

## **COURSE SYLLABUS OF THE DISCIPLINE**

**Modern aspects of geological and geophysical research in the oil and gas industry /  
Современные аспекты геолого-промысловых и геофизических исследований в  
нефтегазовом деле**

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(name of the discipline / module)

**Recommended by the Didactic Council for the Education Field:**

**21.04.01 Oil and gas engineering**

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(code and name of the Higher Education Field)

**The development of the discipline is carried out within the framework of the implementation of the higher education program of higher education (Higher Education Program):**

**Oil and gas engineering / Технологии добычи и транспортировки нефти и газа**

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(name (profile/specialization) of the Higher Education Program)

## 1. COURSE GOALS

The purpose of mastering the discipline "Modern aspects of geological and geophysical research in the oil and gas industry / Современные аспекты геолого-промысловых и геофизических исследований в нефтегазовом деле" is basis for the formation of students' basic knowledge in the field of modern methods of studying oil and gas deposits through the use of geological, field and geophysical methods and a comprehensive study of oil and gas deposits, including for long-term developed fields, which allow us to give a qualitative assessment counting's reserves and estimates of hydrocarbon resources, as well as when choosing methods for influencing the formation and increasing oil recovery. Studying the discipline can significantly improve the quality of graduate training for subsequent practical work and solving problems of both geological and field research and operation and maintenance of oil production facilities.

## 2. LEARNING OUTCOMES

Mastering the discipline "Modern aspects of geological and geophysical research in the oil and gas industry / Современные аспекты геолого-промысловых и геофизических исследований в нефтегазовом деле" is aimed at developing the following competencies (parts of competencies):

*Table 2.1. List of competencies formed by students during the development of the discipline (results of mastering the discipline)*

Competence code	Competence	Competence indicators (within the given discipline)
GC-7	GC-7. Able to: search for the necessary sources of information and data, perceive, analyze, memorize and transmit information using digital means, as well as algorithms when working with data received from various sources in order to effectively use the information received to solve problems; evaluate information, its reliability, build logical conclusions based on incoming information and data.	GC-7.1. Knows the technologies for collecting, processing, analyzing and interpreting information in digital environments; rights and obligations governing relations between people, social communities, organizations.
		GC-7.2. Can assess the risks and threats associated with the use of information and communication technologies in their professional activities, knows how to level them with available means; apply and adapt known methods and technologies of working with information to new tasks due to changing socio-economic conditions; find and analyze relevant legal and economic information sufficient to make informed decisions; apply legal knowledge in the analysis of conflict situations.
		GC-7.3. Has the information technologies of communication, search, processing and storage of information; the skills to prevent negative legal and economic consequences of their own actions or inactions.
GPC-1	Able to solve production and/or research tasks based on fundamental knowledge in the oil and gas field.	GPC-1.1. Knows the methods and technologies (including innovative ones) of development in the field of oil and gas engineering, scientific and methodological support of professional activity, principles of professional ethics.
		GPC-1.2. Can carry out research activities for the development and implementation of innovative technologies in the field of oil and gas engineering; develop programs for monitoring and evaluating the results of the

Competence code	Competence	Competence indicators (within the given discipline)
		<p>implementation of professional activities; develop information and methodological materials in the field of professional activity; use the fundamental knowledge of professional activity to overcome specific challenges of oil and gas production.</p> <p>GPC-1.3. Has the skills of physical and software modeling of separate fragments of the process of choosing the best option for specific conditions; skills in analyzing the causes for the quality reduction of technological processes and suggests effective methods to improve the quality of work in various technological operations; the skills in the use of modern tools and methods for planning and controlling projects related to the complications arising in the course of work.</p>
SPC-5	Able to draw up technical documentation for the implementation of the technological process (work schedules, instructions, plans, estimates, requests for materials, equipment, etc.), make an economic assessment of oil and gas fields in accordance with approved forms	<p>SPC-5.1 Knows the requirements and GOSTs for the preparation of technical documentation, basic methods of geological and industrial assessment of oil and gas fields; methods of geological-industrial and geological-economic assessment (GEO) of new geological exploration projects, taking into account all the uncertainties and risks of their implementation</p> <p>SPC-5.2 Can draw up and draw up technical documentation for the implementation of technological processes in the field of oil and gas field development, transportation and processing of oil and oil products; apply new methods of geological and industrial evaluation of oil and gas fields; determine the geological resources and the probability of finding a deposit, its production potential; carry out planning and evaluation of infrastructure solutions; determination of costs for the discovery and development of a field</p> <p>SPC-5.3 Has the methodology for preparing primary reporting, including work schedules, instructions, plans, estimates, applications for materials, equipment according to approved forms</p>
SPC-6	Capable of applying the basic principles of rational use of natural resources and environmental protection	<p>SPC-6.1 Knows the legal and methodological framework of the procedure for conducting environmental impact assessment EIA and environmental expert activities for use in professional activities; fundamentals of the theory and normative legal acts of the integrated development and rational use of natural resources and environmental protection; the procedure for conducting a geological examination of projects, regulatory documents for compiling an environmental passport</p> <p>SPC-6.2 Can assess the state of the environment when conducting complex geological and geographical studies; use mechanisms for the rational use of natural resources and environmental protection; apply regulatory and methodological documents to assess and prevent environmental damage at production facilities</p> <p>SPC-6.3 Has the methodology of rational use of natural resources and environmental protection; a system of methods (EIA) and conducting state environmental expertise for successful research and production activities; skills and knowledge to assess environmental damage at production facilities, modern methods for eliminating the</p>

Competence code	Competence	Competence indicators (within the given discipline)
		consequences and preventing environmental damage at production facilities
SPC-7	SPC-7 Able to organize, manage, and carry out quality control of the main types of work in the development of oil and gas fields, transportation and processing of oil and gas	<p>SPC-7.1 Knows:</p> <p>The main types of applied systems for assessing the quality of geological types of work in the development of oil and gas fields, transportation and processing of oil and gas; ISO-9001 quality system, GKZ regulations and classification of oil and gas reserves</p> <p>Requirements of regulatory legal acts of the Russian Federation, local regulations, administrative documents and technical documentation in the field of hydrocarbon production</p> <p>Technological processes of hydrocarbon production</p> <p>Purpose, device and principle of operation of equipment for the extraction of hydrocarbon raw materials</p> <p>Physical and chemical properties of hydrocarbon raw materials, chemical reagents, the procedure and rules for their disposal</p> <p>Technological modes, well operation parameters</p> <p>Standards for technological losses of hydrocarbon raw materials during production in accordance with the accepted scheme and development technology</p> <p>The influence of various processes occurring in the reservoir on the productivity factor of a production well</p> <p>The procedure for measuring the productivity factor of a production well</p> <p>Methods for calculating the productivity factor and skin effect according to well surveys with recording the pressure recovery curve</p> <p>Purpose, device and principle of operation of equipment for mechanized production of hydrocarbon raw materials</p> <p>Standards, specifications, guidelines for the development and execution of technical documentation</p> <p>Types of emergencies during well operation, their causes and methods of prevention and elimination</p> <p>Structure, interaction of means of an automated process control system, telemechanics, automatic control systems for hydrocarbon production equipment, ways to control them</p> <p>Requirements for labor protection, industrial, fire and environmental safety</p> <hr/> <p>SPC-7.2 Can:</p> <p>Organize and conduct quality control of work in the development of oil and gas fields, transportation and processing of oil and gas at different stages of the study of specific objects</p> <p>Evaluate the residual life of hydrocarbon production equipment</p> <p>Analyze inflow characteristics in a vertical, horizontal or multilateral well</p> <p>Predict the change in the inflow characteristics from the reservoir to the well, taking into account the reservoir operation mode</p> <p>Develop operating instructions for hydrocarbon production equipment</p> <p>Control the operation of equipment for artificial lift of</p>

Competence code	Competence	Competence indicators (within the given discipline)
		hydrocarbons Identify wells operating with deviations from the planned regime Conduct emergency drills with subordinate personnel according to the action plan for localization and elimination of accidents and incidents at hydrocarbon production facilities SPC-7.3 Has: The methodology for assessing the quality of all types of work in the development of oil and gas fields, transportation and processing of oil and gas at different stages of the study of specific objects Skills for organizing and monitoring the implementation of plans and tasks for the extraction of hydrocarbons Skills for operational management of production and monitoring compliance with hydrocarbon production technology Skills for monitoring compliance with the specified operating mode of well equipment, piping, oil and gas field pipelines, prefabricated pipelines, gas pipelines, pipelines, inhibitor pipelines in accordance with the requirements of the technological regulations of the installation, operating instructions and passports of equipment manufacturers Skills to analyze the dynamics of hydrocarbon production. Organization of providing jobs with up-to-date technological documentation Skills in organizing monitoring and control of the operation of the field and wells Skills of control and management of work on the preparation and maintenance of technical documentation of the unit Skills of control and management in the direction of compliance with the requirements of labor protection, industrial, fire and environmental safety in the unit Skills to control and manage the preparation of reports on the production of hydrocarbons

### 3. ACADEMIC PROGRAM STRUCTURE

Discipline "Modern aspects of geological and geophysical research in the oil and gas industry / Современные аспекты геолого-промысловых и геофизических исследований в нефтегазовом деле " refers to the Compulsory (Disciplines) Module of the block B1 of the Higher Education Program.

Students also learn other disciplines and / or practices that contribute to achieving the planned results of mastering the discipline "Modern aspects of geological and geophysical research in the oil and gas industry / Современные аспекты геолого-промысловых и геофизических исследований в нефтегазовом деле".

*Table 3.1. List of Higher Education Program components / disciplines that contribute to expected learning/training outcomes*

Competence code	Name of the competence	Previous disciplines/modules, practices*	Subsequent disciplines/modules, practices*
GC-7	GC-7. Able to: search for the necessary sources of information and data, perceive, analyze, memorize and transmit information using digital means, as well as algorithms when working with data received from various sources in order to effectively use the information received to solve problems; evaluate information, its reliability, build logical conclusions based on incoming information and data.	Disciplines of the previous level of education	Information technologies in the oil and gas industry / Информационные технологии в нефтегазовом комплексе SFC
GPC-1	Able to solve production and / or research tasks based on fundamental knowledge in the oil and gas industry	Disciplines of the previous level of education	Modern stream in oil and gas processing in Russia / Современные направления нефтегазопереработки в России Current development of the production of unconventional hydrocarbon resources in the world / Современное развитие добычи нетрадиционных ресурсов углеводородов в мире Technological practice (training) / Технологическая практика (учебная) Research work (obtaining primary skills in research work) / Научно-исследовательская работа (получение первичных навыков научно-исследовательской работы) Technological practice (production) / Технологическая практика (производственная) SFC
SPC-5	Able to draw up technical documentation for the implementation of the technological process (work schedules, instructions, plans, estimates, requests for materials, equipment, etc.), economic assessment of oil and gas field facilities in accordance with approved forms	Disciplines of the previous level of education	Resource estimation, computation and recalculation of hydrocarbon reserves / Оценка ресурсов, подсчет и пересчет запасов углеводородов Improving the efficiency of the production process and operation of equipment for the extraction of hydrocarbons / Повышение эффективности процесса добычи и работы оборудования по добыче углеводородного сырья Research work (obtaining primary skills in research work) / Научно-исследовательская работа (получение первичных навыков

Competence code	Name of the competence	Previous disciplines/modules, practices*	Subsequent disciplines/modules, practices*
			научно-исследовательской работы) Research work / Научно-исследовательская работа SFC
GPC-1	Able to solve production and/or research tasks based on fundamental knowledge in the oil and gas field.	Disciplines of the previous level of education	Machinery and equipment for field development and transportation of hydrocarbons / Машины и оборудование для разработки месторождений и транспорта углеводородов Resource estimation, computation and recalculation of hydrocarbon reserves / Оценка ресурсов, подсчет и пересчет запасов углеводородов Modern stream in oil and gas processing in Russia / Современные направления нефтегазопереработки в России Current development of the production of unconventional hydrocarbon resources in the world / Современное развитие добычи нетрадиционных ресурсов углеводородов в мире Methods of oil production intensification / Методы интенсификации добычи нефти Technologies for developing prospective hydrocarbon reserves / Технологии разработки перспективных запасов углеводородов Technological practice (training) / Технологическая практика (учебная) Technological practice (production) / Технологическая практика (производственная) SFC
SPC-7	Able to organize and manage operations for the extraction of hydrocarbons	Disciplines of the previous level of education	Machinery and equipment for field development and transportation of hydrocarbons / Машины и оборудование для разработки месторождений и транспорта углеводородов Resource estimation, computation and recalculation of hydrocarbon reserves / Оценка ресурсов, подсчет и пересчет запасов углеводородов Methods of oil production intensification / Методы

Competence code	Name of the competence	Previous disciplines/modules, practices*	Subsequent disciplines/modules, practices*
			интенсификации добычи нефти Innovative technologies for the development of hydrocarbon deposits / Инновационные технологии разработки месторождений углеводородов Improving the efficiency of the production process and operation of equipment for the extraction of hydrocarbons / Повышение эффективности процесса добычи и работы оборудования по добыче углеводородного сырья Pre-graduate practice / Преддипломная практика SFC

\* - filled in in accordance with the matrix of competencies and Higher Education Program.

#### 4. COURSE WORKLOAD and ACADEMIC/TRAINING/LEARNING ACTIVITIES

The course total workload for the discipline "Modern aspects of geological and geophysical research in the oil and gas industry / Современные аспекты геолого-промысловых и геофизических исследований в нефтегазовом деле " is equal to 7 credits.

Table 4.1. Types of academic activities during the period of the HE program mastering

Type of academic work	TOTAL, acc. h.	Semester (s)	
		1	2
Contact academic hours, acc .	70	36	34
including:			
Lectures	35	18	17
Laboratory work	-	-	-
Seminars (workshops/tutorials)	35	18	17
Self-study (ies), academic hours	146	135	11
Evaluation and assessment (exam or pass/fail grading)	36	9	27
<b>The course total workload</b>	acc. hrs.	<b>252</b>	<b>180</b>
	Credits.	<b>7</b>	<b>5</b>

#### 5. COURSE MODULE and CONTENTS

Table 5.1. The content of the discipline (module) by type of educational work

Name of the section (topic) of the discipline	Contents of the section (topic)	Type of academic work*
Section 1. Introduction. Development of the oil and gas industry and industrial oil and gas production.	Topic 1. 1.The current stage of development of the oil and gas industry. Distribution of current oil production by regions of the Russian Federation. Development of industrial oil production (quick reference). Quality Management System ISO-9001	Lecture, Seminar
	Topic 1.2. Russia's share in global oil production. Stages of geological exploration work. The concept of field development and exploitation. A rational development	Lecture, Seminar

Name of the section (topic) of the discipline	Contents of the section (topic)	Type of academic work*
	system. Requirements of labor protection, industrial, fire and environmental safety in the oil and gas industry	
Section 2. Features of geological, field and geophysical research in the development of oil and gas deposits.	Topic2.1. Well grids under various geological conditions. The concept of "operational object". The concept of operational object. Drilling process as a complex technological process (TP), consisting of many local (sequential, parallel and combined) processes. Linking points (wells) on the ground and transferring them for drilling.	Lecture, Seminar
	Topic2.2. Selection of an operational object. (Receiving and processing seismic data. Conducting GIS in wells in order to identify the object of operation, correlation of well sections). Placement of well grids under various geological conditions, taking into account the structure of the deposit.	Lecture, Seminar
Section 3. Significance and place of well geophysical survey (GIS) methods in the general cycle of geological and geophysical research.	Topic 3.1. Geological and geophysical research in the search and exploration of hydrocarbon deposits (seismic exploration, gravity exploration, magnetic exploration).	Lecture, Seminar
	Topic 3. 2. Significance and place of well geophysical survey (GIS) methods in the general cycle of geological and geophysical research. Basic principles of problem solving: lithological division of a well section; correlation of well sections; identification of mineral formations and assessment of its content; obtaining parameters necessary for calculating field reserves. GKZ regulatory documents.	Lecture, Seminar
Section 4. GIS complexes in oil and gas fields. Monitoring of field development based on geophysical measurements in production wells	Topic 4. 1. Identification of reservoirs, features of application of electrical research methods (UES, MKZ, cavernometry, etc.). Determination of porosity (methods: NC, AK, GGK, PS, YARM). Determination of clay content (GC, PS). Assessment of productivity (oil and gas saturation).	Lecture, Seminar
	Topic 4.2. Monitoring of field development based on geophysical measurements in production wells. The main tasks of the complex of geophysical studies of wells.	Lecture, Seminar
	Topic 4.3.General information about GIS complexes (divided by: the purpose of wells (reference, parametric, evaluation, search, exploration and production); features of the geological section; drilling conditions, etc.). Standard and mandatory GIS complexes.	Lecture, Seminar
Section 5. Determination of the lithological characteristics of rocks. Correlation of well sections, logging charts. Selecting collectors	Topic 5.1. Determination of the lithological characteristics of rocks. Construction of a lithological section of a well: determination of the boundaries and thicknesses of individual layers; assessment of the lithological characteristics of selected layers.	Lecture, Seminar
	Topic 5.2.Assessment of the lithological characteristics	Lecture,

Name of the section (topic) of the discipline	Contents of the section (topic)	Type of academic work*
	of the formation by the GIS complex with refinement based on petrophysical core studies. The main physical features of rocks (clays, mudstones, sandstones, siltstones) in the sandy-clay section	Seminar
	Topic 5.3.Determination of reservoir clay content. The eigenpotential method is the PS method. Use the PS diagrams to determine the relative clay content. Use the PS method in combination with one of the porosity methods (NNK-T, HGK, or AK).	Lecture, Seminar
	Topic 5.4.Determination of volume (or mass) clay content, total porosity of the rock. The method of natural radioactivity is gamma logging. Based on the GC data in rocks with scattered and layered clay content, determine the volume clay content based on the correlation between the readings $\gamma$ of $Y \Delta J$ and the value of $K_{gl}$ .	Lecture, Seminar
	Topic 5.5.Change in the CS value in sandstones (study of porosity, pore saturation (oil, water, gas), and admixture of clay material). Basic and additional methods for constructing a lithological column in a sand-clay section (basic CS, MCZ, cavernometry of KM and SS, additional-GC, tubing (NGC), AK). gas storage in complex reservoirs.	Lecture, Seminar
	Topic 5.6.Construction of a lithological column in a carbonate section (limestones and dolomites), main methods: CS, CNT, AK; additional methods: GC and KM.	Lecture, Seminar
Section 6. Study of reservoir filtration and capacity properties by geological, field and geophysical methods	Topic 6.1.Determination of the reservoir porosity coefficient. Study of the morphology of the void space (intergranular pores, cavities, cracks). Study and determination of primary (intergranular) porosity and secondary (sum of cavern and crack) porosity.	Lecture, Seminar
	Topic 6.2.Estimation of the porosity coefficient by the PS method (reservoir porosity is related to the degree of pore filling with clay cement). Investigation of the correlation dependence of $\alpha_{PS}=f(K_{ps})$ . Setting the boundary value of $\alpha_{PS}$ based on core research data.	Lecture, Seminar
	Topic 6.3. Estimation of the porosity coefficient by the method of electrical logging (the concept of the porosity parameter or relative resistance according to electrical logging data (CS, IR, BC), determination of the relative resistance of a clean collector by the Archi-Dakhnov formula).	Lecture, Seminar
	Topic 6.4. Estimation of the permeability coefficient in sand reservoirs. Study of phase, absolute, and relative permeability. Determination of the correlation between the total or effective porosity of the reservoir and its permeability (due to the inability to determine the tortuosity and specific surface area of the filter	Lecture, Seminar

Name of the section (topic) of the discipline	Contents of the section (topic)	Type of academic work*
	channels). Determination of the porosity coefficient by GIS and core (GIS-core or core - core systems).	
	Topic 6.5. Construction of permeation coefficient dependences on open reservoir porosity on the example of Western Siberia deposits. Estimation of the permeability coefficient in clay reservoirs.	Lecture, Seminar
Section 7. Basic physical and chemical, dynamic, filtration and reservoir characteristics of the deposit. Acquisition and research for the development of operational objects.	Topic 7.1. Generalization and unification of geological field and geophysical parameters for object development. Industry standards for the experimental determination of relative phase permeability (RPA), residual oil saturation, and displacement coefficient.	Lecture, Seminar
	Topic 7.2. Diagnostics of capacitive properties (porosity, fracturing), dynamic (OPP, capillary properties, oil, water-gas saturation, and deformation (Poisson's ratio, Young's modulus) parameters..	Lecture, Seminar
	Topic 7.3. Determination of the current oil saturation by the S/O logging method. Algorithms for determining the calculated parameters of porosity, permeability, and oil saturation using GIS	Lecture, Seminar
Section 8. Geological and geophysical aspects in the processes of oil and gas production technology. Influence of various geological and field factors on the initial and current well flow rates.	Topic 8.1. Reasons for setting standards for extraction from reservoirs and wells. Establishment of production standards from production wells with unlimited and limited selection.	Lecture, Seminar
	Topic 8.2. Field gas treatment. Cleaning of mechanical impurities; gas drying (cooling, absorption, adsorption). Gas purification from hydrogen sulfide ( $H_2S$ ) by absorption and adsorption methods. Gas purification from carbon dioxide.	Lecture, Seminar
	Topic 8.3. Methods for increasing oil recovery. Tertiary hydrodynamic methods (and their combinations): hydraulic fracturing( hydraulic fracturing), crevice unloading of the borehole zone of a productive formation, reagent treatment of wells, technology of acoustic treatment of wells and vibro-wave action.	Lecture, Seminar
Section 9. Field preparation of oil and natural gas. Field development control.	Topic 9.1. Techniques and methods for monitoring changes in reservoir pressure and well flow rates. Construction of reservoir pressure maps (isobar maps).	Lecture, Seminar
	Topic 9.2. Field development control: - and "inflow-composition" studies in a cased well (field-geophysical studies, designed to assess operational parameters (flowmeters, thermometers, barometers)). activation logging for oxygen).	Lecture, Seminar
	Topic 9.3. Invariants of evaluation of the composition in the shaft (moisture measurement, density measurement, resistivity; methods for determining the operational characteristics of productive alloys; geophysical technologies; control of flooding processes (determination of the intensity of water flow is widely	Lecture, Seminar

Name of the section (topic) of the discipline	Contents of the section (topic)	Type of academic work*
	used neutron	

## 6. CLASSROOM EQUIPMENT and TECHNOLOGY SUPPORT REQUIREMENTS

Table 6.1. Classroom Equipment and Technology Support Requirements

Classroom for Academic Activity Type	Classroom equipment	Specialized training / laboratory equipment, software and materials for mastering the discipline (if necessary)
Lecture	Classroom for conducting lecture-type classes: room 335 Set of specialized furniture; technical means: projection screen; SANYO PROxtraX multimedia projector; DEPO Neos 220 system unit	
Seminar	Training room for conducting seminar-type classes: room No. 356 Set of specialized furniture; chalkboard; NEC PLASMA MONITO MODEL PX-42XM1G monitor; DEPO Neos 220 system unit	
For self-study	Training room for conducting seminar-type classes: room No. 356 Set of specialized furniture; chalkboard; NEC PLASMA MONITO MODEL PX-42XM1G monitor; DEPO Neos 220 system unit	

## 7. Recommended Sources for Course Studies

### *Main reading(sources):*

1.Zhdanov M. A. Neftepromyslovaya geologiya i raschet zapasovykh nefi i gaza [Oilfield geology and counting of oil and gas reserves]. Moscow: Nedra Publ., 1981, 453 p —

2.Koronovskiy N. V., Starostin V. I., Avdonin V. V. Geologiya dlya gornogo dela: uchebnoe posobie dlya Vuzov [Geology for Mining: a textbook for Universities]. Moscow: Akademiya Publishing Center, 2007-576 p

3.Latyshva M. G.Vendelshtein V. Yu., Tuzov V. P. Processing and interpretation of geophysical studies of wells. Textbook, Moscow: Nedra Publ., 1990.

4.Permyakov I. G., Khayredinov N. Sh., Shevkunov E. N. Neftegazopromyslovaya geologiya i geofizika: Ucheb. Posobie dlya vuzov [Manual for universities], Moscow: Nedra Publ., 1986, 269 p.

5.Strelchenko V. V. Geofizicheskie issledovaniya boreholes: Uchebnik dlya vuzov [Geophysical studies of wells: A textbook for universities].Business Center", 2008.

6.Tetelmin V. V., Yazev V. A. Osnovy bureniya na nefi i gaz [Fundamentals of oil and gas drilling]. Training manual/.. - 3rd ed.- Dolgoprudny: Publishing House "Intellect", 2014. - 296 p.: ill. (Series "Oil and gas engineering").

7.Tetelmin V. V., Yazev V. A. Neftegazovoe delo [Oil and gas business]. Full course: a study guide. Series "Oil and gas engineering"., 2009, about 900s

### *Additional(optional) reading (sources):*

1. Bakirov E. A., Ermolkin V. I., Larin V. I. et al.. Geology of oil and gas. Textbook for universities, Moscow: Nedra Publ., 1990, 240 p.
2. Belokon D. V. Borehole geophysical information and measurement systems, Moscow: Nedra, 1996.
3. Bogdanovich N. N., Desyatkin A. S., Dobrynin V. M. Geofizicheskie issledovaniya boreholes: Spravochnik foreman po promyslovoy geofizike [Geophysical studies of wells: Master's Guide to Commercial geophysics]. Infra-engineering, 2009, 960 p.
4. Borzunov V. M. Razvedka i promyshlennaya otsenka mestorozhdeniy nerudnykh poleznykh pomoshchestvovykh [Exploration and industrial evaluation of nonmetallic mineral deposits]. Moscow, Nedra Publishing House, 1982, 310 p.
5. Bulatov A. I., Proselkov Yu. M. Drilling and development of oil and gas wells. Terminological dictionary reference. - Moscow: OOO "Nedra- Business Center", 2007. - 255s.
6. Geophysics. Textbook for universities ed. Khmelevsky V. K.-Moscow: KDU, 2007, 2009, 2012.
7. Gorbachev Yu. I. Geophysical studies of wells. Textbook for universities, Moscow: Nedra Publ., 1990.
8. Dakhnov V. N. Electric and magnetic methods of well research, Moscow: Nedra, 1981-344 p.
9. Dobrynin V. M., Wendelshtein B. Yu., Kozhevnikov D. A. Petrophysics. Textbook for universities, Moscow: "Neft i Gaz", 2004.
10. Zimina SV. Geological fundamentals of oil and gas field development: A textbook. Tomsk: TPU Publishing House, 2004, 175 p —
11. Ivanova M. M., Cholovsky I. P., Gutman I. S., Vagin SB., Bragin Yu. I. Neftepromyslovaya geologiya i gidrogeologiya zalezhey uglyodorodov [Oil field geology and hydrogeology of hydrocarbon deposits], Moscow: Neft i gaz, 2002, 455 p.
12. Kanalin, V. G. Handbook of the geologist of oil and gas exploration. Neftegazopromyslovaya geologiya i gidrogeologiya : uchebno-prakticheskoe posobie [Oil and gas field geology and hydrogeology: a textbook]. Kanalin, Moscow: Infra-Engineering, 2014, 416 p. [electronic resource]. - URL: <http://biblioclub.ru/index.php?page=book&id=234775>
13. Podboronov D. A., Tarasov S. V. A brief guide to the interpretation of basic methods of well geophysical research and their comparison with foreign analogues. 2005. 43 p.
14. Rezmanov R. A. Radioaktivnye i drugye neelektricheskie metody issledovaniya boreholes [Radioactive and other non-electric methods of well research], Moscow: Nedra Publ., 1982, 368 p.

*Internet-(based) sources:*

1. Electronic libraries with access for RUDN students:

RUDN University Electronic Library System-RUDN [University Electronic Library System](http://lib.rudn.ru/MegaPro/Web) <http://lib.rudn.ru/MegaPro/Web>

- EBS "University Library online" <http://www.biblioclub.ru>

- EBS Urite <http://www.biblio-online.ru>

- EBS "Student's consultant" [www.studentlibrary.ru](http://www.studentlibrary.ru)

- EBS "Lan" <http://e.lanbook.com/>

- EBS "Troitsky Bridge"

- Electronic fund of legal and regulatory documents <https://docs.cntd.ru/document/1200124394> (quality management system)

- State Commission for Inventory Calculation <https://www.gkz-rf.ru/>

## 2. Databases and search engines:

- electronic fund of legal and regulatory and technical documentation <http://docs.cntd.ru/>
- Yandex search engine <https://www.yandex.ru/>
- Google search engine <https://www.google.ru/>
- SCOPUS abstract database  
<http://www.elsevier.com/locate/SCOPUS>

*Learning toolkits for self- studies in the RUDN LMS TUIS:*

1. Course of lectures on the discipline "Modern aspects of geological and geophysical research in the oil and gas industry / Современные аспекты геолого-промысловых и геофизических исследований в нефтегазовом деле".

\* - all teaching materials for independent work of students are placed in accordance with the current procedure on the discipline page **in TUIS!**

**8. ASSESSMENT AND EVALUATION TOOLKIT**

Marking criteria (MC) and a 100-point (score) scale assessment of the level of competence formation (part of competencies) based on the results of mastering the discipline "Modern aspects of geological and geophysical research in the oil and gas industry / Современные аспекты геолого-промысловых и геофизических исследований в нефтегазовом деле" are presented in the Appendix to the present Work Program of the discipline.

\* - MC and the 100-point (score) scale are formed on the basis of the requirements of the relevant local normative act of the Peoples' Friendship University of Russia.

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