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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

**Technologies for developing prospective hydrocarbon reserves / Технологии  
разработки перспективных запасов углеводородов**

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 "Technologies for developing prospective hydrocarbon reserves / Технологии разработки перспективных запасов углеводородов" is to obtain knowledge, skills and experience in the field of development and operation of oil fields, which characterize the stages of the formation of competencies and ensure the achievement of the planned results of the development of the educational program.

The study of the course "Technologies for developing prospective hydrocarbon reserves / Технологии разработки перспективных запасов углеводородов" provides for the acquisition of practical skills in solving certain design problems in calculating the indicators of the development of oil deposits, and the principles of hydrodynamic modeling of the process of developing an oil deposit, which is the key to successful professional activity. It is planned to study methods of influencing filtration fields in order to control and regulate the filtration of reservoir fluids and increase the degree of oil recovery from deposits.

## 2. REQUIREMENTS FOR LEARNING OUTCOMES

The course "Technologies for developing prospective hydrocarbon reserves / Технологии разработки перспективных запасов углеводородов" is designed for students to acquire following competences (competences in part):

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

<b>Competence code</b>	<b>Competence descriptor</b>	<b>Competence formation indicators (within this course)</b>
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	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 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 SPC-5.3 Has the methodology for preparing primary reporting, including work schedules, instructions, plans, estimates, applications for materials, equipment according to approved forms
SPC-6	Capable of applying the basic principles of rational use of natural resources and environmental protection	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 SPC-6.2 Can assess the state of the environment when

Competence code	Competence descriptor	Competence formation indicators (within this course)
		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 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 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*
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	-	<i>Comprehensive analysis of processing, storage and marketing of hydrocarbons**;</i> <i>Diagnostics of oil and petroleum products main pipeline facilities**;</i> <i>Improving the efficiency of the production process and operation of equipment for the extraction of hydrocarbons**;</i> <i>Innovative technologies for the development of hydrocarbon deposits**;</i> <i>Innovative technologies for the transportation and storage of hydrocarbons**;</i> Pre-graduation Practical

Competence code	Name of competence	Previous disciplines/modules, practices*	Subsequent disciplines/modules, practices*
			Training;
SPC-6	Capable of applying the basic principles of rational use of natural resources and environmental protection	-	<i>Pre-graduation Practical Training;</i> <i>Project management in the oil and gas industry**;</i> <i>Economics and management of oil and gas production**;</i> <i>Current development of the production of unconventional hydrocarbon resources in the world;</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>Current development of the production of unconventional hydrocarbon resources in the world;</i> <i>Methods of oil production intensification;</i>

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

#### 4. COURSE WORKLOAD

The total workload of the course "Technologies for developing prospective hydrocarbon reserves / Технологии разработки перспективных запасов углеводородов" is 7 credits.

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

Type of study work	TOTAL , acc.hrs.	Semester(s)		
		1	2	
<i>Contact academic hours, acc .</i>	70	36	34	
including:				
Lectures	35	18	17	
Laboratory work	-	-	-	
Seminars (workshops/tutorials)	35	18	17	
<i>Self-study (ies), academic hours</i>	164	108	56	
<i>Evaluation and assessment (exam or pass/fail grading)</i>	18		18	
<b>The course total workload</b>	acc.hrs.	<b>252</b>	<b>144</b>	<b>108</b>
	credits .	<b>7</b>	<b>4</b>	<b>3</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 study work
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Section 1. Complicated conditions for the development of oil fields.	The concept of complicated development conditions. Classification of complicated conditions. Basic principles of oil field development.	Lecture, Seminar
Section 2. Complicated conditions of a natural nature.	Complications associated with the geological structure of objects. Complications associated with the physical and chemical properties of products. Complications associated with the climatic and geographical features of the deposits.	Lecture, Seminar
Section 3. Methods for the development of oil and gas fields in complicated natural conditions	Methods for the development of low-permeability oil and gas fields. Methods for the development of oil fields with high viscosity.	Lecture, Seminar
Section 4. Complicated technogenic conditions.	Technogenic consequences characteristic of developed oil fields. Deterioration of the energy state of the development object. Main reasons. Change in water cut of production wells due to the development system. Main reasons.	Lecture, Seminar
Section 5. Methods for the development of oil and gas fields in complicated technogenic conditions	Methods for the development of oil fields at a late stage of production. Methods for enhanced oil recovery.	Lecture, Seminar
Section 6. Influence of Complicating Factors on Well Productivity and Reservoir Recovery	Influence of complicating factors on well productivity and current development indicators. Methods of dealing with the consequences of the influence of complicating factors in the process of field development. Assessment of the degree of influence of complicating factors on the process of developing reserves. Influence of complicating factors on the final oil recovery factor (ORF) and possible means of increasing it.	Lecture, Seminar

## 6. CLASSROOM EQUIPMENT and TECHNOLOGY SUPPORT REQUIREMENTS

- *Table 6.1. Classroom Equipment and Technology Support Requirements*

<b>Classroom for Academic Activity Type</b>	<b>Classroom equipment</b>	<b>Specialized educational / laboratory equipment, software and materials for mastering the discipline (if necessary)</b>
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	

Classroom for Academic Activity Type	Classroom equipment	Specialized educational / laboratory equipment, software and materials for mastering the discipline (if necessary)
	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. RESOURCES RECOMMENDED FOR COURSE

### *Main reading(sources):*

1. Musin, M.M. Development of oil fields: [16+] / M.M. Musin, A.A. Lipaev , R.S. Khisamov ; ed. A.A. Lipaeva . - 2nd ed., revised . and additional - Moscow; Vologda: Infra-Engineering, 2019. - 329 p. : illustrations, tables, schemes. ISBN 978-5-9729-0314-6. – URL: <http://biblioclub.ru/index.php?page=book&id=564385>
2. Galikeev , I.A. Exploitation of oil fields in complicated conditions: [16+] / I.A. Galikeev , V.A. Nasyrov, A.M. Nasyrov. - Moscow; Vologda: Infra-Engineering, 2019. - 357 p. : illustrations, tables, schemes. – Access mode: by subscription. ISBN 978-5-9729-0288-0. – URL: <http://biblioclub.ru/index.php?page=book&id=564377>
3. Sizov, V.F. Management of development of oil deposits with hard-to-recover reserves: textbook (course of lectures) / V.F. Sizov; Ministry of Education and Science of the Russian Federation, Federal State Autonomous Educational Institution of Higher Professional Education "North Caucasian Federal University". - Stavropol: NCFU, 2014. - 136 p. : ill. – URL: <http://biblioclub.ru/index.php?page=book&id=457629>

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

1. Bulchaev , N.D. Protection of pumping equipment of oil wells in complicated operating conditions: monograph / N.D. Bulchaev , Yu.N. Bezborodov; Ministry of Education and Science of the Russian Federation, Siberian Federal University. - Krasnoyarsk: Siberian Federal University, 2015. - 138 p. : tab., graph., ill. - Bibliography . in book. - ISBN 978-5-7638-3263-1. – URL: <http://biblioclub.ru/index.php?page=book&id=435598>

### *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](http://www.studentlibrary.ru)
  - EL "Lan" <http://e.lanbook.com/>
  - EL "Trinity Bridge"

### *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](http://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 "Technologies for developing prospective hydrocarbon reserves / Технологии разработки перспективных запасов углеводородов".
2. Guidelines for students on the development of the course "Technologies for developing prospective hydrocarbon reserves / Технологии разработки перспективных запасов углеводородов".

\*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:**

Associate Professor of the Department of Mineral  
Developing and Oil&Gas Engineering  
\_\_\_\_\_  
position, educational department

Тюкавкина О.В.  
\_\_\_\_\_  
name and surname

#### **Head of Department:**

Head of the Department of Mineral Developing  
and Oil&Gas Engineering  
\_\_\_\_\_  
position, educational department

Котельников А.Е.  
\_\_\_\_\_  
name and surname

#### **Head of Educational Programme:**

Professor of the Department of Mineral  
Developing and Oil&Gas Engineering  
\_\_\_\_\_  
position, educational department

Капустин В.М.  
\_\_\_\_\_  
name and surname