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

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

2024

1. COURSE GOALS

The goal of the course "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. REQUIREMENTS FOR LEARNING OUTCOMES

The course "Innovative technologies for the development of hydrocarbon deposits / Инновационные технологии разработки месторождений углеводородов" 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)
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-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	SPC-7.1 Knows: 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 Requirements of regulatory legal acts of the Russian Federation, local regulations, administrative documents and

Competence code	Competence descriptor	Competence formation indicators (within this course)
		technical documentation in the field of hydrocarbon production Technological processes of hydrocarbon production Purpose, device and principle of operation of equipment for the extraction of hydrocarbon raw materials Physical and chemical properties of hydrocarbon raw materials, chemical reagents, the procedure and rules for their disposal Technological modes, well operation parameters Standards for technological losses of hydrocarbon raw materials during production in accordance with the accepted scheme and development technology The influence of various processes occurring in the reservoir on the productivity factor of a production well The procedure for measuring the productivity factor of a production well Methods for calculating the productivity factor and skin effect according to well surveys with recording the pressure recovery curve Purpose, device and principle of operation of equipment for mechanized production of hydrocarbon raw materials Standards, specifications, guidelines for the development and execution of technical documentation Types of emergencies during well operation, their causes and methods of prevention and elimination Structure, interaction of means of an automated process control system, telemechanics, automatic control systems for hydrocarbon production equipment, ways to control them Requirements for labor protection, industrial, fire and environmental safety SPC-7.2 Can: 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 Evaluate the residual life of hydrocarbon production equipment Analyze inflow characteristics in a vertical, horizontal or multilateral well Predict the change in the inflow characteristics from the reservoir to the well, taking into account the reservoir operation mode Develop operating instructions for hydrocarbon production equipment Control the operation of equipment for artificial lift of 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

Competence code	Competence descriptor	Competence formation indicators (within this course)
		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 PROGRAMME STRUCTURE

The course refers to the elective 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	Competence descriptor	Previous courses/modules, internships*	Subsequent courses/modules, internships*
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	Machinery and equipment for field development and transportation of hydrocarbons; Modern aspects of geological and geophysical research in the oil and gas industry;	Pre-graduation Practical Training;
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	*Advanced oil and gas processing equipment and product quality management***; Modern aspects of geological and geophysical research in the oil and gas industry; *Modern stream in oil and gas*	Pre-graduation Practical Training;

Competence code	Competence descriptor	Previous courses/modules, internships*	Subsequent courses/modules, internships*
		*processing in Russia***; Technologies for developing prospective hydrocarbon reserves; Technological practice (educational) / Технологическая практика (учебная); Technological practice (industrial) / Технологическая практика (производственная);	

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

4. COURSE WORKLOAD

The total workload of the course "Innovative technologies for the development of hydrocarbon deposits / Инновационные технологии разработки месторождений углеводородов" is 4 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) 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*
The course total workload	acc.hrs. _	**144**	**144**
	credits	**4**	**4**

5. COURSE MODULES 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. 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 (	Lecture,

	Schlumberger). WellWatcher FLUX intelligent completion system (Schlumberger).	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. RESOURCES RECOMMENDED FOR COURSE

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

7. 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:

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position, educational department	name and surname
Senior lecturer of the Department of Mineral Developing and Oil&Gas Engineering	Tcharo Ya.A.
position, educational department	name and surname

Head of Department:

Head of the Department of Mineral Developing and Oil&Gas Engineering	Kotelnikov A.E.
position, educational department	name and surname

Head of Educational Programme:

Professor of the Department of Mineral Developing and Oil&Gas Engineering	Kapustin V.M.
position, educational department	name and surname