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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 OF THE DISCIPLINE**

**Innovative technologies for the development of hydrocarbon deposits /  
Инновационные технологии разработки месторождений углеводородов**  

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(name of discipline/module)

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

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**21.04.01 Oil and gas engineering**

(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):**

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

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

## 1. COURSE GOALS

The purpose of mastering the discipline "Innovative technologies for the development of hydrocarbon deposits / Инновационные технологии разработки месторождений углеводородов" is to equip students with theoretical knowledge and practical skills in solving complex issues related to the use of software and equipment for well operation and efficient field development. Teaching students to identify problems and select intellectual and technical developments for the conditions of various fields. General information about the application of the latest technologies and developments in the field of data collection and processing, as well as adjustments and changes in operating modes during well operation and in general during field development.

The aims of the course are:

- study of the methodology for identifying problems in the field development and well operation;
- study of existing intellectual Russian and foreign developments;
- acquiring the skills of choosing one or another equipment;
- mastering the methodology for calculating the characteristics of equipment.

## 2. LEARNING OUTCOMES

Mastering the discipline "Innovative technologies for the development of hydrocarbon deposits / Инновационные технологии разработки месторождений углеводородов" is aimed at developing the following competencies (parts of competencies) among students:

*Table 2.1. The list of competencies formed by students in the course of mastering the discipline (the results of mastering the discipline)*

Competence code	Competence	Competence indicators (within this discipline)
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-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</p>

Competence code	Competence	Competence indicators (within this discipline)
		<p>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> <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 hydrocarbons</p> <p>Identify wells operating with deviations from the planned regime</p> <p>Conduct emergency drills with subordinate personnel according to the action plan for localization and elimination of accidents and incidents at hydrocarbon production facilities</p> <p>SPC-7.3 Has:</p> <p>The methodology for assessing the quality of all types of</p>

Competence code	Competence	Competence indicators (within this discipline)
		<p>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>Skills for organizing and monitoring the implementation of plans and tasks for the extraction of hydrocarbons</p> <p>Skills for operational management of production and monitoring compliance with hydrocarbon production technology</p> <p>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</p> <p>Skills to analyze the dynamics of hydrocarbon production. Organization of providing jobs with up-to-date technological documentation</p> <p>Skills in organizing monitoring and control of the operation of the field and wells</p> <p>Skills of control and management of work on the preparation and maintenance of technical documentation of the unit</p> <p>Skills of control and management in the direction of compliance with the requirements of labor protection, industrial, fire and environmental safety in the unit</p> <p>Skills to control and manage the preparation of reports on the production of hydrocarbons</p>

### 3. ACADEMIC PROGRAMME STRUCTURE

The discipline "Innovative technologies for the development of hydrocarbon deposits / Инновационные технологии разработки месторождений углеводородов" refers to the University Disciplines Module of block B1 of the Higher Education Program.

As part of the Higher Education Program, students also master other disciplines and / or practices that contribute to the achievement of the planned results of mastering the discipline "Innovative technologies for the development of hydrocarbon deposits / Инновационные технологии разработки месторождений углеводородов".

*Table 3.1. The list of components of the Higher Education Program that contribute to the achievement of the planned results of the development of the discipline*

Competence code	Name of competence	Previous disciplines/modules, practices*	Subsequent disciplines/modules, practices*
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	Modern aspects of geological and geophysical research in the oil and gas industry / Современные аспекты геолого-промысловых и геофизических исследований в нефтегазовом деле	Technological practice (training) / Технологическая практика (учебная) Technological practice (production) / Технологическая практика (производственная) Pre-graduate practice /

Competence code	Name of competence	Previous disciplines/modules, practices*	Subsequent disciplines/modules, practices*
			Преддипломная практика SFC
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	Modern aspects of geological and geophysical research in the oil and gas industry / Современные аспекты геолого-промысловых и геофизических исследований в нефтегазовом деле Machinery and equipment for field development and transportation of hydrocarbons / Машины и оборудование для разработки месторождений и транспорта углеводородов Methods of oil production intensification / Методы интенсификации добычи нефти	Pre-graduate practice / Преддипломная практика SFC

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

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

The course total workload for the discipline "Innovative technologies for the development of hydrocarbon deposits / Инновационные технологии разработки месторождений углеводородов" is equal to 4 credits.

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

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

#### 5. COURSE MODULES and CONTENTS

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

Name of the section	Contents of the section (topic)	Type of
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(topic) of the discipline		study work
Section 1. General information about smart wells	Topic 1.1. The concept of an intelligent well. Basic elements and principle of operation of an intelligent well.	Lecture, Lab work
	Topic 1.2. Examples of intellectualization of wells for oil production.	
Section 2. Systems of intelligent automation in technological operations for oil and gas production	Topic 2.1. Technical solutions for an intelligent control system for mechanized oil production. Inflow control devices.	Lecture, Lab work
	Topic 2.2. Manara intelligent production control system ( Schlumberger). WellWatcher FLUX intelligent completion system ( Schlumberger).	Lecture, Lab work
Section 3. Examples of implementation of intelligent technologies	Topic 3.1. Intelligent developments and their implementation in Russian fields	Lecture, Lab work
	Topic 3.2. Foreign experience in the implementation of intellectual developments.	Lecture, Lab work
	Topic 3.3. Prospects for the development of high-tech "smart" fields in Russia and abroad.	Lecture, Lab work

## 6. CLASSROOM EQUIPMENT and TECHNOLOGY SUPPORT REQUIREMENTS

### 1. *Table 6.1. 6. 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. 335 A set of specialized furniture; technical means: projection screen; multimedia projector SANYO PROxtraX ; system block DEPO Neos 220	
Seminar	Classroom for conducting seminar-type classes: room. No. 356 A set of specialized furniture; chalk board; monitor NEC PLASMA MONITO MODEL PX-42XM1G; system block DEPO Neos 220	
For self-study	Classroom for conducting seminar-type classes: room. No. 356 A set of specialized furniture; chalk board; monitor NEC PLASMA MONITO MODEL PX-42XM1G; system block DEPO Neos 220	

## 7.RECOMMENDED SOURCES for COURSE STUDIES

### *Main reading(sources):*

1. Bolsunovskaya L.M. [and others] Petroleum Engineering. course book = Oil and gas engineering . Book for students: textbook / ed. L.M. Bolsunovskaya, R.N. Abramova, I.A.

Matveenko. — Electron . Dan. - Tomsk: TPU, 2014. - 742 p.

<https://e.lanbook.com/book/62912>

2. Tetelmin V.V. Oil and gas engineering . Textbook / V.V. Tetelmin , V.A. Yazev. - 2nd ed ; Dolgoprudny: Publishing House "Intellect", 2014. - 800 p.

<http://lib.rudn.ru>

3. Tetelmin V.V. Oil and Gas Drilling Fundamentals: Study Guide / - 3rd ed. - Dolgoprudny: Intellect, 2014. - 296 p.

<http://znanium.com/catalog/product/478822>

*Additional(optional) reading (sources):*

1. Saifullin I.Sh., Tetelmin V.V., Yazev V.A. Physical foundations of oil production: Textbook / - Dolgoprudny: Intellect, 2013. - 328 p.

<http://znanium.com/catalog/product/423812>

2. Arbuzov, V.N. Collection of tasks on the technology of oil and gas production in complicated conditions: workshop: study guide / V.N. Arbuzov, E.V. Kurganov. - Electron . Dan. - Tomsk: TPU, 2014. - 68 p.

<https://e.lanbook.com/book/82862>

*Internet-(based) sources:*

1. Electronic libraries with access for RUDN students

RUDN Electronic Library System - RUDN EBS <http://lib.rudn.ru/MegaPro/Web>

- ELS "University Library Online" <http://www.biblioclub.ru>

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

- ELS "Student Consultant" [www.studentlibrary.ru](http://www.studentlibrary.ru)

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

- EBS "Trinity Bridge"

2. Databases and search engines:

- electronic fund of legal and normative-technical documentation <http://docs.cntd.ru/>

- Yandex search engine [https:// www .yandex.ru/](https://www.yandex.ru/)

- Google search engine <https://www.google.ru/>

- abstract database SCOPUS [http:// www .elsevier.com/ locate / scopus /](http://www.elsevier.com/locate/scopus/)

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

1. Guidelines for students on the development of the discipline "Innovative technologies for the development of hydrocarbon deposits / Инновационные технологии разработки месторождений углеводородов."

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

## 8.ASSESSMENT AND EVALUATION TOOLKIT

Marking criteria (MC) and a 100-point (score) scale for evaluating the level of competencies (part of competencies) based on the results of mastering the discipline "Innovative technologies for the development of hydrocarbon deposits / Инновационные технологии разработки месторождений углеводородов" are presented in the Appendix to this 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.

### DEVELOPERS:

Associate Professor of the Department of Mineral Developing and Oil&Gas Engineering		Tyukavkina O.V.
Position, Department	Signature	Full name
Assistant of the Department of Mineral Developing and Oil&Gas Engineering		Gorbyleva Ya.A.
Position, Department	Signature	Full name
<b>Head of Department:</b>		
Director of the Department of Mineral Developing and Oil&Gas Engineering		Kotelnikov A.E.
Name of Department	Signature	Full name
<b>Head of Educational Programme:</b>		
Professor of the Department of Mineral Developing and Oil&Gas Engineering		Kapustin V.M.
Position, Department	Signature	Full name