

Документ подписан простой электронной подписью
Информация о владельце:
ФИО: Ястребов Олег Александрович
Должность: Ректор
Дата подписания: 28.05.2024 11:42:00
Уникальный программный ключ:
ca953a0120d891083f939673078ef1a989dae18a

**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

**Advanced oil and gas processing equipment and product quality management /
Современное оборудование для переработки нефти и газа и управление
качеством производимой продукции**

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 "Advanced oil and gas processing equipment and product quality management / Современное оборудование для переработки нефти и газа и управление качеством производимой продукции" is to obtain knowledge, skills and experience in the field of technology of oil, natural hydrocarbon gases and gas condensates, its theoretical and applied significance, the basic physical and chemical properties of oil and oil products, the principles of oil treatment, direct distillation of oil and oil and gas condensate raw materials, and as well as further processing to obtain the entire range of petroleum products.

The aims of the course are:

- study of the main processes of primary and secondary processing of oil and gas, their relationship, raw materials for each process and products;
- knowledge of modern oil and gas processing plants.
- study of the latest achievements in the improvement of processes, individual units of installations and modernization of the main equipment;
- analysis and generalization of the results and their use in further practical work at oil refineries;
- obtaining knowledge for solving practical problems of improving equipment and blocks of technological installations.

2. REQUIREMENTS FOR LEARNING OUTCOMES

The course "Advanced oil and gas processing equipment and product quality management / Современное оборудование для переработки нефти и газа и управление качеством производимой продукции" 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-1	Able to use theoretical knowledge when performing technological scientific research in the field of development, transportation and processing of oil and gas	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 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 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
SPC-4	Able to manage the system for monitoring the technical condition and technical diagnostics at the facilities and plants of the oil and gas complex	SPC-4.1 Knows the principles, physical foundations, technical support of technical control and diagnostic methods, modern developments in the field of strength of materials, fracture mechanics, materials technology and materials science; design features, manufacturing technology, operation and repair of the control object,

Competence code	Competence descriptor	Competence formation indicators (within this course)
		<p>types and types of defects, probable zones of their formation, taking into account the loads acting on the object and other factors, principles, physical foundations, technical support for the types and methods of technical control and diagnostics; principles of construction, functional diagrams and rules for operating equipment for a given method of control, rules for selecting and checking the quality of used consumable flaw detection materials; control systems used to check objects (products) of a certain type; metrological support; standards, calculation methods and other applicable regulatory documents and rules for assessing the technical condition; harmful environmental factors of this control method and ways to prevent their impact on the environment and humans; principles of planning and organization of work of technical control and diagnostic units, current state and prospects for the development of technical control and diagnostic methods; rules for electrical safety and fire safety, rules for the construction and safe operation of facilities</p> <p>SPC-4.2 Can determine the methods, equipment, technologies and techniques to be used for specific types of objects; perform control operations, evaluate and identify the results of control and testing, issue conclusions on the results of technical control and diagnostics; organize, conduct and manage calculations and experimental work to assess the technical condition</p> <p>SPC-4.3 Has the skills to perform verification calculations, taking into account the identified defects; assessment of the mutual influence of various defects on the technical condition of the control object; determining the need for additional research in order to clarify the determining parameters of the technical condition; development of measures to reduce operational risks based on risk analysis, minimization of operational risks</p>
SPC-5	<p>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>	<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</p>

Competence code	Competence descriptor	Competence formation indicators (within this course)
		to approved forms
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 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	Name of competence	Previous disciplines/modules, practices*	Subsequent disciplines/modules, practices*
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>Comprehensive analysis of processing, storage and marketing of hydrocarbons**;</i> Current development of the production of unconventional hydrocarbon resources in the world; <i>Innovative technologies for the transportation and storage of hydrocarbons**;</i> Geoinformation Systems and Applications; Research work / Научно-исследовательская работа (получение первичных навыков научно-исследовательской работы); Research Work; Pre-graduation Practical Training;
SPC-4	Able to manage the system for		<i>Diagnostics of oil and</i>

Competence code	Name of competence	Previous disciplines/modules, practices*	Subsequent disciplines/modules, practices*
	monitoring the technical condition and technical diagnostics at the facilities and plants of the oil and gas complex		<p><i>petroleum products main pipeline facilities**;</i> <i>Fundamentals of construction and operation of pipeline transport;</i> <i>Innovative technologies for the transportation and storage of hydrocarbons**;</i> <i>Machinery and equipment for field development and transportation of hydrocarbons;</i> <i>Methods of oil production intensification;</i> <i>Technological practice (educational) / Технологическая практика (учебная);</i> <i>Technological practice (industrial) / Технологическая практика (производственная);</i> <i>Pre-graduation Practical Training;</i></p>
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><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> <i>Modern aspects of</i></p>

Competence code	Name of competence	Previous disciplines/modules, practices*	Subsequent disciplines/modules, practices*
			<i>geological and geophysical research in the oil and gas industry; Technologies for developing prospective hydrocarbon reserves; Technological practice (educational) / Технологическая практика (учебная); Technological practice (industrial) / Технологическая практика (производственная); Pre-graduation Practical Training;</i>
SPC-9	<p>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</p>		<i>Technological practice (industrial) / Технологическая практика (производственная); Pre-graduation Practical Training; Project management in the oil and gas industry**; Economics and management of oil and gas production**; Current development of the production of unconventional hydrocarbon resources in the world; Technological processes of pipeline transport; Technologies for developing prospective hydrocarbon reserves;</i>

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

4. COURSE WORKLOAD

The total workload of the course "Advanced oil and gas processing equipment and product quality management / Современное оборудование для переработки нефти и газа и управление качеством производимой продукции" is 5 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
<i>Contact academic hours, acc .</i>	54	54
including:		
Lectures	18	18
Laboratory work		
Seminars (workshops/tutorials)	36	36
<i>Self-study (ies), academic hours</i>	99	99
<i>Evaluation and assessment (exam or pass/fail grading)</i>	27	27
The course total workload	acc.hrs.	180
	credits.	5

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. Mass transfer (diffusion) processes	Basic concepts and laws of mass transfer . Equilibrium systems. Evaporation and condensation. Rectification. Azeotropic and extractive distillation. absorption and desorption. The main types and calculation of distillation and absorption columns. Adsorption. Extraction. Drying	Lecture, Lab work
Section 2. Hydromechanical processes	Characteristics of disperse systems. Settling. Filtration. Centrifugal settling and centrifugal filtration. Electrical deposition. Separation of gas dispersed systems. Mixing liquids. Hydrodynamics of a layer of granular materials	Lecture, Lab work
Section 3. Mechanical processes	Grinding of hard materials. Classification and dosing of solid materials	Lecture, Lab work
Section 4. Thermal processes	Tube furnaces. Heat exchangers	Lecture, Lab work
Section 5. Processes of chemical processing of petroleum raw materials	The main regularities of petrochemical processes. reaction apparatus	Lecture, Lab work

6. LOGISTICS AND TECHNICAL SUPPORT OF THE DISCIPLINE

Table 6.1. Logistics of discipline

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-	

Classroom for Academic Activity Type	Classroom equipment	Specialized educational / laboratory equipment, software and materials for mastering the discipline (if necessary)
	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. Ryabov, V. D. Chemistry of oil and gas: textbook. allowance / V.D. Ryabov. - 2nd ed., Rev. and additional - Moscow: Publishing House "FORUM": INFRA-M, 2019. - 335 p. <https://znanium.com/catalog/product/940691>

2. Zarifyanova, M.Z. Chemistry and technology of secondary oil refining processes : textbook / M.Z. Zarifyanova, T.L. Puchkova, A.V. Sharifullin ; Ministry of Education and Science of Russia, Kazan National Research Technological University. - Kazan: Kazan Research Technological University (KNITU), 2015. - 156 p. <https://biblioclub.ru/index.php?page=book&id=428799>

3. Nekozyreva, T. N. Chemistry of oil and gas: textbook / T. N. Nekozyreva, O. V. Shalamberidze. - Tyumen: Tsogu, 2013. - 76 p. - ISBN 978-5-9961-0768-1. — Text: electronic // Doe: electronic library system. <https://e.lanbook.com/book/55436>

Additional(optional) reading (sources):

1. Reservoirs for receiving, storing and dispensing petroleum products: study guide / Yu.N. Bezborodov, V.G. Shram, E.G. Kravtsova and others; Ministry of Education and Science of the Russian Federation, Siberian Federal University. - Krasnoyarsk: Siberian Federal University, 2015. - 110 p.

<http://biblioclub.ru/index.php?page=book&id=435609>

2. Agabekov, V.E. Oil and gas: technologies and products of processing / V.E. Agabekov. - Minsk: Belarusian Science, 2011. - 460 p.

<http://biblioclub.ru/index.php?page=book&id=86694>

3. Ponomareva, G. A. Hydrocarbons of oil and gas: physical and chemical properties: textbook / G. A. Ponomareva. - Orenburg: OGU, 2016. - 98 p. - ISBN 978-5-7410-1411-0. — Text: electronic // Doe: electronic library system. <https://e.lanbook.com/book/98000>

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 "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 ""Advanced oil and gas processing equipment and product quality management / Современное оборудование для переработки нефти и газа и управление качеством производимой продукции".

2. Guidelines for students on the development of the course ""Advanced oil and gas processing equipment and product quality management / Современное оборудование для переработки нефти и газа и управление качеством производимой продукции".

*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:

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

position, educational department

Kapustin V.M.

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