas engineering


signature

V.E. Markov

Department director

geology, mining and oil and gas engineering


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*Federal State Autonomous Educational Institution for Higher Education
«Peoples' Friendship University of Russia»*

Engineering academy

SUMMARY OF THE DISCIPLINE

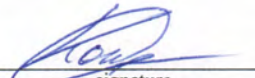
Educational program

05.04.01 «Geology». Innovative technologies in search and investigation of solid minerals

Name of discipline	<i>Mathematical methods of modeling in Geology</i>
Discipline volume	5 ECTS credits (180 academic hours)
Summary of discipline	
Name of sections (subjects) of discipline	Summary of sections (subjects) of discipline:
1. Geographic information systems	The collection, storage and analysis of geologic data in geographic information systems and specialized computer programs. Sources and types of geological data. Coordinate systems, raster and vector representation models for spatial data. Attribute and meta - data, spatial database. Basic analytical operations with spatial and attribute data.
2. Methods of mathematical statistics for the solution of geological problems	Univariate, bivariate and multivariate statistical models and their application in Geology. Mathematical modeling of geological fields.
3. 3D modeling and calculation of reserves of mineral deposits	Design, creation and analysis of databases to build 3D models of deposits, wireframe modeling of ore bodies, block model, variography, interpolation, certification models, the estimation of ore reserves.

Developers:

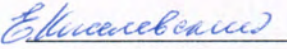
associate professor of department of geology,
mining and oil and gas engineering


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A. E. Kotelnikov

Department director

geology, mining and oil and gas engineering


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E.V. Kiselevskiy

*Federal State Autonomous Educational Institution for Higher Education
«Peoples' Friendship University of Russia»*

Engineering academy

SUMMARY OF THE DISCIPLINE

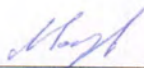
Educational program

05.04.01 «Geology». Innovative technologies in search and investigation of solid minerals

Name of discipline	<i>Geoinformation technologies in search and exploration of mineral deposits</i>
Discipline volume	3 ECTS credits (108 academic hours)
Summary of discipline	
Name of sections (subjects) of discipline	Summary of sections (subjects) of discipline:
1. General issues of Geoinformatics	Geographic information system (GIS) applications, structure, software and hardware.
2. Organization and visualization of data in GIS.	Sources and data types, input and storage of spatial coordinate and attribute data. Vector and raster data, mapping database
3. Transformation and analysis of spatial and attribute data in GIS	Coordinate systems, projections, and transformations. Actions with vector, raster and attribute data in a GIS.
4. Applied aspects of Geoinformatics	Examples of GIS implementation. Prospects and tendencies of development of Geoinformatics in Russia and abroad.

Developers:

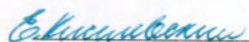
Senior lecturer of department of geology,
mining and oil and gas engineering


signature

V. E. Markov

Department director

geology, mining and oil and gas engineering


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E.V. Kiselevskiy

*Federal State Autonomous Educational Institution for Higher Education
«Peoples' Friendship University of Russia»*

Engineering academy

SUMMARY OF THE DISCIPLINE

Educational program

05.04.01 «Geology». Innovative technologies in search and investigation of oil and gas deposits

Name of discipline	<i>Innovative methods of geological remote sensing</i>
Discipline volume	3 ECTS credits (108 academic hours)
Summary of discipline	
Name of sections (subjects) of discipline	Summary of sections (subjects) of discipline:
1. Physical fundamentals of remote sensing	Overview of remote methods of studying the Earth in Geology. The parameters of the electromagnetic radiation. The interaction of electromagnetic radiation with various substances and environments.
2. Methods satellite imagery and data of Earth remote sensing	Review of current status in the field of obtaining and processing of remote sensing data. The characteristics of Aero - and space images.
3. Computer processing of remote sensing data of the Earth	Software for processing remote sensing data. Levels of processing of remote sensing data. Special processing (spectral transformation, transformation by the method of principal component, filtering, mathematical operations on raster layers, focal statistics).
4 Technology interpretation data of remote sensing and integrated interpretation of the results using geological, geophysical, geochemical, and landscape materials.	Methods of interpretation of remote sensing data of the Earth. Specificity and the possibility of using materials of different spectrum bands for geological studies. The application of space investigation methods in the search for minerals.

Developers:

Senior lecturer of department of geology,
mining and oil and gas engineering

position, name of department


signature

V. E. Markov
initials, surname

Department director

geology, mining and oil and gas engineering

position, name of department


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E. V. Kiselevskiy
initials, surname