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ФИО: Ястребов Олег Александрович
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**Federal State Autonomous Educational Institution of Higher Education
Peoples' Friendship University of Russia named after Patrice Lumumba
RUDN University
Academy of Engineering**

educational division (faculty/institute/academy) as higher education programme developer

COURSE SYLLABUS

**Current development of the production of unconventional hydrocarbon resources in
the world / Современное развитие добычи нетрадиционных ресурсов
углеводородов в мире**

course title

Recommended by the Didactic Council for the Education Field of:

21.04.01 Oil and Gas Engineering

field of studies / speciality code and title

**The course instruction is implemented within the professional education programme of
higher education:**

Oil and Gas Engineering / Технологии добычи и транспортировки нефти и газа

higher education programme profile/specialisation title

1. COURSE GOALS

The goal of the course "Current development of the production of unconventional hydrocarbon resources in the world / Современное развитие добычи нетрадиционных ресурсов углеводородов в мире" is the acquisition by students of theoretical knowledge, practical skills, as well as the development of innovative technologies for open-pit, mine and well development of unconventional hydrocarbons.

The aims of the course are:

- understanding of the concept of "non-traditional source of hydrocarbons", the economic benefits of their use;
- mastering by students of knowledge about the characteristics and features of non-traditional hydrocarbon sources, modern methods of their use, problems and prospects for the development of the industry of exploitation of non-traditional hydrocarbon sources, mastering methods for evaluating their effectiveness.

2. REQUIREMENTS FOR LEARNING OUTCOMES

The course "Current development of the production of unconventional hydrocarbon resources in the world / Современное развитие добычи нетрадиционных ресурсов углеводородов в мире" is designed for students to acquire following competences (competences in part):

Table 2.1. List of competences that students acquire during the course

Competence code	Competence descriptor	Competence formation indicators (within this course)
GC-1	Able to search, make a critical analysis of problem situations based on a systematic approach, develop a strategy.	GC-1.1. Knows the methods of critical analysis and evaluation of modern scientific achievements; methods of critical analysis; basic principles of critical analysis. GC-1.2. Can analyze the task, highlighting its basic components, decompose the task; receive new knowledge based on analysis, synthesis, etc.; carry out a critical analyze of information necessary to solve the problem; collect data on complex scientific problems related to the professional field; search for information and solutions based on actions, experiment and experience. GC-1.3. Has the ability to study the problem of professional activity using analysis; synthesis and other methods of intellectual activity; identify scientific problems and use adequate methods to solve them; the skills of value judgments in solving professional situations.
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 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. 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.
GPC-4	Able to find and process the information required for decision-making in scientific research and in practical technical activities	<p>GPC-4.1. Knows the technology of conducting standard experiments on standard equipment in the laboratory and in production; a complex of modern methods for processing the results of research, practical technical activities using existing equipment, instruments and materials.</p> <p>GPC-4.2. Can independently search, analyze and select the necessary information, organize, transform, store and transmit it; analyze the internal logic of scientific knowledge; justify their worldview and social position and apply the acquired knowledge in areas not related to professional activities; assess innovation risks; compare and process the results of research activities using standard equipment, instruments and materials.</p> <p>GPC-4.3. Has the technique of experimentation using software packages; the main directions of development of innovative technologies in the oil and gas industry; the skills in developing innovative approaches in specific technologies with the help of AWS.</p>
SPC-1	Able to use theoretical knowledge when performing technological scientific research in the field of development, transportation and processing of oil and gas	<p>SPC-1.1 Knows fundamental concepts in the field of geology of oil and gas fields, methods of forecasting, prospecting and exploration of mineral deposits; regulatory and methodological documents in the field of hydrocarbon production and development of oil and gas fields</p> <p>SPC-1.2 Can use theoretical knowledge and mining and geological information to carry out technological scientific research, as well as apply knowledge of regulatory and methodological documents to assess oil and gas fields</p> <p>SPC-1.3 Has the theoretical knowledge, methods of subsurface research in the field of oil and gas field development; skills to perform production, technological and engineering research in the field of hydrocarbon production, development of oil and gas fields</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</p>

		successful research and production activities; skills and knowledge to assess environmental damage at production facilities, modern methods for eliminating the consequences and preventing environmental damage at production facilities
SPC-9	Able to organize the work of performers, find and make management decisions, rules for ensuring the safety of technological processes, as well as personnel when working in the field, in laboratories, in office processing	SPC-9.1 Knows the safety rules and safety precautions when working in the field, in laboratories, during office processing SPC-9.2 Can justify and make management decisions in the field of organization and regulation of labor; conduct briefings on ensuring the safety of technological processes, as well as personnel when working in the field, in laboratories, during office processing SPC-9.3 Has the methodology for ensuring the safety of technological processes, as well as personnel when working in the field, in laboratories, during office processing

3. ACADEMIC PROGRAMME STRUCTURE

The course refers to the variable component of (B1) block of the higher educational programme curriculum.

Table 3.1. The list of the higher education programme components that contribute to the achievement of the expected learning outcomes as the course results

Competence code	Name of competence	Previous disciplines/modules, practices*	Subsequent disciplines/modules, practices*
GC-1	Able to search, make a critical analysis of problem situations based on a systematic approach, develop a strategy.		Pre-graduation Practical Training; SFC
GPC-1	Able to solve production and/or research tasks based on fundamental knowledge in the oil and gas field.	Modern aspects of geological and geophysical research in the oil and gas industry; Technological practice (educational) / Технологическая практика (учебная); Technological practice (industrial) / Технологическая практика (производственная);	SFC
GPC-4	Able to find and process the information required for decision-making in scientific research and in practical technical activities	Geoinformation Systems and Applications;	SFC
SPC-1	Able to use theoretical knowledge when performing technological scientific research in the field of development, transportation and processing of oil and gas	<i>Advanced oil and gas processing equipment and product quality management**</i> ; Geoinformation Systems and Applications;	Research Work; Pre-graduation Practical Training; SFC
SPC-6	Capable of applying the basic principles of rational use of natural resources and	<i>Technological practice (industrial) / Технологическая практика</i>	Pre-graduation Practical Training; SFC

Competence code	Name of competence	Previous disciplines/modules, practices*	Subsequent disciplines/modules, practices*
	environmental protection	<i>(производственная); Advanced oil and gas processing equipment and product quality management**; Modern stream in oil and gas processing in Russia**; Technological processes of pipeline transport; Technologies for developing prospective hydrocarbon reserves;</i>	
SPC-9	Able to organize the work of performers, find and make management decisions, rules for ensuring the safety of technological processes, as well as personnel when working in the field, in laboratories, in office processing	<i>Technological practice (educational) / Технологическая практика (учебная); Machinery and equipment for field development and transportation of hydrocarbons; Modern aspects of geological and geophysical research in the oil and gas industry; Modern stream in oil and gas processing in Russia**; Technologies for developing prospective hydrocarbon reserves; Technological practice (industrial) / Технологическая практика (производственная);</i>	SFC

* - filled in in accordance with the matrix of competencies and Higher Education Programme

4. COURSE WORKLOAD

The total workload of the course "Current development of the production of unconventional hydrocarbon resources in the world / Современное развитие добычи нетрадиционных ресурсов углеводородов в мире" is 5 credits.

Table 4.1 Types of academic activities during the period of the HE programme mastering

Type of study work	TOTAL, acc.	Semester(s)
		3
Contact academic hours, acc .	54	54
including:		
Lectures	18	18
Laboratory work		
Seminars (workshops/tutorials)	36	36
Self-study (ies), academic hours	63	63

Type of study work		TOTAL, acc.	Semester(s) 3
<i>Evaluation and assessment (exam or pass/fail grading)</i>		27	27
The course total workload	acc.hrs.	144	144
	credits	4	4

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 study work
Module 1: Types of hydrocarbon resources and their sources	Topic 1.1. Introduction to the concept of 'unconventional hydrocarbon resources', classification approaches.	Lecture, Seminar
	Topic 1.2. Stages of studying unconventional sources of gas and oil raw materials, growth of demand for unconventional hydrocarbon resources.	Lecture, Seminar
	Topic 1.3. Assessment of unconventional hydrocarbon resources in Russia and the world. Economic incentives for the development of such fields.	Lecture, Seminar
Module 2: Unconventional gas resources	Topic 2.1. Gas hydrates.	Lecture, Seminar
	Topic 2.2. Coalbed methane.	Lecture, Seminar
	Topic 2.3. Shale gas	Lecture, Seminar
	Topic 2.4. Gas of tight reservoirs and water-dissolved gas.	Lecture, Seminar
Module 3: Unconventional oil resources	Topic 3.1. Oil of low-permeability reservoirs.	Lecture, Seminar
	Topic 3.2. Heavy and extra heavy oils.	Lecture, Seminar
	Topic 3.3. Natural bitumens, oil sands.	Lecture, Seminar
	Topic 3.4. Synthetic oil from kerogen-containing rocks.	Lecture, Seminar

6. CLASSROOM EQUIPMENT and TECHNOLOGY SUPPORT REQUIREMENTS

Table 6.1. Classroom Equipment and Technology Support Requirements

Classroom for Academic Activity Type	Classroom equipment	Specialized educational / laboratory equipment, software and materials for mastering the discipline (if necessary)
Lecture	Training room for conducting lecture-type classes: room. No. 2030 A set of specialized furniture; interactive panel	
Seminar	Computer class No. 2033 Set of specialized furniture; PC, telepanel	
For self-study	Classroom for conducting seminar-type classes: room. No. 2037 Set of specialized furniture;	

Classroom for Academic Activity Type	Classroom equipment	Specialized educational / laboratory equipment, software and materials for mastering the discipline (if necessary)
	chalkboard; projector, laptop	

7. RESOURCES RECOMMENDED FOR COURSE

Main reading(sources):

1. Golik V.I. Special methods of field development: Textbook / - M.: NITs INFRA-M, 2014.
<http://znanium.com/catalog/product/344986>
2. Tetel'min V.V., Yazev V.A. Energy of oil and gas: Textbook /. - Dolgoprudny: Intelligence, 2009. - 352 p.
<http://znanium.com/catalog/product/241178>
3. Tetel'min V.V., Yazev V.A., Solov'yanov A.A. Shale hydrocarbons. Mining technologies. Environmental Threats: Textbook /. - Dolgoprudny: Intellect, 2014. - 296 p.
<http://znanium.com/catalog/product/495846>

Additional(optional) reading (sources):

1. Apasov, T.K. Methods of intensification of oil production and enhanced oil recovery for the fields of Western Siberia [Electronic resource]: tutorial / T.K. Apasov, R.T. Apasov, G.T. Apasov. — Electron. Dan. - Tyumen: Tsogu, 2015. - 187 p.
<https://e.lanbook.com/book/91835>
2. Ganieva T.F. High-viscosity oils, natural bitumens and bituminous rocks [Electronic resource]: textbook / T.F. Ganieva, V.K. Polovnyak. — Electron. Dan. - Kazan: KNRTU, 2012
<https://e.lanbook.com/book/73243>

Internet sources

1. Electronic libraries (EL) of RUDN University and other institutions, to which university students have access on the basis of concluded agreements:
 - RUDN Electronic Library System (RUDN ELS) <http://lib.rudn.ru/MegaPro/Web>
 - EL "University Library Online" <http://www.biblioclub.ru>
 - EL "Yurayt" <http://www.biblio-online.ru>
 - EL "Student Consultant" www.studentlibrary.ru
 - EL "Lan" <http://e.lanbook.com/>
 - EL "Trinity Bridge"

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 - EL "University Library Online" <http://www.biblioclub.ru>
 - EL "Yurayt" <http://www.biblio-online.ru>
 - EL "Student Consultant" www.studentlibrary.ru
 - EL "Lan" <http://e.lanbook.com/>
 - EL "Trinity Bridge"

Learning toolkits for self- studies:

1. A course of lectures on the course ""Current development of the production of unconventional hydrocarbon resources in the world / Современное развитие добычи нетрадиционных ресурсов углеводородов в мире".
2. Guidelines for students on the development of the course ""Current development of the production of unconventional hydrocarbon resources in the world / Современное развитие добычи нетрадиционных ресурсов углеводородов в мире".

*The training toolkit and guidelines for the course are placed on the course page in the university telecommunication training and information system under the set procedure.

8. ASSESSMENT TOOLKIT AND GRADING SYSTEM* FOR EVALUATION OF STUDENTS' COMPETENCES LEVEL AS COURSE RESULTS

The assessment toolkit and the grading system* to evaluate the level of competences (competences in part) formation as the course results are specified in the Appendix to the course syllabus.

* The assessment toolkit and the grading system are formed on the basis of the requirements of the relevant local normative act of RUDN University (regulations / order).

DEVELOPERS:

Senior lecturer of the Department of Mineral
Developing and Oil&Gas Engineering

position, educational department

Kapitonova I.L.

name and surname

Head of Department:

Head of the Department of Mineral Developing
and Oil&Gas Engineering

position, educational department

Kotelnikov A.E.

name and surname

Head of Educational Programme:

Professor of the Department of Mineral
Developing and Oil&Gas Engineering

position, educational department

Kapustin V.M.

name and surname