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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

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

(name of discipline/module)

Recommended by the Didactic Council for the Education Field:

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):

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 "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 discipline "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. LEARNING OUTCOMES

Mastering the discipline "Technologies for developing prospective hydrocarbon reserves / Технологии разработки перспективных запасов 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-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</p> |

| Competence code | Competence | Competence indicators (within this discipline) |
|-----------------|--|---|
| | | 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 PROGRAM STRUCTURE

Discipline "Technologies for developing prospective hydrocarbon reserves / Технологии разработки перспективных запасов углеводородов" refers to the Compulsory (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 "Technologies for developing prospective hydrocarbon reserves / Технологии разработки перспективных запасов углеводородов".

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

| 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 | - | 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 |

| Competence code | Name of competence | Previous disciplines/modules, practices* | Subsequent disciplines/modules, practices* |
|-----------------|--|--|---|
| | | | оборудования по добыче углеводородного сырья Technological practice (training) / Технологическая практика (учебная) Technological practice (production) / Технологическая практика (производственная) SFC |
| SPC-6 | Capable of applying the basic principles of rational use of natural resources and environmental protection | - | Technological practice (training) / Технологическая практика (учебная) Technological practice (production) / Технологическая практика (производственная) SFC |
| 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 | - | Economics and management of oil and gas production / Экономика и управление нефтегазовым производством Project management in the oil and gas industry / Управление проектами в нефтегазовой отрасли Technological practice (production) / Технологическая практика (производственная) 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 "Technologies for developing prospective hydrocarbon reserves / Технологии разработки перспективных запасов углеводородов" is equal to 5 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) | |
|-------------------------------|----------------------|-------------|----|
| | | 1 | 2 |
| Contact academic hours, acc . | 70 | 36 | 34 |
| including: | | | |

| Type of study work | TOTAL , acc.hrs. | Semester(s) | |
|--|---------------------|-------------|------------|
| | | 1 | 2 |
| Lectures | 35 | 18 | 17 |
| Laboratory work | - | - | - |
| Seminars (workshops/tutorials) | 35 | 18 | 17 |
| <i>Self-study (ies), academic hours</i> | <i>164</i> | <i>108</i> | <i>56</i> |
| <i>Evaluation and assessment (exam or pass/fail grading)</i> | <i>18</i> | | <i>18</i> |
| The course total workload | acc.hrs. | 252 | 144 |
| | credits . | 7 | 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 |
|---|--|--------------------|
| 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*

| 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. 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-(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
 - 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. A course of lectures on the discipline "Technologies for developing prospective hydrocarbon reserves / Технологии разработки перспективных запасов углеводородов."
2. Guidelines for students on mastering the discipline "Technologies for developing prospective hydrocarbon reserves / Технологии разработки перспективных запасов 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 assessing the level of competencies (part of competencies) based on the results of mastering the discipline "Technologies for developing prospective hydrocarbon reserves / Технологии разработки перспективных запасов 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 |
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| Position, Department | Signature | Full name |
| Head of Department: | | |
| Director of the Department of Mineral Developing and Oil&Gas Engineering |  | Kotelnikov A.E. |
| Name of Department | Signature | Full name |
| Head of Educational Programme: | | |
| Professor of the Department of Mineral Developing and Oil&Gas Engineering |  | Kapustin V.M. |
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